Case No. 7352

Application, Transcripts,

Small Exhibits, Etc.

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STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO
21 October 1981

EXAMINER HEARING

IN THE MATTER OF:

Application of Yates Petroleum Corporation for designation of a tight formation, Eddy County, New Mexico.

CASE **7352**

BEFORE: **Richard L. Stamets**

TRANSCRIPT OF HEARING

A P P E A R A N C E S

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E X H I B I T S

MR. STAMETS: We will call next Case 7352.

MR. PEARCE: Application of Yates Petroleum Corporation for a designation of a tight formation, Eddy County, New Mexico.

MR. DICKERSON: Chad Dickerson, of Artesia, New Mexico, Mr. Examiner, appearing on behalf of the applicant, and we have two witnesses.

(Witnesses sworn.)

MR. DICKERSON: We call Mr. Ray Beck at this time.

RAY BECK

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

DIRECT EXAMINATION

BY MR. DICKERSON:

Q Will you state your name, your occupation, and by whom you're employed, please?

A Ray Beck, petroleum geologist, Yates Petroleum Corporation, Artesia, New Mexico.

Q Mr. Beck, would you briefly summarize your educational and work experience background as it relates to this application?

A I have a Bachelor of Science degree and a Master of Science degree in geology from Texas Tech University.

I worked for Shell in Texas for nine years and I worked for Yates Petroleum for ten years in southeast New Mexico.

Q And are you familiar with the subject lands in question?

A Yes.

Q And have you prepared certain exhibits upon which you intend to rely today?

A I have.

Q Would you briefly describe this formation for which tight formation designation is sought, Mr. Beck, by geological parameters? And briefly state the purpose of this application on behalf of Yates Petroleum Corporation?

A As to the application, Yates Petroleum Corporation seeks tight formation designation for a portion of the Permo-Penn underlying lands in western Eddy County, New Mexico, which are described in Exhibit Number One and shown in map form in Exhibits Numbers Two and Three.

The description of the formation by geological parameters is as follows: The formation sought to be covered by this application is that stratigraphic interval between the top of a marker named the Third Sister Cycle of the Wolfcamp series of the Permian system, and the top of the Canyon series of the Pennsylvanian system.

Correlations of the Third Sister Cycle and the Canyon Series are shown on a network of four cross sections spread over the subject area, Exhibits Five through Eight.

Positions of the Third Sister and Canyon geologic column are illustrated in Exhibit Number Four.

The Third Sister Cycle to Canyon Series varies from approximately 1000 to 1400 feet in thickness.

Q Mr. Beck, please refer specifically to Exhibit Number One and describe for the Examiner what this exhibit reflects.

MR. STAMETS: If -- I don't believe I've said the witness is qualified, but he is.

Q What is Exhibit Number One, Mr. Beck?

A. Exhibit Number One is a list which describes the lands which overlie the Permo-Penn interval for which tight formation designation is sought in this application.

Q And that's approximately 318,000 acres in Eddy County, New Mexico, is that correct?

A That is correct.

Q And what is reflected by Exhibit Number Two?

A Exhibit Number Two is a map of one inch equal 5000 feet scale, which shows the lands described in Exhibit Number One.

The subject area stretches over a portion of western Eddy County, New Mexico from the Pecos River east of the City of Artesia to the Huapache Monocline some forty miles to the southwest.

Also shown by circled well spots are all wells within the outline which have penetrated the above defined Permo-Penn formation and/or lower horizons.

Red colored well spots are wells which are currently producing gas from the above defined Permo-Penn interval.

Deposits of the subject Permo-Penn interval are a complex of three major environments of deposition or facies, shelf, bank, and basin facies.

The shelf facies, lying in bands to the west or northwest, is comprised of interbedded limestones, shales, siltstones, and sandstones.

Terrigenous clastics, that is shales, siltstones, and sandstones, increase, and marine limestones and shales decrease, traversing from east to west or southeast to northwest; that is, in a shelfward direction.

Deposits of the shelf facies are effectively non-porous and impermeable, and constitute an up-dip mega-seal to the bank facies.

The bank facies is composed mostly of marine limestones with a few intercalated marines shales. These marine limestones are made up of bioherms and their associated debris aprons interfingered with oolite bars.

The porosity that is present is a result of preservation of primary porosity, principally of bryozoan material and creation of secondary porosity by leaching of oolitic grainstones and former aragonitic shell material.

Most of the gas production that has been established in the subject Permo-Penn interval has been from deposits of the bank facies.

The basin facies consists mainly of thin-bedded, fine-grained sandstones, siltstones, and shales, which were transported to the relatively deeper basin from the bank and shelf areas during periods of lower sea level.

Main conduits for transport to the basin were through passes between segments of the bank facies.

Scattered within the overall basin facies are isolated limestone or carbonate build-ups, termed isolated mounds. In some of the isolated mounds porosity has been developed and/or preserved, but many are effectively non-porous and impermeable.

Some of the isolated mounds have produced gas. Wells in the basin facies which have encountered mounds are indicated by the letter "M" close by the well spot.

About one-third of the subject Permo-Penn interval in the upper part, has been termed the Antelope Sink Zone, named for an interval in the Sun, formerly Tom Brown, No. 1 Antelope Sink Unit, in Section 18, 19 South, 24 East. This well is shown on two cross sections, Exhibits Six and Eight.

The geographical limits of shelf, bank, and basin shown on Exhibit Two are for the Antelope Sink Zone alone.

Lower zones of the subject Permo-Penn interval are not shown, but their facies trends are essentially parallel to those shown on Exhibit Number Two.

Exhibit Number Two also shows the traces of the cross sections intorduced in later exhibits.

Q Mr. Beck, please refer to Exhibit Number Three and describe what it shows.

A Exhibit Number Three is identical to Exhibit Number Two from the standpoint of scale, outline of lands, well spots, and colored well spots.

The purpose of this exhibit is to illustrate the structural attitude of the Permo-Penn formation in the subject area.

Mapping was done on the top of the Antelope Sink Zone in the shelf and bank areas, and on top of the Canyon Series in the basinal areas.

As the cross sections will show, the Antelope Sink Zone is essentially parallel with the Third Sister Cycle above.

Dashed contours are 100 feet contour intervals on top of the Antelope Sink zone. Solid contours are 100 foot contour intervals on the top of the Canyon Series.

These contours indicate that over most of the outlined area the Permo-Penn interval dips to the east, southeast, at approximately 100 feet per mile; however, in the southwestern part of the outlines area, near the Huapache Monocline, the Permo-Penn interval dips east to northeasterly at 200 to 300 feet per mile and structure is complicated by faulting.

Structural relief on the top of the subject Permo-Penn is approximately 3300 feet in the outlined area. Ground level elevations rise approximately 1500 feet from wells near the Pecos River in Township 17 South, Range 26 East, to wells near the Huapache Monocline in Township 21 South, 21 East.

The drill depth to the top of the Third Sister Cycle in the highest well, the Pennzoil No. 1 United Federal, in Section 28 of 21 South, 21 East, is 4927 feet. And the drill depth to the top of the Third Sister in the lowest well, the HEYCO No. 1 Big Boggy State, in Section 36 of 17 South, 26 East, is 6717 feet.

The average depth to the top of the subject Permo-Penn formation is thus 5822 feet, and there's a correction from that in the statement we sent in to the OCD and the USGS. There's a typographical error there of it says 5827, but it's really 5822.

Q And that mistake is not material, Mr. Beck, is it --

A No.

Q -- for the purposes of this application?

A No, sir, it's just a typographical error.

Q Refer to Exhibit Number Four and describe what it shows.

A Exhibit Number Four illustrates the stratigraphic column present in western Eddy County, New

Mexico.

This geologic section was compiled from New Mexico Oil Conservation Division reference cross sections and other industry accepted correlations.

The main purpose of this exhibit is to show the Permo-Penn stratigraphic interval sought to be covered by this application in relation to geologic time and other stratigraphic horizons.

Q Refer to Exhibit Number Five and describe what it reflects.

A. Exhibit Number Five is a northwest to southeast stratigraphic cross section, A-A', hung on the Third Sister Cycle of the Wolfcamp Series.

This cross section is transverse to the three major facies trends of shelf, bank, and basin.

Other pertinent correlations shown are the top of the Antelope Sink Zone of the shelf and bank facies, top of the Pennsylvanian, by correlating with the New Mexico Oil Conservation Division reference cross sections, and the top of the Canyon Series.

Drill stem test, core, and completion data are shown on the cross section.

Well No. 6 was cored in the Permo-Penn and the core analysis report is given at a later exhibit.

Wells 2, 3, and 5 are currently producing Permo-Penn gas and have been assigned to the Eagle Creek Permo-Penn Gas Field by the New Mexico Oil Conservation Division.

Wells 4 and 6 should produce Permo-Penn gas but they have not yet been completed in that interval.

Note that Well 8 produced gas from an isolated mound. This well was assigned to the Atoka Cisco West Gas Field, and produced 64,125 Mcf of gas and 146 barrels of condensate before abandonment in 1980.

Q Mr. Beck, please go to Exhibit Number Six and describe what it shows.

A Exhibit Number Six is a northwest/southeast stratigraphic cross section, B-B', which is again hung on the Third Sister Cycle and is transverse to the three major facies of shelf, bank, and basin.

I might just add here off -- off the written thing that we handed in, that we're moving from north essentially to south on these three transverse cross sections.

A key correlation well, the Sun, Tom Brown, No. 1 Antelope Sink Unit, is Well 3. Tops pertinent to this application are picked in this well as follows: Third Sister, 5860; Antelope Sink Zone, 6080; top of the bank facies, 6140; top of the Pennsylvanian, by correlation with the New Mexico Oil Conservation Division reference cross sections, 6190; base of the bank facies, 6449, on the written transcript we sent earlier it was 6420. That's a mistake. It should be 6449. And the Canyon Series is 7060.

Note that the perforated interval straddles the systemic boundary between the Permian and the Pennsylvanian.

And Antelope Sink Unit No. 1 has been assigned to the Antelope Sink Upper Penn Gas Field.

Well 4 should also produce Permo-Penn gas but it has not yet been completed in that zone.

Q Refer to Exhibit Number Seven, Mr. Beck, and describe what it shows.

A. Exhibit Number Seven is another northwest to southeast stratigraphic cross section, C-C', which is also hung on the Third Sister Cycle.

Wells 4 and 6 are producing gas from the Permo-Penn formation and have been assigned to the Box Canyon Permo-Penn Gas Field.

Q Now refer to Exhibit Number Eight, please, and describe what it shows.

A. Exhibit Number Eight is a southwest to northeast stratigraphic cross section, D-D', which is hung on the Third Sister Cycle. This longitudinal, or strike, cross section is more or less parallel to the major facies of shelf, bank, and basin.

The purpose of this cross section is to tie the three previous transverse cross sections.

It may be noted that the main gas productive Antelope Sink Zone bank facies correlate very well, on the left, from the Box Canyon Permo-Penn Gas Field to Antelope Sink Upper Penn Gas Field to the Penasco Draw Permo-Penn Gas Field to the Eagle Creek Permo-Penn Gas Field.

Q Mr. Beck, were Exhibits One through Eight prepared by you or under your direction and supervision?

A Yes, they were.

MR. DICKERSON: Mr. Examiner, at this time Applicant would move admission of Exhibits One through Eight.

MR. STAMETS: These exhibits will be admitted.

MR. DICKERSON: And that concludes our direct testimony from this witness.

CROSS EXAMINATION

BY MR. STAMETS:

Q Mr. Beck, you've presented quite a number of logs here. I want to discuss just briefly what produces in this interval, or what may produce.

As you were going through here you named off certain wells and indicated that a zone might be productive later on which wasn't completed there now.

It would appear to me as though in your discussion primarily you are looking at the bank facies or these mounds as being the producing intervals throughout this section.

A. Correct.

Q. Are any of the other zones outside the banks or mounds apt to be productive?

A. In this -- in this geographical area they're all -- they're either completed from the bank facies or from the isolated mounds. There is nothing producing, or there's no sand intervals to be produced -- that are producing. These are all carbonates.

What we tried to do here is include the bank and the isolated mounds together because they're both carbonates, they're both tight, as will be presented by the following witness from the engineering data. We just tried to pick something that could be correlated throughout this geographical area and to include all the carbonates that produce in this thing in that envelope between the Third Sister as we picked it on the Tom Brown Antelope Sink Well and the Canyon.

Really, so far all that's been produced is the bank facies and a few of the isolated mounds, and most of the isolated mounds are really either tight or haven't -- or are limited.

Q The engineering witness who we will hear shortly, will be making his determinations as to productivity, permeability, from the same bank and mound sections.

A Yes, sir. He has got every well listed that has penetrated the Permo-Penn at least as far as the Canyon, and all the wells that are currently producing, has the data on all of those, and he can show from that.

We were just trying to establish here the geological parameters of the formations we're wishing to be designated as tight formation, and also the geographical area.

Q But you would not expect to be making a well in the first 100 feet of the section anywhere.

A No, sir, it's all tight Wolfcamp beds, and I can think of nothing in the geographical area in this envelope that's not -- that would not be tight.

Q Okay

MR. [illegible]AMETS: Any other questions of this witness? He may be excused.

MR. DICKERSON: Call Mr. David Boneau at this time.

DAVID F. BONEAU

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

DIRECT EXAMINATION

BY MR. DICKERSON:

Q. Will you state your name, your occupation, and by whom you're employed?

A. I'm David Boneau. I'm a reservoir engineering supervisor for Yates Petroleum Corporation in Artesia, New Mexico.

Q. Mr. Boneau, have you -- would you briefly summarize your educational and work experience for the Examiner?

A. Yes. I have a BAchelor of Science degree in physics from the University of Notre Dame in 1962 and a PhD in physics from Iowa State University in 1969.

For twelve years after I worked for Phillips Petroleum Company in Bartlesville, Oklahoma, and in Odessa, Texas. In Odessa I was reservoir engineer for the

Goldsmith District and in Bartlesville I served in various responsibilities, including reservoir enginerring supervisor for the Phillips R & D Department.

Q Mr. Boneau, as part of your responsibilities, have you made an examination and a study of the wells in question upon which you intend to testify today?

A Yes, sir.

Q And are you familiar with this application?

A Yes, sir.

MR. DICKERSON: Mr. Examiner, is this witness considered qualified?

MR. STAMETS: He is.

Q Mr. Boneau, would you briefly state what you intend to show by the exhibits upon which you will testify?

A Yes. The data that I'm going to present will show that the Permo-Penn interval defined by the previous witness meets the guidelines set forth by the Federal Energy Regulatory Commission for designation as a tight sand formation under Section 107 of the Natural Gas Policy Act.

These guidelines require, first, an estimated in situ gas permeability throughout the pay section of less than 0.1 millidarcy.

The stabilized production rate against

atmospheric pressure of wells completed for production in this formation without stimulation is not expected to exceed 188,000 cubic feet for production from the average depth of 5822 feet.

And thirdly, no well drilled into this proposed tight formation is expected to produce without stimulation more than five barrels of crude oil per day.

Q Mr. Boneau, would you refer to Exhibit Number Two, previously introduced, and describe what is pertinent on that exhibit insofar as your testimony is concerned?

A Okay. Exhibit Two is the map presented by the previous witness on which is outlined the area for which the tight gas designation is sought.

The red dots show the location of the 50 wells that are completed in the designated Permo-Penn interval, as of January 1, 1981.

Triangles indicate wells where drill stem test data was used to calculate in situ permeability of the pay section. There are ten triangles and we'll discuss those permeability calculations in detail later on.

And there's one square which indicates the location of the well where core data is available.

Q Mr. Boneau, at this time please refer the Examiner to your Exhibit Number Nine and describe what is reflected in it.

A. Exhibit Number Nine is a 29 -- 26 page list of all wells within the boundary of the proposed area that were drilled deep enough to penetrate the designated Permo-Penn interval.

Information on these 333 wells includes well name, location, operator, spud date, total depth, field, and production up to January 1, 1981. The list is current to the start of 1981. That was our cutoff.

Most of these wells were drilled as Morrow prospects to depths near 9000 feet.

There are 119 Morrow producers in the proposed area. These Morrow wells have produced a total of 82.2 billion standard cubic feet for an average of 691 million standard cubic feet per well. The Morrow is the principal gas producing interval in this area.

Many of the deep wells in Exhibit Number Nine will be completed in the designated Permo-Penn formation at some point in the future if the Permo-Penn gas can be produced economically.

In addition, exploratory drilling for Morrow gas will be stimulated somewhat when the tight gas sand designation makes the Permo-Penn interval a more attractive salvage zone.

That's enough about Exhibit Nine, I think.

Q Refer to Exhibit Number Ten and describe what it shows.

A Exhibit Number Ten is a list of the 50 wells completed in the designated Permo-Penn interval as of January 1, 1981. Most of the engineering data on the subject formation will come from the wells in Exhibit Number Ten.

Although the average depth to the top of the designated Permo-Penn interval is 5922 feet -- 5822 feet, thank you -- production from 49 of the 50 wells comes from below the 5822 feet. The average depth to the top of the pay zone in these 50 wells is 6490 feet.

These wells have produced a total of 9.01 billion standard cubic feet for an average of 180 million standard cubic feet per well.

MR. STAMETS: Would you give me the average depth for the completion interval on those again, please?

A Surely. The average depth to the top of the pay zone, the top perforation in the 50 wells, is 6490 feet.

MR. STAMETS: Okay, and then the average production?

A The average production is 180 million standard cubic feet per well.

MR. STAMETS: Thank you.

A Surely.

Q Mr. Boneau, please refer to Exhibit Number Eleven and describe what it represents.

A Exhibit Eleven is a list of wells that were spudded or completed in the designated Permo-Penn interval after July 15th, 1979.

These eight wells are the only ones out of the 50 wells in Exhibit Number Ten that would be eligible for tight gas prices, according to my understanding of the rules, should the present application for tight gas designation be approved.

Approximately five additional wells have come on line in 1981, and according to my understanding, again, these would also be eligible if the tight formation designation is approved.

All production from the other 42 active wells will never be eligible for tight gas prices under current regulations.

MR. STAMETS: Mr. Boneau, to your knowledge, were any of these wells on Exhibit Eleven, plus the five that you discussed, drilled specifically for the Permo-

Penn or were those all deeper wells?

A. My memory says that they were all drilled initially to the Morrow. They were all drilled deeper.

MR. STAMETS: Okay, thank you.

A. I have reason to believe that's correct, since Mr. Beck is over here nodding.

So our point in Exhibit Eleven is that our application mainly seeks a long-term opportunity to produce gas from the designated Permo-Penn formation by recompleting wells originally drilled to deeper horizons, and recompleting them in the future, for the most part.

Q Now, Mr. Boneau, would you kindly analyze your engineering data available?

A. Do you really want to use all this stuff?

Q As far as it pertains to this application.

A. How about I try to show it in a list.

Q Okay.

MR. DICKERSON: Mr. Examiner, please note that the written information furnished as the statement of the meaning and purpose of each exhibit does analyze these formulas and so forth in considerably more detail than Mr. Boneau will now go into.

MR. STAMETS: Well, and I would point

out for the record, too, that this application has been carefully examined by Mike Stogner, who is an engineer on the staff of the Division, and any problems therewith have probably been ferreted out by this time and will show up in the cross examination, if any.

A. Okay. So I'd like to say with the foregoing as kind of a background, and the engineering data part of it, we will try to demonstrate that three criteria are met; first, that the average permeability in the natural state is less than, or equal to, 0.1 millidarcy; that the stabilized flow rate before stimulation is less than 183 Mcf per day; and third, that no well produces more than five barrels of oil per day.

The estimated average in situ gas permeability throughout the pay section was calculated by two standard methods that are widely accepted in the industry.

These methods include, first, permeability calculation from pressure build-up data taken during drill stem tests; and second, laboratory measurements on a cored section of the designated Permo-Penn interval from one well, a single well.

First I'm going to talk about permeability calculated from drill stem test data. This kind of data will give a good representation of the in situ permeability, since the drill stem test is performed while the well was still being drilled; the formation has been altered relatively little from its natural condition. If there is some formation damage due to the drilling mud, most of this damage is removed during the preflow phase of the drill stem test.

In contrast, pressure data taken after the well is acidized or fractured will give higher values for the permeability because the formation has been etched and broken by the treatments.

Okay.

Q Mr. Boneau, refer to Exhibit Number Twelve, please, and describe what it shows.

A. Exhibit Number Twelve shows data from the drill stem test at ten wells within the proposed area. The locations of these wells are indicated by triangles on Exhibit Number Two.

Of the ten wells only Murphy NW Federal No. 1 is not presently completed in the desginated Permo-Penn formation. This well was cored and drill stem tested in the Permo-Penn interval, but it is now a completed Morrow producer.

The values of permeability calculated from the drill stem tests, which are the second column from the right on Exhibit Twelve, range from 0.003 millidarcy for the Irish Hills "KW" State No. 2, up to 0.091 millidarcy for La Cama No. 1.

The average permeability for the ten wells was determined to be 0.031 millidarcy.

The last column in Exhibit Number Twelve, the one that's labeled "Years to Reach Pseudo-Steady State", gives the approximate time required for a pressure disturbance at the wellbore to reach the outer boundary of the reservoir feeding the well.

Said another way, gas near the outer boundary of a reservoir begins to move towards the wellbore at the time indicated in the righthand column in Exhibit Number Twelve.

Flush production of gas relatively near the well occurs until the whole reservoir is feeding the well. Then the pressure begins to drop with time uniformly throughout the reservoir and the flow rate becomes stabilized.

The calculated time to reach stabilized flow ranges from 1.8 years for Well Cities "JG" State No. 1, up to 33 years for Irish Hills "KW" State No. 2.

The average time was determined to be 10.7 years to reach this stabilized flow.

The idea of using a time to reach stabilized flow was introduced here because it follows naturally from the calculation of the formation permeability from the drill stem test data.

I intend to discuss the stabilized flow idea in more detail after all the data on permeability has been presented.

Q Mr. Boneau, refer to Exhibit Number Thirteen and describe what it shows.

A Okay. The second procedure for obtaining in situ permeability is to measure the permeability of actual cored sections of the Permo-Penn rock in a laboratory.

The only core data available comes from the Murphy "NW" Federal No. 1 Well, which was the well marked with a square in Exhibit Number Two.

A log of the Permo-Penn interval in the Murphy Well is -- appears in Exhibit Five as Well No. 6.

Exhibit Thirteen, then, shows the permeability measured by CORE Laboratories for the 72 feet of core recovered from this well. Special tests were run on 16 samples from the Murphy core to evaluate the effect of overburden pressure on the core samples in order to determine a representative value for the in situ reservoir permeability.

Routine core analyses are normally run with a confining or overburden pressure of only 200 psi. The overburden pressure within the Permo-Penn formation is really about 3300 psi, and special core tests were required in order to correct the results of routine core analyses for the effect of the actual overburden pressure.

The results of these special tests, performed at an overburden pressure of 3300 psi, are listed in the last two columns of Exhibit Number Thirteen.

So Exhibit Number Thirteen shows both the routine core data and the special core data on the Murphy cores.

Q Refer, Mr. Boneau, to Exhibit Number Fourteen and describe what it shows.

A Exhibit Number Fourteen shows the correlation that was developed between the routine permeability at 200 psi overburden pressure and the in situ permeability at the actual overburden pressure of 3300 psi.

Data from the petroleum literature was used to help define this relationship, since there are relatively few data points available from the Murphy core. And an awful lot of the data points appear in the lower lefthand corner at very low permeabilities, and there aren't very many data points in the body of the figure, and I thought that the Amoco experience in the laboratory would help define that relationship.

So the dashed line in Exhibit Fourteen is a correlation developed by a Mr. Jones and Mr. Owens of Amoco Production Company for rocks where overburden pressure has a minimum effect on permeability, and the reference is on Exhibit Fourteen as SPE 75-51.

And this Amoco work was reported in the Journal of Petroleum Technology in September of 1980.

The solid line in Exhibit Fourteen was drawn parallel to the dashed line in order to better fit the actual points for the Murphy core. This solid line was used to convert the routine permeability values into in situ permeabilities values at 3300 psi overburden pressure.

Q What is shown by Exhibit Number Fifteen?

A Exhibit Number Fifteen tabulates the permeabilities of the core material from the Permo-Penn pay section in the Murphy "NW" Federal No. 1. Those sections of the interval that the electric log condemned as nonproductive are omitted.

The average routine permeability for the Murphy Well is 0.116 millidarcy, indicated at the bottom of the fourth column.

It happens that the in situ permeability corrected for overburden pressure taken from core data, which is the number at the bottom of the fifth column in Exhibit

Fifteen, both came out to be 0.035 millidarcy for the Murphy "NW" Federal No. 1, and I don't believe it, but that's the way it turned out.

The Murphy Well can be considered a typical well, since its in situ permeability of 0.035 millidarcy is very close to the average 0.031 millidarcy for the ten wells that we talked about drill stem test data in Exhibit Number Twelve.

So as a summary of the permeability data, we have two types of data, the average in situ permeability from drill stem test data, 0.031 millidarcy; the average in situ permeability from the available core data, 0.035 millidarcy.

Both types of engineering data indicate that the permeability of the designated Permo-Penn pay section is comfortably below the 0.1 millidarcy.

Q What is shown by Exhibit Number Sixteen?

A Okay. The second criteria relates to the gas flow rates and then the third criteria is the oil flow rates.

The data on the flow rates before stimulation are not available for the vast majority of the wells that produce in the designated Permo-Penn formation. The natural flow rates are so low that they are routinely neither measured nor recorded. The normal completion procedure has been to perforate and treat the well immediately.

In the absence of data on natural flow rates, we propose to use production data for the stimulated wells at a time in their life when the production rates are approaching stabilized rates.

Exhibit Twelve showed that the time to reach the stabilized rate varied from 1.8 to 33 years and averaged 10.7 years. Thus, actual flow rates measured two years into the lives of the Permo-Penn wells will be either near stabilized rates or still considerably higher than the stabilized rates.

Exhibit Sixteen shows actual production rates for the 24th calendar month in the producing lives of the wells that are producing from the designated Permo-Penn formation.

Only 34 of the 50 wells have been producing for two years or longer, and the average rate of gas production for the 32 wells is 144,000 cubic feet per day at the bottom of the first set of figures in Exhibit Sixteen.

And the average rate of oil production, which is at the bottom of the last set of figures in Exhibit Sixteen, is 0.6 barrels of oil per day.

The gas rates vary from one to 655,000

cubic feet per day, and only two wells produced over 300,000 cubic feet per day.

The oil rates vary from zero to 4.1 barrels of oil per day after two years. Only one well produced over two barrels of oil per day, and no well produced as much as five barrels of oil per day in the 24th month after it began production.

The FERC guidelines require that the gas flow rate be measured against atmospheric pressure. The average flow rate of 144,000 cubic feet per day calculated above for stimulated wells, was measured against pipeline pressures of 150 to 300 psi.

The corresponding flow rate at one atmosphere is given by the equation -- I guess I'm stuck with reading the equation -- the flow rate at one atmosphere is the flow rate, the actual flow rate, times the quantity P_f^2 minus P_s^2 at 1 atmosphere over the quantity P_f^2 minus P_s^2 actual conditions.

Now, you just -- why don't we -- can we just go back and skip this?

MR. STAMETS: Is that shown somewhere?

A. Yeah, it's shown on the paper.

MR. STAMETS: What page is that on, Mr. Boneau?

A. Bottom of page seven.

MR. STAMETS: Okay.

A. Why don't we just go back to saying that we calculated for stimulated wells measured against pipeline pressures of 150 to 300 psi. When we calculate the stabilized flow rate for production against atmospheric pressure the 144 Mcf per day becomes 146 Mcf per day in making that correction.

So the rates in Exhibit Sixteen are maximum values, I believe, since all the data applies to stimulated wells and since many of the wells have not yet actually stabilized. Thus, the average gas production rate is about 146,000 cubic feet per day, or less, and the maximum of oil production rate is about 4.1 barrels of oil per day, or less, under stabilized non-stimulated conditions.

Q Mr. Boneau, what is known regarding the techniques for protection of the fresh water zones in the land in question?

A. Okay. All the wells proposed for tight sand designation, all of this area, lies within the Roswell Artesian Water Basin, as established by the New Mexico State Engineer. This Roswell Artesian Water Basin is a main source of fresh water to Chaves County and northern Eddy County.

Regulations governing the drilling of oil and gas wells within the basin are enforced by the New

Mexico Oil Conservation Division in order to protect the fresh water formations.

These regulations require that a water protection string be set and cemented through the fresh water bearing strata.

The base of the Artesian aquifer lies at a depth of about 1000 feet at the north end of the proposed area and at a depth of about 1400 feet at the south end.

In a typical casing program conductor pipe is set at a depth of 300 to 400 feet and cement is circulated to surface in order to protect the shallow fresh water.

Then an intermediate string of casing is set about 100 feet below the base of the Artesian aquifer at a depth of 1100 to 1500 feet. Cement is circulated to surface behind the intermediate string to protect the Artesian aquifer.

The production casing is then set at the total depth of the well, which is usually in the Morrow formation, and cemented with 400 to 1000 sacks of cement. This provides a cement shield approximately 1000 feet above the top of the Permo-Penn designated formation.

The application to drill and the casing program for each individual well must be approved by the New Mexico Oil Conservation Division, and by the United States

Geological Survey for wells on Federal lands.

Q What is shown by your Exhibit Number Seventeen?

A. Exhibit Seventeen summarizes the engineering data that has been presented on the designated Permo-Penn formation.

The average in situ reservoir permeability determined by two standard methods, averages less than the allowed 0.1 millidarcy.

The average stabilized flow rate for gas is below the maximum allowed daily rate of 188,000 cubic feet per day.

And lastly, no well produces as much as five barrels of oil per day under stabilized conditions.

Q Mr. Boneau, were Exhibits Numbers Nine through Seventeen either prepared by you or under your direction and supervision?

A. Yes, sir.

MR. DICKERSON: Mr. Examiner, at this time Applicant moves admission of Exhibits Nine through Seventeen.

MR. STAMETS: They are accepted.

MR. DICKERSON: And that concludes our direct testimony.

A. Well, may I say one more thing?

Q. Yes, go ahead. Do you have anything else you would like to add, Mr. Boneau?

A. Mike Stogner called me on Monday about--asking about more detailed data on the drill stem test, and yesterday I prepared quickly some of the data, most of the data, all the data, on four of those ten drill stem tests, and if that question comes up we can talk about it to that extent, or at least I responded to that telephone call to that extent.

MR. DICKERSON: That concludes our direct testimony, Mr. Examiner.

CROSS EXAMINATION

BY MR. STAMETS:

Q. Referring to Exhibit Sixteen, and also Exhibit Twelve, you gave us some information on what you feel a reasonable figure should be for the unstimulated production rates.

Why didn't you show the rates for those DST's on Exhibit Twelve? It would seem like that would give us unstimulated production rates, actual unstimulated production rates.

A. That's a good question and I just happen to have in my pocket a list of those ten drill stem test rates.

Q Good. I will write those figures down on my copy of this exhibit. I may wind up asking you to do the same later.

MR. DICKERSON: We'll be glad to submit those.

A The reason that they're not there was that I had the feeling that the 50 wells, that I didn't want to use too small a sample for the average.

Q Right.

A And so I went for something that would -- big numbers, and got 34 wells, finally. Okay.

That's no excuse for not giving you ten for you to do whatever you want with them, and I apologize for that.

Oh, hell, I don't -- let's see if I have them in the same order that you have them.

The first one is 25 Mcf --

Q And that's the Box Canyon Well.

A Box Canyon.

Q All right.

A Cities "JC", 189. Cities "JH", 56. City of Artesia, 83. [illegible] "[illegible]" 17, 89. [illegible] "JJ", 190. Irish Hills "KM" No. 2, I have 70 written down. I remember it was 69.2, I think, actually, but 70 is fine. La Cana, 136. Murphy "NW", 221. And Powell "DG", 48.

Q Have you averaged those?

A. The average is 105.

Q And that's below the magic 188.

A. It's below the 188. It's below the 144 that we get by using actual production at pseudo-steady state conditions.

Q Have you compared those figures with the ones that you derived on Exhibit Sixteen for the wells that are producing?

A. No, but I'm willing to do it with you now, if you'd like.

Q Let's just take a look at some there. Box Canyon 4-A, you've got 655 on Sixteen.

A. As compared to 25. Box Canyon 4-A responded to its stimulation. So, that's the highest production rate there. That's right.

Q And Cities "JG" has produced for less than two years --

A. Less than two years.

Q -- and there are no figures.

A. "JG" is 96 compared to 56.

City of Artesia, 55, is below the drill

stem test value, 83. Federal "[illegible]" is 2 compared to it was 29, and the Griffin "JJ", 288, responded somewhat to stimulation.

Q Is that right? My eyes don't track straight across that page.

Yes, that's correct. Thank you.

A Irish Hills "KW" has been on line a very relatively short time and there's no value. La Cama now produces 337, or its production rate after two years was 337, compared to 136 on the drill stem test.

Murphy is the well that's a Morrow producer, has not yet been completed in the designated Permo-Penn formation.

And the Powell "DG" produces 175 compared to 48 on the drill stem test.

So the actual production is, after stimulation, and let's see if there's really -- really what kind of correlation would we develop.

La Cama, that should stabilize in about two years. You'd think that those numbers would be roughly the same, and it's up to you whether 136 and 337 are roughly the same.

At the bottom, Powell "DG" is 175 compared to 48, but it should take [illegible] years to stabilize, so it's reasonable that 175 is still above 48.

City of Artesia, that stabilizes in two years, is 55 instead of 83, which is a reasonable comparison, so maybe we could make it sound like there was a reasonable comparison.

Q When you averaged the rates on Exhibit Sixteen did you include those wells that had produced less than two years in your --

A Oh, no, no, no.

The average down there is the sum of the numbers divided by 34.

Q Okay, and 34 of those wells had produced for two years.

A Right.

Q And the other with asterisks didn't, but they didn't enter into the calculation.

A But they did not enter into the calculation one way or the other.

Q And of those wells, only one is shut-in, so that really has no significant effect on the final outcome of what you've calculated there.

A Let me state that more precisely. The average 144 is the sum of those numbers divided by 34. 34 is the number of entries, number of numerical entries in the column. So there are -- there are 34 numbers, 14 asterisks, and 2 SI's. The SI's and the asterisks did not enter in the calculation.

I'm sorry to confuse you.

Q Well, that's all right. That's easy to do in these cases.

Certainly Exhibit Twelve intends to, if not confirm Exhibit Sixteen, but would tend to indicate, if anything, Exhibit Sixteen may be overly generous in this calculation of production against atmospheric pressure.

A I agree. We -- I told the people that worked on this with me that we were going to make every doubt in the -- on the side of being generous, and we, I think, we did that.

I tried consciously to do that.

Q Now I presume somewhere are the formulas and factors used in calculating permeability shown on Exhibit Twelve.

A They -- they are in these pages that I prepared in response to Mike's telephone call, and I have two copies of information on four of the wells. That, I think, is representative of the whole thing and it's just as many as I could get together in an organized fashion in one day.

Q There is no problem, though, with submitting this information on all of these wells subsequent to the hearing.

A If you want that information, you'll get that information, I assure you.

Q Okay. Could you give one copy of what you have to Mike and let him take a quick look at it and see if he has any problems with the data on it?

A I do have the original on it, an original and two copies, and I'm going to keep the originals.

The reason for the scarcity of -- of copies is that one of the exhibits for each well is a log and it was hand-clored in and the hand-coloring is kind of a limiting factor in getting very many copies made.

Q But you do have the formula on the front, plus the calculated deliverability -- or --

A Okay, can I try to explain what's there?

Q Yeah, you may.

A There's a summary page on the front with the formulas and the numbers built into the calculations.

There's a Horner plot with a dashed line drawn through what we took as the straight line portion.

There's a gas analysis for the gas from the well, which was used to determine properties like Z, the deviation factor, and the viscosity of the gas.

Then there are three pages that are copied from the Halliburton drill stem test report, which -- the first is like a summary of the drill stem test; then there's the pressure build-up data; and then there's a sheet where Halliburton has listed what it -- the steps it took during the drill stem tests and the rates that it measured.

Then there's a log of the region around the drill stem test interval, with the area showing gas effect outlined in red, and the height of the pay section when the drill stem test was taken from that log.

And on the front page at the bottom we put references of where we got the equations and where we got the charts for the Z factors and the viscosities, and such. We did not include actual copies of those correlations.

MR. STAMETS: Mike will just --

MR. STOGNER: This is what I want.

MR. STAMETS: This is what you want. Okay, so if they can submit that on all the wells, if we have any problems with it, we can correspond and try to get a resolution of them.

MR. STOGNER: This will answer a lot of my questions.

A. On one of the wells I found what I would consider a mistake and it lowered the actual measured permeability, I think, from .003 to .002, or something, but you may notice that I've noted that for your information on this form.

MR. DICKERSON: Should we submit those as numbered exhibits?

MR. STAMETS: Why don't you just submit that as supplemental information to the Exhibit Number Twelve?

MR. DICKERSON: Okay.

MR. STAMETS: And you can just label each one with the well name so it's obvious which they belong to, and then if upon review of this data we have any questions, we may have to seek further clarification.

But it does appear that you have here submitted the type of information that we're looking for on these wells, which will allow us to make the proper evaluation.

Have you got any questions?

MR. STOGNER: Yes, I do have a question.

MR. STAMETS: Okay.

QUESTIONS BY MR. STOGNER:

Q On our Murphy "NW" Federal No. 1, where the core was taken, do you feel this was drilled into one of the isolated mounds?

A. No. No, it's in the bank, I believe, isn't it?

Up here, just barely inside this bank, basin, but it was not a mound up here.

MR. STAMETS: That's No. 6 on A-A'. Okay.

Q. Well, do you feel this is representative to the mounds that are in this tight sand area, this core sample?

A. I feel it's as representative of those as any one core is going to be representative of anything.

Q. The overburden pressure was calculated to be 3300 psi. I guess it was a gradient of .5085 psi per foot and you used the average top of the formation at 6490. Is this again representative of the area, and how did you calculate that?

A. The Murphy core was taken before I worked for Yates Petroleum. I attempted to track down who used 3300 psi as the overburden, as the representative overburden pressure, and it's -- that would be representative of the Murphy rather than the whole thing, since it's talking about the Murphy.

The two people involved both said that the other person was responsible, so I did my own calculation based on what I saw in the literature, and I have trouble re-producing that right at the moment, but I got like it ought to be 4900, which would make the permeability even lower, and so I don't think --

Q Something like .6 psi per foot gradient?

A. Okay, what I read up on it, you know, and I make no bones on doing this, but I -- I locked into this question and what I found was that people use 1 psi per foot minus the reservoir pressure.

And I found that used in other tight gas sand hearings and in petroleum literature, and that gives, like you say, about .6 psi per foot.

Anyway, we'd say that the 3300 is an order of magnitude number that somebody picked as representative.

MR. STOGNER: That's all the questions I have.

A. And that's all I can support it with.

RECROSS EXAMINATION

BY MR. STAMETS:

Q One of Mr. Stogner's questions stimulated one more.

Are any of the tests shown on Exhibit Twelve in a mound?

A I don't think so. Ray?

MR. BECK: There's one right there. No. There's one right there, the well in 2, 19, 24.

A Irish Hills.

MR. STAMETS: That would be the Irish Hills.

A Yeah, I thought of that question this morning and I didn't have a chance to look it up, but--

MR. BECK: La Cama.

A So apparently the answer is La Cama and Irish Hills.

MR. BECK: No, no, Irish Hills isn't in a mound. It's just La Cama.

A Is that the agreed answer, that one of them is in a mound, and that's La Cama?

MR. BECK: The only triangle that's in a mound is the La Cama Well in 20 of 18, 25.

MR. STAMETS: And that was 136, again below the magic 188 figure.

Mr. Beck, did you -- since you're up and about, did you recommend a type log for this area?

MR. BECK: Well, sir, we reproduced the logs on the cross sections at 2-1/2 inches equal 100 feet, so people could see and actually calculate the porosity off of the compensated neutron - formation density logs, which most of the logs are, there are some sonic logs, but they all constitute logs which can be referred to, and it gives you nine, nineteen, twenty-eight -- about thirty wells which you could look at, which would constitute type logs.

MR. STAMETS: Okay, for purposes of this order, we can select one of these wells as the type log in determining the top and bottom of the formation.

MR. BECK: Oh, the type log, the one that I was referring to most as the type log, is the Well No. 3 of cross section B-B', Exhibit Number Six.

The name of the well is the Tom -- now it's Sun, formerly the Tom Brown, No. 1 Antelope Sink Well, in Section 18 of 19, 24.

And in my testimony I gave the tops of the Third Sister, the top and the bottom, and other pertinent correlations, like Antelope Sink Zone, top of the bank facies, the bottom of the bank facies.

And that would constitute my type log.

MR. STAMETS: Okay. Mike has one more question.

QUESTIONS BY MR. STOGNER:

Q Dr. Boneau, on page five of your testimony, the drainage area was assumed to equal 320-acre proration unit, do you feel this is a representative of the actual radius of drainage? In this formation?

A It was taken as 320 acres because that's the proration unit size. But some of the Cisco wells have a good chance of draining that and some of them have a -- will probably drain half or two-thirds, or something, of that.

It's as reasonable a number as I could pick. I cannot stand here and defend that all of them are going to drain 320 acres, no.

MR. STOGNER: Thank you, Dr. Boneau. That's all I have.

MR. STAMETS: Any other questions of this witness? He may be excused.

Anything further in this case?

If there is nothing further, this case will be taken under advisement, subject to submittal of the supplemental data.

And the hearing is adjourned.

(Hearing concluded.)

SALLY W. BOYD, C.S.R.
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Phone (505) 455-7409

C E R T I F I C A T E

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

I do hereby certify that the foregoing is [illegible] in [illegible]

[illegible]

______________________, Examiner
Oil Conservation Division

OIL CONSERVATION DIVISION

OCT - 5 1981

RECEIVED

CASE NO. 7352

APPLICATION OF YATES PETROLEUM CORPORATION

FOR DESIGNATION OF A TIGHT FORMATION

EDDY COUNTY, NEW MEXICO

ENGINEERING TESTIMONY

The engineering testimony will be presented by David F. Boneau of Yates Petroleum Corporation, Artesia, New Mexico.

David F. Boneau is Reservoir Engineering Supervisor for Yates Petroleum Corporation in Artesia, New Mexico. Reservoir work on the deep gas wells in Eddy County is part of his responsibility.

Prior to joining Yates Petroleum in 1980, ~~Mr.~~ Dr. Boneau worked for Phillips Petroleum in Bartlesville, Oklahoma and in Odessa, Texas for a total of twelve years. He served as reservoir engineer for the Goldsmith District while in Odessa and as reservoir engineering supervisor for the Research and Development Department in Bartlesville. His primary responsibilities included secondary and tertiary recovery projects in the Permian Basin and elsewhere.

Mr. Boneau received a bachelor of science degree in physics from the University of Notre Dame in 1962 and a doctor of science degree in physics from Iowa State University in 1969.

Mr. Boneau has testified as an expert witness before the Texas Railroad Commission, but has not appeared previously before the Oil Conservation Division of New Mexico.

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO
21 October 1981

EXAMINER HEARING

IN THE MATTER OF:

Application of Yates Petroleum Corporation for designation of a tight formation, Eddy County, New Mexico.

CASE 7352

BEFORE: Richard L. Stamets

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Oil Conservation Division:

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Legal Counsel to the Division
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For the Applicant:

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EXHIBITS

MR. STAMETS: We will call next Case 7352.

MR. PEARCE: Application of Yates Petroleum Corporation for a designation of a tight formation, Eddy County, New Mexico.

MR. DICKERSON: Chad Dickerson, of Artesia, New Mexico, Mr. Examiner, appearing on behalf of the applicant, and we have two witnesses.

(Witnesses sworn.)

MR. DICKERSON: We call Mr. Ray Beck at this time.

RAY BECK

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

DIRECT EXAMINATION

BY MR. DICKERSON:

Q. Will you state your name, your occupation, and by whom you're employed, please?

A. Ray Beck, petroleum geologist, Yates Petroleum Corporation, Artesia, New Mexico.

Q. Mr. Beck, would you briefly summarize your educational and work experience background as it relates to this application?

A. I have a Bachelor of Science degree and a Master of Science degree in geology from Texas Tech University.

I worked for Shell in Texas for nine years and I worked for Yates Petroleum for ten years in southeast New Mexico.

Q. And are you familiar with the subject lands in question?

A. Yes.

Q. And have you prepared certain exhibits upon which you intend to rely today?

A. I have.

Q. Would you briefly describe this formation for which tight formation designation is sought, Mr. Beck, by geological parameters? And briefly state the purpose of this application on behalf of Yates Petroleum Corporation?

A. As to the application, Yates Petroleum Corporation seeks tight formation designation for a portion of the Permo-Penn underlying lands in western Eddy County, New Mexico, which are described in Exhibit Number One and shown in map form in Exhibits Numbers Two and Three.

The description of the formation by geological parameters is as follows: The formation sought to be covered by this application is that stratigraphic interval between the top of a marker named the Third Sister Cycle of the Wolfcamp series of the Permian system, and the top of the Canyon series of the Pennsylvanian system.

Correlations of the Third Sister Cycle and the Canyon Series are shown on a network of four cross sections spread over the subject area, Exhibits Five through Eight.

Positions of the Third Sister and Canyon geologic column are illustrated in Exhibit Number Four.

The Third Sister Cycle to Canyon Series varies from approximately 1000 to 1400 feet in thickness.

Q. Mr. Beck, please refer specifically to Exhibit Number One and describe for the Examiner what this exhibit reflects.

MR. STAMETS: If -- I don't believe I've said the witness is qualified, but he is.

Q. What is Exhibit Number One, Mr. Beck?

A. Exhibit Number One is a list which describes the lands which overlie the Permo-Penn interval for which tight formation designation is sought in this application.

Q. And that's approximately 318,000 acres in Eddy County, New Mexico, is that correct?

A. That is correct.

Q. And what is reflected by Exhibit Number Two?

A. Exhibit Number Two is a map of one inch equal 5000 feet scale, which shows the lands described in Exhibit Number One.

The subject area stretches over a portion of western Eddy County, New Mexico from the Pecos River east of the City of Artesia to the Huapache Monocline some forty miles to the southwest.

Also shown by circled well spots are all wells within the outline which have penetrated the above defined Permo-Penn formation and/or lower horizons.

Red colored well spots are wells which are currently producing gas from the above defined Permo-Penn interval.

Deposits of the subject Permo-Penn interval are a complex of three major environments of deposition or facies, shelf, bank, and basin facies.

The shelf facies, lying in bands to the west or northwest, is comprised of interbedded limestones, shales, siltstones, and sandstones.

Terrigenous clastics, that is shales, siltstones, and sandstones, increase, and marine limestones and shales decrease, traversing from east to west or southeast to northwest; that is, in a shelfward direction.

Deposits of the shelf facies are effectively non-porous and impermeable, and constitute an up-dip mega-seal to the bank facies.

The bank facies is composed mostly of marine limestones with a few intercalated marines shales. These marine limestones are made up of bioherms and their associated debris aprons interfingered with oolite bars.

The porosity that is present is a result of preservation of primary porosity, principally of bryozoan material and creation of secondary porosity by leaching of oolitic grainstones and former aragonitic shell material.

Most of the gas production that has been established in the subject Permo-Penn interval has been from deposits of the bank facies.

The basin facies consists mainly of thin-bedded, fine-grained sandstones, siltstones, and shales, which were transported to the relatively deeper basin from the bank and shelf areas during periods of lower sea level.

Main conduits for transport to the basin were through passes between segments of the bank facies.

Scattered within the overall basin facies are isolated limestone or carbonate build-ups, termed isolated mounds. In some of the isolated mounds porosity has been developed and/or preserved, but many are effectively non-porous and impermeable.

Some of the isolated mounds have produced gas. Wells in the basin facies which have encountered mounds are indicated by the letter "M" close by the well spot.

About one-third of the subject Permo-Penn interval in the upper part, has been termed the Antelope Sink Zone, named for an interval in the Sun, formerly Tom Brown, No. 1 Antelope Sink Unit, in Section 18, 19 South, 24 East. This well is shown on two cross sections, Exhibits Six and Eight.

The geographical limits of shelf, bank, and basin shown on Exhibit Two are for the Antelope Sink Zone alone.

Lower zones of the subject Permo-Penn interval are not shown, but their facies trends are essentially parallel to those shown on Exhibit Number Two.

Exhibit Number Two also shows the traces of the cross sections intorduced in later exhibits.

Q. Mr. Beck, please refer to Exhibit Number Three and describe what it shows.

A. Exhibit Number Three is identical to Exhibit Number Two from the standpoint of scale, outline of lands, well spots, and colored well spots.

The purpose of this exhibit is to illustrate the structural attitude of the Permo-Penn formation in the subject area.

Mapping was done on the top of the Antelope Sink Zone in the shelf and bank areas, and on top of the Canyon Series in the basinal areas.

As the cross sections will show, the Antelope Sink Zone is essentially parallel with the Third Sister Cycle above.

Dashed contours are 100 feet contour intervals on top of the Antelope Sink zone. Solid contours are 100 foot contour intervals on the top of the Canyon Series.

These contours indicate that over most of the outlined area the Permo-Penn interval dips to the east, southeast, at approximately 100 feet per mile; however, in the southwestern part of the outlines area, near the Huapache Monocline, the Permo-Penn interval dips east to northeasterly at 200 to 300 feet per mile and structure is complicated by faulting.

Structural relief on the top of the subject Permo-Penn is approximately 3300 feet in the outlined area. Ground level elevations rise approximately 1500 feet from wells near the Pecos River in Township 17 South, Range 26 East, to wells near the Huapache Monocline in Township 21 South, 21 East.

The drill depth to the top of the Third Sister Cycle in the highest well, the Pennzoil No. 1 United Federal, in Section 28 of 21 South, 21 East, is 4927 feet. And the drill depth to the top of the Third Sister in the lowest well, the HEYCO No. 1 Big Boggy State, in Section 36 of 17 South, 26 East, is 6717 feet.

The average depth to the top of the subject Permo-Penn formation is thus 5822 feet, and there's a correction from that in the statement we sent in to the OCD and the USGS. There's a typographical error there of it says 5827, but it's really 5822.

Q. And that mistake is not material, Mr. Beck, is it --

A. No.

Q. -- for the purposes of this application?

A. No, sir, it's just a typographical error.

Q. Refer to Exhibit Number Four and describe what it shows.

A. Exhibit Number Four illustrates the stratigraphic column present in western Eddy County, New

Mexico.

This geologic section was compiled from New Mexico Oil Conservation Division reference cross sections and other industry accepted correlations.

The main purpose of this exhibit is to show the Permo-Penn stratigraphic interval sought to be covered by this application in relation to geologic time and other stratigraphic horizons.

Q Refer to Exhibit Number Five and describe what it reflects.

A Exhibit Number Five is a northwest to southeast stratigraphic cross section, A-A', hung on the Third Sister Cycle of the Wolfcamp Series.

This cross section is transverse to the three major facies trends of shelf, bank, and basin.

Other pertinent correlations shown are the top of the Antelope Sink Zone of the shelf and bank facies, top of the Pennsylvanian, by correlating with the New Mexico Oil Conservation Division reference cross sections, and the top of the Canyon Series.

Drill stem test, core, and completion data are shown on the cross section.

Well No. 6 was cored in the Permo-Penn and the core analysis report is given at a later exhibit.

Wells 2, 3, and 5 are currently producing Permo-Penn gas and have been assigned to the Eagle Creek Permo-Penn Gas Field by the New Mexico Oil Conservation Division.

Wells 4 and 6 should produce Permo-Penn gas but they have not yet been completed in that interval.

Note that Well 8 produced gas from an isolated mound. This well was assigned to the Atoka Cisco West Gas Field, and produced 64,125 Mcf of gas and 146 barrels of condensate before abandonment in 1980.

Q Mr. Beck, please go to Exhibit Number Six and describe what it shows.

A. Exhibit Number Six is a northwest/southeast stratigraphic cross section, B-B', which is again hung on the Third Sister Cycle and is transverse to the three major facies of shelf, bank, and basin.

I might just add here off -- off the written thing that we handed in, that we're moving from north essentially to south on these three transverse cross sections.

A key correlation well, the Sun, Tom Brown, No. 1 Antelope Sink Unit, is Well 3. Tops pertinent to this application are picked in this well as follows: Third Sister, 5860; Antelope Sink Zone, 6080; top of the bank facies, 6140; top of the Pennsylvanian, by correlation with the New Mexico Oil Conservation Division reference cross sections, 6190; base of the bank facies, 6449, on the written transcript we sent earlier it was 6420. That's a mistake. It should be 6449. And the Canyon Series is 7060.

Note that the perforated interval straddles the systemic boundary between the Permian and the Pennsylvanian.

And Antelope Sink Unit No. 1 has been assigned to the Antelope Sink Upper Penn Gas Field.

Well 4 should also produce Permo-Penn gas but it has not yet been completed in that zone.

Q. Refer to Exhibit Number Seven, Mr. Beck, and describe what it shows.

A. Exhibit Number Seven is another northwest to southeast stratigraphic cross section, C-C', which is also hung on the Third Sister Cycle.

Wells 4 and 6 are producing gas from the Permo-Penn formation and have been assigned to the Box Canyon Permo-Penn Gas Field.

Q. Now refer to Exhibit Number Eight, please, and describe what it shows.

A. Exhibit Number Eight is a southwest to northeast stratigraphic cross section, D-D', which is hung on the Third Sister Cycle. This longitudinal, or strike, cross section is more or less parallel to the major facies of shelf, bank, and basin.

The purpose of this cross section is to tie the three previous transverse cross sections.

It may be noted that the main gas productive Antelope Sink Zone bank facies correlate very well, on the left, from the Box Canyon Permo-Penn Gas Field to Antelope Sink Upper Penn Gas Field to the Penasco Draw Permo-Penn Gas Field to the Eagle Creek Permo-Penn Gas Field.

Q Mr. Beck, were Exhibits One through Eight prepared by you or under your direction and supervision?

A. Yes, they were.

MR. DICKERSON: Mr. Examiner, at this time Applicant would move admission of Exhibits One through Eight.

MR. STAMETS: These exhibits will be admitted.

MR. DICKERSON: And that concludes our direct testimony from this witness.

CROSS EXAMINATION

BY MR. STAMETS:

Q Mr. Beck, you've presented quite a number of logs here. I want to discuss just briefly what produces in this interval, or what may produce.

As you were going through here you named off certain wells and indicated that a zone might be productive later on which wasn't completed there now.

It would appear to me as though in your discussion primarily you are looking at the bank facies or these mounds as being the producing intervals throughout this section.

A. Correct.

Q. Are any of the other zones outside the banks or mounds apt to be productive?

A. In this -- in this geographical area they're all -- they're either completed from the bank facies or from the isolated mounds. There is nothing producing, or there's no sand intervals to be produced -- that are producing. These are all carbonates.

What we tried to do here is include the bank and the isolated mounds together because they're both carbonates, they're both tight, as will be presented by the following witness from the engineering data. We just tried to pick something that could be correlated throughout this geographical area and to include all the carbonates that produce in this thing in that envelope between the Third Sister as we picked it on the Tom Brown Antelope Sink Well and the Canyon.

Really, so far all that's been produced is the bank facies and a few of the isolated mounds, and most of the isolated mounds are really either tight or haven't -- or are limited.

Q. The engineering witness who we will hear shortly, will be making his determinations as to productivity, permeability, from the same bank and mound sections.

A. Yes, sir. He has got every well listed that has penetrated the Permo-Penn at least as far as the Canyon, and all the wells that are currently producing, has the data on all of those, and he can show from that.

We were just trying to establish here the geological parameters of the formations we're wishing to be designated as tight formation, and also the geographical area.

Q. But you would not expect to be making a well in the first 100 feet of the section anywhere.

A. No, sir, it's all tight Wolfcamp beds, and I can think of nothing in the geographical area in this envelope that's not -- that would not be tight.

Q. Okay.

MR. STAMETS: Any other questions of

this witness? He may be excused.

MR. DICKERSON: Call Mr. David Boneau at this time.

DAVID F. BONEAU

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

DIRECT EXAMINATION

BY MR. DICKERSON:

Q. Will you state your name, your occupation, and by whom you're employed?

A. I'm David Boneau. I'm a reservoir engineering supervisor for Yates Petroleum Corporation in Artesia, New Mexico.

Q. Mr. Boneau, have you -- would you briefly summarize your educational and work experience for the Examiner?

A. Yes. I have a BAchelor of Science degree in physics from the University of Notre Dame in 1962 and a PhD in physics from Iowa State University in 1969.

For twelve years after I worked for Phillips Petroleum Company in Bartlesville, Oklahoma, and in Odessa, Texas. In Odessa I was reservoir engineer for the atmospheric pressure of wells completed for production in this formation without stimulation is not expected to exceed 188,000 cubic feet for production from the average depth of 5822 feet.

And thirdly, no well drilled into this proposed tight formation is expected to produce without stimulation more than five barrels of crude oil per day.

Q. Mr. Boneau, would you refer to Exhibit Number Two, previously introduced, and describe what is pertinent on that exhibit insofar as your testimony is concerned?

A. Okay. Exhibit Two is the map presented by the previous witness on which is outlined the area for which the tight gas designation is sought.

The red dots show the location of the 50 wells that are completed in the designated Permo-Penn interval, as of January 1, 1981.

Triangles indicate wells where drill stem test data was used to calculate in situ permeability of the pay section. There are ten triangles and we'll discuss those permeability calculations in detail later on.

And there's one square which indicates the location of the well where core data is available.

Q. Mr. Boneau, at this time please refer the Examiner to your Exhibit Number Nine and describe what is

Goldsmith District and in Bartlesville I served in various responsibilities, including reservoir enginerring supervisor for the Phillips R & D Department.

Q. Mr. Boneau, as part of your responsibilities, have you made an examination and a study of the wells in question upon which you intend to testify today?

A. Yes, sir.

Q. And are you familiar with this application?

A. Yes, sir.

MR. DICKERSON: Mr. Examiner, is this witness considered qualified?

MR. STAMETS: He is.

Q. Mr. Boneau, would you briefly state what you intend to show by the exhibits upon which you will testify?

A. Yes. The data that I'm going to present will show that the Permo-Penn interval defined by the previous witness meets the guidelines set forth by the Federal Energy Regulatory Commission for designation as a tight sand formation under Section 107 of the Natural Gas Policy Act.

These guidelines require, first, an estimated in situ gas permeability throughout the pay section of less than 0.1 millidarcy.

The stabilized production rate against

reflected in it.

A. Exhibit Number Nine is a 29 -- 26 page list of all wells within the boundary of the proposed area that were drilled deep enough to penetrate the designated Permo-Penn interval.

Information on these 333 wells includes well name, location, operator, spud date, total depth, field, and production up to January 1, 1981. The list is current to the start of 1981. That was our cutoff.

Most of these wells were drilled as Morrow prospects to depths near 9000 feet.

There are 119 Morrow producers in the proposed area. These Morrow wells have produced a total of 82.2 billion standard cubic feet for an average of 691 million standard cubic feet per well. The Morrow is the principal gas producing interval in this area.

Many of the deep wells in Exhibit Number Nine will be completed in the designated Permo-Penn formation at some point in the future if the Permo-Penn gas can be produced economically.

In addition, exploratory drilling for Morrow gas will be stimulated somewhat when the tight gas sand designation makes the Permo-Penn interval a more attractive salvage zone.

That's enough about Exhibit Nine, I think.

Q. Refer to Exhibit Number Ten and describe what it shows.

A. Exhibit Number Ten is a list of the 50 wells completed in the designated Permo-Penn interval as of January 1, 1981. Most of the engineering data on the subject formation will come from the wells in Exhibit Number Ten.

Although the average depth to the top of the designated Permo-Penn interval is 5922 feet -- 5822 feet, thank you -- production from 49 of the 50 wells comes from below the 5822 feet. The average depth to the top of the pay zone in these 50 wells is 6490 feet.

These wells have produced a total of 9.01 billion standard cubic feet for an average of 180 million standard cubic feet per well.

MR. STAMETS: Would you give me the average depth for the completion interval on those again, please?

A. Surely. The average depth to the top of the pay zone, the top perforation in the 50 wells, is 6490 feet.

MR. STAMETS: Okay, and then the average production?

A. The average production is 180 million standard cubic feet per well.

MR. STAMETS: Thank you.

A. Surely.

Q. Mr. Boneau, please refer to Exhibit Number Eleven and describe what it represents.

A. Exhibit Eleven is a list of wells that were spudded or completed in the designated Permo-Penn interval after July 15th, 1979.

These eight wells are the only ones out of the 50 wells in Exhibit Number Ten that would be eligible for tight gas prices, according to my understanding of the rules, should the present application for tight gas designation be approved.

Approximately five additional wells have come on line in 1981, and according to my understanding, again these would also be eligible if the tight formation designation is approved.

All production from the other 42 active wells will never be eligible for tight gas prices under current regulations.

MR. STAMETS: Mr. Boneau, to your knowledge, were any of these wells on Exhibit Eleven, plus the five that you discussed, drilled specifically for the Permo-

Penn or were those all deeper wells?

A. My memory says that they were all drilled initially to the Morrow. They were all drilled deeper.

MR. STAMETS: Okay, thank you.

A. I have reason to believe that's correct, since Mr. Beck is over here nodding.

So our point in Exhibit Eleven is that our application mainly seeks a long-term opportunity to produce gas from the designated Permo-Penn formation by recompleting wells originally drilled to deeper horizons, and recompleting them in the future, for the most part.

Q. Now, Mr. Boneau, would you kindly analyze your engineering data available?

A. Do you really want to use all this stuff?

Q. As far as it pertains to this application.

A. How about I try to show it in a list.

Q. Okay.

MR. DICKERSON: Mr. Examiner, please note that the written information furnished as the statement of the meaning and purpose of each exhibit does analyze these formulas and so forth in considerably more detail than Mr. Boneau will now go into.

MR. STAMETS: Well, and I would point

out for the record, too, that this application has been carefully examined by Mike Stogner, who is an engineer on the staff of the Division, and any problems therewith have probably been ferreted out by this time and will show up in the cross examination, if any.

A. Okay. So I'd like to say with the foregoing as kind of a background, and the engineering data part of it, we will try to demonstrate that three criteria are met; first, that the average permeability in the natural state is less than, or equal to, 0.1 millidarcy; that the stabilized flow rate before stimulation is less than 188 Mcf per day; and third, that no well produces more than five barrels of oil per day.

The estimated average in situ gas permeability throughout the pay section was calculated by two standard methods that are widely accepted in the industry.

These methods include, first, permeability calculation from pressure build-up data taken during drill stem tests; and second, laboratory measurements on a cored section of the designated Permo-Penn interval from one well, a single well.

First I'm going to talk about permeability calculated from drill stem test data. This kind of data will give a good representation of the in situ permeability, since the drill stem test is performed while the well was still being drilled; the formation has been altered relatively little from its natural condition. If there is some formation damage due to the drilling mud, most of this damage is removed during the preflow phase of the drill stem test.

In contrast, pressure data taken after the well is acidized or fractured will give higher values for the permeability because the formation has been etched and broken by the treatments.

Okay.

Q. Mr. Boneau, refer to Exhibit Number Twelve, please, and describe what it shows.

A. Exhibit Number Twelve shows data from the drill stem test at ten wells within the proposed area. The locations of these wells are indicated by triangles on Exhibit Number Two.

Of the ten wells only Murphy NW Federal No. 1 is not presently completed in the desginated Permo-Penn formation. This well was cored and drill stem tested in the Permo-Penn interval, but it is now a completed Morrow producer.

The values of permeability calculated from the drill stem tests, which are the second column from the right on Exhibit Twelve, range from 0.003 millidarcy for the Irish Hills "KW" State No. 2, up to 0.091 millidarcy for La Cama No. 1.

The average permeability for the ten wells was determined to be 0.031 millidarcy.

The last column in Exhibit Number Twelve, the one that's labeled "Years to Reach Pseudo-Steady State", gives the approximate time required for a pressure disturbance at the wellbore to reach the outer boundary of the reservoir feeding the well.

Said another way, gas near the outer boundary of a reservoir begins to move towards the wellbore at the time indicated in the righthand column in Exhibit Number Twelve.

Flush production of gas relatively near the well occurs until the whole reservoir is feeding the well. Then the pressure begins to drop with time uniformly throughout the reservoir and the flow rate becomes stabilized.

The calculated time to reach stabilized flow ranges from 1.8 years for Well Cities "JG" State No. 1, up to 33 years for Irish Hills "KW" State No. 2.

The average time was determined to be 10.7 years to reach this stabilized flow.

The idea of using a time to reach stabioverburden pressure within the Permo-Penn formation is really about 3300 psi, and special core tests were required in order to correct the results of routine core analyses for the effect of the actual overburden pressure.

The results of these special tests, performed at an overburden pressure of 3300 psi, are listed in the last two columns of Exhibit Number Thirteen.

So Exhibit Number Thirteen shows both the routine core data and the special core data on the Murphy cores.

Q Refer, Mr. Boneau, to Exhibit Number Fourteen and describe what it shows.

A Exhibit Number Fourteen shows the correlation that was developed between the routine permeability at 200 psi overburden pressure and the in situ permeability at the actual overburden pressure of 3300 psi.

Data from the petroleum literature was used to help define this relationship, since there are relatively few data points available from the Murphy core. And an awful lot of the data points appear in the lower lefthand corner at very low permeabilities, and there aren't very many data points in the body of the figure, and I thought that the Amoco experience in the laboratory would help define that relationship.

lized flow was introduced here because it follows naturally from the calculation of the formation permeability from the drill stem test data.

I intend to discuss the stabilized flow idea in more detail after all the data on permeability has been presented.

Q. Mr. Boneau, refer to Exhibit Number Thirteen and describe what it shows.

A. Okay. The second procedure for obtaining in situ permeability is to measure the permeability of actual cored sections of the Permo-Penn rock in a laboratory.

The only core data available comes from the Murphy "NW" Federal No. 1 Well, which was the well marked with a square in Exhibit Number Two.

A log of the Permo-Penn interval in the Murphy Well is -- appears in Exhibit Five as Well No. 6.

Exhibit Thirteen, then, shows the permeability measured by CORE Laboratories for the 72 feet of core recovered from this well. Special tests were run on 16 samples from the Murphy core to evaluate the effect of overburden pressure on the core samples in order to determine a representative value for the in situ reservoir permeability

Routine core analyses are normally run with a confining or overburden pressure of only 200 psi. The

So the dashed line in Exhibit Fourteen is a correlation developed by a Mr. Jones and Mr. Owens of Amoco Production Company for rocks where overburden pressure has a minimum effect on permeability, and the reference is on Exhibit Fourteen as SPE 75-51.

And this Amoco work was reported in the Journal of Petroleum Technology in September of 1980.

The solid line in Exhibit Fourteen was drawn parallel to the dashed line in order to better fit the actual points for the Murphy core. This solid line was used to convert the routine permeability values into in situ permeabilities values at 3300 psi overburden pressure.

Q. What is shown by Exhibit Number Fifteen?

A. Exhibit Number Fifteen tabulates the permeabilities of the core material from the Permo-Penn pay section in the Murphy "NW" Federal No. 1. Those sections of the interval that the electric log condemned as nonproductive are omitted.

The average routine permeability for the Murphy Well is 0.116 millidarcy, indicated at the bottom of the fourth column.

It happens that the in situ permeability corrected for overburden pressure taken from core data, which is the number at the bottom of the fifth column in Exhibit

Fifteen, both came out to be 0.035 millidarcy for the Murphy "NW" Federal No. 1, and I don't believe it, but that's the way it turned out.

The Murphy Well can be considered a typical well, since its in situ permeability of 0.035 millidarcy is very close to the average 0.031 millidarcy for the ten wells that we talked about drill stem test data in Exhibit Number Twelve.

So as a summary of the permeability data, we have two types of data, the average in situ permeability from drill stem test data, 0.031 millidarcy; the average in situ permeability from the available core data, 0.035 millidarcy.

Both types of engineering data indicate that the permeability of the designated Permo-Penn pay section is comfortably below the 0.1 millidarcy.

Q. What is shown by Exhibit Number Sixteen?

A. Okay. The second criteria relates to the gas flow rates and then the third criteria is the oil flow rates.

The data on the flow rates before stimulation are not available for the vast majority of the wells that produce in the designated Permo-Penn formation. The natural flow rates are so low that they are routinely neither measured nor recorded. The normal completion procedure has been to perforate and treat the well immediately.

In the absence of data on natural flow rates, we propose to use production data for the stimulated wells at a time in their life when the production rates are approaching stabilized rates.

Exhibit Twelve showed that the time to reach the stabilized rate varied from 1.8 to 33 years and averaged 10.7 years. Thus, actual flow rates measured two years into the lives of the Permo-Penn wells will be either near stabilized rates or still considerably higher than the stabilized rates.

Exhibit Sixteen shows actual production rates for the 24th calendar month in the producing lives of the wells that are producing from the designated Permo-Penn formation.

Only 34 of the 50 wells have been producing for two years or longer, and the average rate of gas production for the 32 wells is 144,000 cubic feet per day at the bottom of the first set of figures in Exhibit Sixteen.

And the average rate of oil production, which is at the bottom of the last set of figures in Exhibit Sixteen, is 0.6 barrels of oil per day.

The gas rates vary from one to 655,000

cubic feet per day, and only two wells produced over 300,000 cubic feet per day.

The oil rates vary from zero to 4.1 barrels of oil per day after two years. Only one well produced over two barrels of oil per day, and no well produced as much as five barrels of oil per day in the 24th month after it began production.

The FERC guidelines require that the gas flow rate be measured against atmospheric pressure. The average flow rate of 144,000 cubic feet per day calculated above for stimulated wells, was measured against pipeline pressures of 150 to 300 psi.

The corresponding flow rate at one atmosphere is given by the equation -- I guess I'm stuck with reading the equation -- the flow rate at one atmosphere is the flow rate, the actual flow rate, times the quantity P_f^2 minus P_s^2 at 1 atmosphere over the quantity P_f^2 minus P_s^2 actual conditions.

Now, you just -- why don't we -- can we just go back and skip this?

MR. STAMETS: Is that shown somewhere?

A. Yeah, it's shown on the paper.

MR. STAMETS: What page is that on, Mr. Boneau?

A. Bottom of page seven.

MR. STAMETS: Okay.

A. Why don't we just go back to saying that we calculated for stimulated wells measured against pipeline pressures of 150 to 300 psi. When we calculate the stabilized flow rate for production against atmospheric pressure the 144 Mcf per day becomes 146 Mcf per day in making that correction.

So the rates in Exhibit Sixteen are maximum values, I believe, since all the data applies to stimulated wells and since many of the wells have not yet actually stabilized. Thus, the average gas production rate is about 146,000 cubic feet per day, or less, and the maximum of oil production rate is about 4.1 barrels of oil per day, or less, under stabilized non-stimulated conditions.

Q. Mr. Boneau, what is known regarding the techniques for protection of the fresh water zones in the land in question?

A. Okay. All the wells proposed for tight sand designation, all of this area, lies within the Roswell Artesian Water Basin, as established by the New Mexico State Engineer. This Roswell Artesian Water Basin is a main source of fresh water to Chaves County and northern Eddy County.

Regulations governing the drilling of oil and gas wells within the Basin are enforced by the New

Mexico Oil Conservation Division in order to protect the fresh water formations.

These regulations require that a water protection string be set and cemented through the fresh water bearing strata.

The base of the Artesian aquifer lies at a depth of about 1000 feet at the north end of the proposed area and at a depth of about 1400 feet at the south end.

In a typical casing program conductor pipe is set at a depth of 300 to 400 feet and cement is circulated to surface in order to protect the shallow fresh water.

Then an intermediate string of casing is set about 100 feet below the base of the Artesian aquifer at a depth of 1100 to 1500 feet. Cement is circulated to surface behind the intermediate string to protect the Artesian aquifer.

The production casing is then set at the total depth of the well, which is usually in the Morrow formation, and cemented with 400 to 1000 sacks of cement. This provides a cement shield approximately 1000 feet above the top of the Permo-Penn designated formation.

The application to drill and the casing program for each individual well must be approved by the New Mexico Oil Conservation Division, and by the United States

Geological Survey for wells on Federal lands.

Q What is shown by your Exhibit Number Seventeen?

A. Exhibit Seventeen summarizes the engineering data that has been presented on the designated Permo-Penn formation.

The average in situ reservoir permeability determined by two standard methods, averages less than the allowed 0.1 millidarcy.

The average stabilized flow rate for gas is below the maximum allowed daily rate of 188,000 cubic feet per day.

And lastly, no well produces as much as five barrels of oil per day under stabilized conditions.

Q Mr. Boneau, were Exhibits Numbers Nine through Seventeen either prepared by you or under your direction and supervision?

A. Yes, sir.

MR. DICKERSON: Mr. Examiner, at this time Applicant moves admission of Exhibits Nine through Seventeen.

MR. STAMETS: They are accepted.

MR. DICKERSON: And that concludes our direct testimony.

A. Well, may I say one more thing?

Q. Yes, go ahead. Do you have anything else you would like to add, Mr. Boneau?

A. Mike Stogner called me on Monday about--asking about more detailed data on the drill stem test, and yesterday I prepared quickly some of the data, most of the data, all the data, on four of those ten drill stem tests, and if that question comes up we can talk about it to that extent, or at least I responded to that telephone call to that extent.

MR. DICKERSON: That concludes our direct testimony, Mr. Examiner.

CROSS EXAMINATION

BY MR. STAMETS:

Q. Referring to Exhibit Sixteen, and also Exhibit Twelve, you gave us some information on what you feel a reasonable figure should be for the unstimulated production rates.

Why didn't you show the rates for those DST's on Exhibit Twelve? It would seem like that would give us unstimulated production rates, actual unstimulated production rates.

A. That's a good question and I just happen to have in my pocket a list of those ten drill stem test rates

Q Good. I will write those figures down on my copy of this exhibit. I may wind up asking you to do the same later.

MR. ᴾICKERSON: We'll be glad to submit those.

A. The reason that they're not there was that I had the feeling that the 50 wells, that I didn't want to use too small a sample for the average.

Q Right.

A. And so I went for something that would -- big numbers, and got 34 wells, finally. Okay.

That's no excuse for not giving you ten for you to do whatever you want with them, and I apologize for that.

Oh, hell, I don't -- let's see if I have them in the same order that you have them.

The first one is 25 Mcf --

Q And that's the Box Canyon Well.

A. Box Canyon.

Q. All right.

A. Cities "JG", 189. Cities "JH", 56. City of Artesia, 83. Federal "BZ" 12, 29. Griffin "JJ", 190. Irish Hills "KW" No. 2, I have 70 written down. I remember it was 69.2, I think, actually, but 70 is fine. La Cama, 136. Murphy "NW", 221. And Powell "DG", 48.

Q. Have you averaged those?

A. The average is 105.

Q. And that's below the magic 188.

A. It's below the 188. It's below the 144 that we get by using actual production at pseudo-steady state conditions.

Q. Have you compared those figures with the ones that you derived on Exhibit Sixteen for the wells that are producing?

A. No, but I'm willing to do it with you now, if you'd like.

Q. Let's just take a look at some there. Box Canyon 4-A, you've got 655 on Sixteen.

A. As compared to 25. Box Canyon 4-A responded to its stimulation. So, that's the highest production rate there. That's right.

Q. And Cities "JG" has produced for less than two years --

A. Less than two years.

Q. -- and there are no figures.

A. "JH" is 96 compared to 56.

City of Artesia, 55, is below the drill

stem test value, 83. Federal "BZ" is 2 compared to it was 29, and the Griffin "JJ", 288, responded somewhat to stimulation.

Q Is that right? My eyes don't track straight across that page.

Yes, that's correct. Thank you.

A. Irish Hills "KW" has been on line a very -- relatively short time and there's no value. La Cama now produces 337, or its production rate after two years was 337, compared to 136 on the drill stem test.

Murphy is the well that's a Morrow producer, has not yet been completed in the designated Permo-Penn formation.

And the Powell "DG" produces 175 compared to 48 on the drill stem test.

So the actual production is, after stimulation, and let's see if there's really -- really what kind of correlation would we develop.

La Cama, that should stabilize in about two years. You'd think that those numbers would be roughly the same, and it's up to you whether 136 and 337 are roughly the same.

At the bottom, Powell "DG" is 175 compared to 48, but it should take 14 years to stabilize, so it's reasonable that 175 is still above 48.

City of Artesia, that stabilizes in two years, is 55 instead of 83, which is a reasonable comparison, so maybe we could make it sound like there was a reasonable comparison.

Q. When you averaged the rates on Exhibit Sixteen did you include those wells that had produced less than two years in your --

A. Oh, no, no, no.

The average down there is the sum of the numbers divided by 34.

Q. Okay, and 34 of those wells had produced for two years.

A. Right.

Q. And the other with asterisks didn't, but they didn't enter into the calculation.

A. But they did not enter into the calculation one way or the other.

Q. And of those wells, only one is shut-in, so that really has no significant effect on the final outcome of what you've calculated there.

A. Let me state that more precisely. The average 144 is the sum of those numbers divided by 34. 34 is the number of entries, number of numerical entries in the column. So there are -- there are 34 numbers, 14 asterisks, and 2 SI's. The SI's and the asterisks did not enter in the calculation.

I'm sorry to confuse you.

Q. Well, that's all right. That's easy to do in these cases.

Certainly Exhibit Twelve intends to, if not confirm Exhibit Sixteen, but would tend to indicate, if anything, Exhibit Sixteen may be overly generous in this calculation of production against atmospheric pressure.

A. I agree. We -- I told the people that worked on this with me that we were going to make every doubt in the -- on the side of being generous, and we, I think, we did that.

I tried consciously to do that.

Q. Now I presume somewhere are the formulas and factors used in calculating permeability shown on Exhibit Twelve.

A. They -- they are in these pages that I prepared in response to Mike's telephone call, and I have two copies of information on four of the wells. That, I think, is representative of the whole thing and it's just as many as I could get together in an organized fashion in one day.

Q. There is no problem, though, with submitting this information on all of these wells subsequent to the hearing.

A. If you want that information, you'll get that information, I assure you.

Q. Okay. Could you give one copy of what you have to Mike and let him take a quick look at it and see if he has any problems with the data on it?

A. I do have the original on it, an original and two copies, and I'm going to keep the originals.

The reason for the scarcity of -- of copies is that one of the exhibits for each well is a log and it was hand-clored in and the hand-coloring is kind of a limiting factor in getting very many copies made.

Q. But you do have the formula on the front, plus the calculated deliverability -- or --

A. Okay, can I try to explain what's there?

Q. Yeah, you may.

A. There's a summary page on the front with the formulas and the numbers built into the calculations.

There's a Horner plot with a dashed line drawn through what we took as the straight line portion.

There's a gas analysis for the gas from the well, which was used to determine properties like Z, the deviation factor, and the viscosity of the gas.

Then there are three pages that are copied from the Halliburton drill stem test report, which -- the first is like a summary of the drill stem test; then there's the pressure build-up data; and then there's a sheet where Halliburton has listed what it -- the steps it took during the drill stem tests and the rates that it measured.

Then there's a log of the region around the drill stem test interval, with the area showing gas effect outlined in red, and the height of the pay section when the drill stem test was taken from that log.

And on the front page at the bottom we put references of where we got the equations and where we got the charts for the Z factors and the viscosities, and such. We did not include actual copies of those correlations.

MR. STAMETS: Mike will just --

MR. STOGNER: This is what I want.

MR. STAMETS: This is what you want. Okay, so if they can submit that on all the wells, if we have any problems with it, we can correspond and try to get a resolution of them.

MR. STOGNER: This will answer a lot of my questions.

A. On one of the wells I found what I would consider a mistake and it lowered the actual measured permeability, I think, from .003 to .002, or something, but you may notice that I've noted that for your information on this form.

MR. DICKERSON: Should we submit those as numbered exhibits?

MR. STAMETS: Why don't you just submit that as supplemental information to the Exhibit Number Twelve?

MR. DICKERSON: Okay.

MR. STAMETS: And you can just label each one with the well name so it's obvious which they belong to, and then if upon review of this data we have any questions, we may have to seek further clarification.

But it does appear that you have here submitted the type of information that we're looking for on these wells, which will allow us to make the proper evaluation.

Have you got any questions?

MR. STOGNER: Yes, I do have a question.

MR. STAMETS: Okay.

QUESTIONS BY MR. STOGNER:

Q. On our Murphy "NW" Federal No. 1, where the core was taken, do you feel this was drilled into one of the isolated mounds?

A. No. No, it's in the bank, I believe, isn't it?

Up here, just barely inside this bank, basin, but it was not a mound up here.

MR. STAMETS: That's No. 6 on A-A'. Okay.

Q. Well, do you feel this is representative to the mounds that are in this tight sand area, this core sample?

A. I feel it's as representative of those as any one core is going to be representative of anything.

Q. The overburden pressure was calculated to be 3300 psi. I guess it was a gradient of .5085 psi per foot and you used the average top of the formation at 6490. Is this again representative of the area, and how did you calculate that?

A. The Murphy core was taken before I worked for Yates Petroleum. I attempted to track down who used 3300 psi as the overburden, as the representative overburden pressure, and it's -- that would be representative of the Murphy rather than the whole thing, since it's talking about the Murphy.

The two people involved both said that the other person was responsible, so I did my own calculation based on what I saw in the literature, and I have trouble re-producing that right at the moment, but I got like it ought to be 4900, which would make the permeability even lower, and so I don't think --

Q Something like .6 psi per foot gradient?

A. Okay, what I read up on it, you know, and I make no bones on doing this, but I -- I looked into this question and what I found was that people use 1 psi per foot minus the reservoir pressure.

And I found that used in other tight gas sand hearings and in petroleum literature, and that gives, like you say, about .6 psi per foot.

Anyway, we'd say that the 3300 is an order of magnitude number that somebody picked as representative.

MR. STOGNER: That's all the questions I have.

A. And that's all I can support it with.

RECROSS EXAMINATION

BY MR. STAMETS:

Q One of Mr. Stogner's questions stimulated one more.

Are any of the tests shown on Exhibit Twelve in a mound?

A. I don't think so. Ray?

MR. BECK: There's one right there. No. There's one right there, the well in 2, 19, 24.

A. Irish Hills.

MR. STAMETS: That would be the Irish Hills.

A. Yeah, I thought of that question this morning and I didn't have a chance to look it up, but--

MR. BECK: La Cama.

A. So apparently the answer is La Cama and Irish Hills.

MR. BECK: No, no, Irish Hills isn't in a mound. It's just La Cama.

A. Is that the agreed answer, that one of them is in a mound, and that's La Cama?

MR. BECK: The only triangle that's in a mound is the La Cama Well in 20 of 18, 25.

MR. STAMETS: And that was 136, again below the magic 188 figure.

Mr. Beck, did you -- since you're up and about, did you recommend a type log for this area?

MR. BECK: Well, sir, we reproduced the logs on the cross sections at 2-1/2 inches equal 100 feet, so people could see and actually calculate the porosity off of the compensated neutron - formation density logs, which most of the logs are, there are some sonic logs, but they all constitute logs which can be referred to, and it gives you nine, nineteen, twenty-eight -- about thirty wells which you could look at, which would constitute type logs.

MR. STAMETS: Okay, for purposes of this order, we can select one of these wells as the type log in determining the top and bottom of the formation.

MR. BECK: Oh, the type log, the one that I was referring to most as the type log, is the Well No. 3 of cross section B-B', Exhibit Number Six.

The name of the well is the Tom -- now it's Sun, formerly the Tom Brown, No. 1 Antelope Sink Well, in Section 18 of 19, 24.

And in my testimony I gave the tops of the Third Sister, the top and the bottom, and other pertinent correlations, like Antelope Sink Zone, top of the bank facies, the bottom of the bank facies.

And that would constitute my type log.

MR. STAMETS: Okay. Mike has one more question.

QUESTIONS BY MR. STOGNER:

Q. Dr. Boneau, on page five of your testimony, the drainage area was assumed to equal 320-acre proration unit, do you feel this is a representative of the actual radius of drainage? In this formation?

A. It was taken as 320 acres because that's the proration unit size. But some of the Cisco wells have a good chance of draining that and some of them have a -- will probably drain half or two-thirds, or something, of that.

It's as reasonable a number as I could pick. I cannot stand here and defend that all of them are going to drain 320 acres, no.

MR. STOGNER: Thank you, Dr. Boneau. That's all I have.

MR. STAMETS: Any other questions of this witness? He may be excused.

Anything further in this case?

If there is nothing further, this case will be taken under advisement, subject to submittal of the supplemental data.

And the hearing is adjourned.

(Hearing concluded.)

C E R T I F I C A T E

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

Sally W. Boyd CSR

I do [illegible] that the foregoing is [illegible] in [illegible] No. 7352 heard by me on 10-21 1981.

Richard L. Stamets, Examiner
Oil Conservation Division

SALLY W. BOYD, C.S.R.
Rt. 1 Box 193-B
Santa Fe, New Mexico 87501
Phone (505) 455-7409

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

BRUCE KING
GOVERNOR
LARRY KEHOE
SECRETARY

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-2434

June 2, 1982

Mr. Howard Kilchrist
Federal Energy Regulatory Comm.
825 North Capitol Street, N.E.
Washington, D. C. 20426

Re: Permo-Penn Tight Gas Formation Case

Dear Mr. Kilchrist:

Enclosed for the use by members of your staff, please find two copies of the transcript of hearing held in the above-referenced matter which was docketed before the New Mexico Oil Conservation Division as Case No. 7352 and which recommendation is contained in Order No. R-6904.

If I can be of further assistance, please do not hesitate to call.

Sincerely,

W. PERRY PEARCE
General Counsel

WPP/dr

cc: Chad Dickerson
Losee, Carson & Dickerson

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

BRUCE KING
GOVERNOR
LARRY KEHOE
SECRETARY

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-2434

February 15, 1982

Mr. Chad Dickerson
Losee, Carson & Dickerson
Attorneys at Law
Post Office Box 239
Artesia, New Mexico 88210

Re: CASE NO. 7352
ORDER NO. R-6904

Applicant:

Yates Petroleum Corporation

Dear Sir:

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

Yours very truly,

JOE D. RAMEY
Director

JDR/fd

Copy of order also sent to:

Hobbs OCD x
Artesia OCD x
Aztec OCD ______

Other ______

United States Department of the Interior

OFFICE OF THE SECRETARY

Minerals Management Service
South Central Region
P. O. Box 26124
Albuquerque, New Mexico 87125

OIL CONSERVATION DIVISION
SANTA FE

MAR 0 2 1982

Mr. W. Perry Pearce
Oil Conservation Division
State of New Mexico
P. O. Box 2088
Santa Fe, New Mexico 87501

Dear Mr. Pearce:

This jurisdictional agency concurs in the recommendation of the State of New Mexico, Case No. 7352, Order No. R-6904, dated February 15, 1982, that the Permo-Penn formation underlying the described lands in subject order in Eddy County, New Mexico, be designated as a Section 107 tight formation.

It is requested that this concurrence be included with the recommendation submitted to the Federal Energy Regulatory Commission.

Sincerely yours,

James W. Shelton
F/e Gene F. Daniel
Deputy Minerals Manager
Oil & Gas

RECEIVED
SEP 18 1981
OIL CONSERVATION DIVISION
SANTA FE

BEFORE THE OIL CONSERVATION DIVISION

OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF YATES PETROLEUM CORPORATION FOR TIGHT FORMATION DESIGNATION, EDDY COUNTY, NEW MEXICO	:	CASE NO. 7352

AMENDED APPLICATION

COMES NOW Yates Petroleum Corporation, by its attorneys, and states:

1. Applicant is the owner of interests in the Permo-Penn formation underlying portions of the lands described in Exhibit "A" attached hereto and incorporated by reference. For purposes hereof, the Permo-Penn formation is defined as that interval between the top of the marker named the Third Sister Cycle of the Wolfcamp Series of the Permian System, and the top of the Canyon Series of the Pennsylvanian System.

2. Said formation underlying the lands described in Exhibit "A" is expected to have an average <u>in situ</u> gas permeability throughout the pay section of 0.1 millidarcy or less.

3. The average depth to the top of said formation is 5,827 feet. The stabilized production rate, either at atmospheric pressure or calculated against atmospheric pressure of wells completed for production in the formation without stimulation, is not expected to exceed 188 MCF of gas per day.

4. No well drilled into said formation underlying the lands described on Exhibit "A" is expected to produce more than five barrels of crude oil per day prior to application of stimulation techniques or processes.

WHEREFORE, Applicant prays that the Division enter its Order recommending to the Federal Energy Regulatory Commission that, pursuant to Section 107 of the Natural Gas Policy Act of 1978, and 18 C.F.R. §271.701, the Permo-Penn Reservoir underlying the lands described in Exhibit "A" be

designated as a tight formation, together with such other and further relief as the Division deems proper.

YATES PETROLEUM CORPORATION

By: Chad Dickerson

Chad Dickerson

LOSEE, CARSON & DICKERSON, P.A.
P. O. Drawer 239
Artesia, New Mexico 88210

Attorneys for Applicant

EXHIBIT "A"

Township 17 South, Range 24 East, N.M.P.M.

All Sections

Township 17 South, Range 25 East, N.M.P.M.

All Sections

Township 17 South, Range 26 East, N.M.P.M.

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All Sections

Township 22 South, Range 21 East, N.M.P.M.

Sections 1 through 12

Township 22 South, Range 22 East, N.M.P.M.

Sections 1 through 12

in Eddy County, New Mexico.

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION DIVISION FOR THE PURPOSE OF CONSIDERING:

CASE NO. 7352
Order No. R-6904

APPLICATION OF YATES PETROLEUM CORPORATION FOR DESIGNATION OF A TIGHT FORMATION, EDDY COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9:00 A.M. on October 21, 1981, at Santa Fe, New Mexico, before Examiner Richard L. Stamets.

NOW, on this 15th day of February, 1982, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:

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

(2) That the applicant, Yates Petroleum Corporation, requests that the Division recommend to the Federal Energy Regulatory Commission that the Permo-Penn formation underlying the lands situated in Eddy County, New Mexico, described in Exhibit "A" attached hereto and incorporated by reference ("the Subject Area"), be designated as a tight formation in accordance with Section 107 of the Natural Gas Policy Act of 1978, and 18 C.F.R. Section 271.701, et seq.

(3) That the Permo-Penn formation underlying the Subject Area is that stratigraphic interval between the top of a marker named the Third Sister Cycle of the Wolfcamp series of the Permian system and the top of the Canyon series of the Pennsylvanian system.

(4) That the type section for the Permo-Penn formation is found at a depth of from approximately 5860 feet to 7060 feet on the Sonic log dated July 22, 1963, from the Sun (Tom Brown) Antelope Sink Unit Well No. 1, located in Unit G of Section 18, Township 19 South, Range 24 East, Eddy County, New Mexico.

(5) That the Permo-Penn formation in the Subject Area is a complex of shelf, bank and basin facies reflecting three major environments of deposition, trending basinward from the west and northwest and dipping to the east and southeast at approximately 100 feet per mile in most of the Subject Area. The shelf facies to the northwest is composed of deposits of interbedded limestones, shales, siltstones and sandstones, and is effectively non-porous and impermeable and acts as an up-dip seal to the bank facies; that the bank facies is composed mostly of marine limestones made up in large part of bioherms and their associated debris aprons with a few intercalated marine shales; that the basin facies to the southeast consists mainly of thin-bedded, fine-grained sandstones, siltstones and shales, within which are scattered isolated mounds of built-up carbonates, in some of which porosity occurs but many of which are effectively non-porous and impermeable.

(6) That as of January 1, 1981, the Permo-Penn formation underlying the Subject Area has been penetrated by 333 wells, 50 of which were completed in the Permo-Penn formation as of January 1, 1981; that the average depth to the top of the pay zone in these 50 wells is 6490 feet, and the productive interval in said wells begins several hundred feet below the top of the marker named the Third Sister Cycle; and from all available data there appears to be no other productive zones within the Permo-Penn formation; that the large number of wells drilled through the Permo-Penn formation in the Subject Area gives reasonably effective control over both the vertical limits of said formation, and the areal extent of the Subject Area.

(7) That the depth to the top of the Permo-Penn formation in the Subject Area varies from 4927 feet in the highest well drilled to 6717 feet in the lowest with an average depth to the top of such formation of 5822 feet.

(8) The thickness of the Permo-Penn formation in the Subject Area varies from 1000 to 1400 feet, much of which is non-productive; the markers picked to define the Permo-Penn formation are the only ones which can be accurately picked throughout the Subject Area to most closely isolate the productive zones for which tight formation designation is sought; that recognition of said markers will facilitate industry and regulatory analysis of the formation in question.

(9) That the average insitu permeability calculated from all available drill stem test data is 0.031 millidarcy. The average insitu permeability from the only core data available is 0.035 millidarcy, thus confirming the drill stem test data.

(10) That the average production rate in the 10 available drill stem tests was 105 Mcf per day and the average production rate against atmospheric pressure for the 34 completed and stimulated wells that have approached stabilized conditions was 146 Mcf per day; that the drill stem test data should more closely represent average production rates inasmuch as the actual production figures are from wells in which production has been enhanced by stimulation.

(11) That maximum liquid production in any well at stabilized conditions is 4.1 barrels of oil per day and average production is 0.6 barrels of oil per day.

(12) That the data available indicate that the Permo-Penn formation in the Subject Area meets all the criteria set forth in 18 C.F.R. Section 271.701, et seq, viz:

(a) the estimated average insitu permeability throughout the pay section is expected to be less than 0.1 millidarcy;

(b) the stablilized production rate, against atmospheric pressure, of wells completed for production in the formation, without stimulation, is not expected to exceed 188 Mcf per day t the average depth to the top of the formation of 5822 feet;

(c) no well drilled into the formation is expected to produce without stimulation more than five barrels of oil per day; and

(d) the Division has not authorized the formation or any portion thereof to be developed by infill drilling.

(13) That the Artesian aquifer within the proposed area has its base at depths from 1000 feet to 1400 feet or approximately 4500 feet above the Permo-Penn formation.

(14) That existing State of New Mexico and Federal Regulations relating to casing and cementing of wells will assure that development of the Permo-Penn formation will not adversely affect the Artesian aquifer or other shallower aquifers.

(15) That the Permo-Penn formation within the Subject Area should be designated as a tight formation.

IT IS THEREFORE ORDERED:

(1) That it be, and hereby is recommended to the Federal Energy Regulatory Commission pursuant to Section 107 of the Natural Gas Policy Act of 1978, and 18 C.F.R. Section 271.701, et seq, that the Permo-Penn formation underlying the Subject Area be designated as a tight formation.

(2) That jurisdiction of this cause be retained for the entry of such further orders as the Division may deem necessary.

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

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

JOE D. RAMEY
Director

S E A L

CASE NO. 7352
ORDER NO. R-6904

EXHIBIT "A"

Township 17 South, Range 24 East, N.M.P.M.

All Sections

Township 17 South, Range 25 East, N.M.P.M.

All Sections

Township 17 South, Range 26 East, N.M.P.M.

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All Sections

Township 22 South, Range 21 East, N.M.P.M.

Sections 1 through 12

Township 22 South, Range 22 East, N.M.P.M.

Sections 1 through 12

containing 318,187.13 acres, more or less, in Eddy County, New Mexico.

LAW OFFICES
LOSEE, CARSON & DICKERSON, P. A.
300 AMERICAN HOME BUILDING
P. O. DRAWER 239
ARTESIA, NEW MEXICO 88210

A. J. LOSEE
JOEL M. CARSON
CHAD DICKERSON
DAVID R. VANDIVER

AREA CODE 505
746-3508

October 2, 1981

OIL CONSERVATION DIVISION
, 1981
RECEIVED

VIA PUROLATOR

Energy and Minerals Department
Oil Conservation Division
P. O. Box 2088
State Land Office
Santa Fe, New Mexico 87501

Re: Case No. 7352
Application for Tight Formation
October 21, 1981 Examiner Hearing

Gentlemen:

Enclosed, please find four copies of a complete set of Exhibits 1 through 17, which Yates Petroleum Corporation proposes to offer or introduce at the hearing set for the captioned case, together with two separate statements of the meaning and purpose of each exhibit, one as to engineering (Exhibits 9 - 17) and one as to geological testimony (Exhibits 1 - 8).

Sincerely yours,

LOSEE, CARSON & DICKERSON, P.A.

Chad Dickerson

Chad Dickerson

CD:pvm
Enclosures

OIL CONSERVATION DIVISION
OCT - 5 1981
RECEIVED

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO
23 September 1981

EXAMINER HEARING

IN THE MATTER OF:

Application of Yates Petroleum Corporation for designation of a tight formation, Eddy County, New Mexico.

CASE 7352

BEFORE: Richard L. Stamets

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Oil Conservation Division:

W. Perry Pearce, Esq.
Legal Counsel to the Division
State Land Office Bldg.
Santa Fe, New Mexico 87501

For the Applicant:

MR. STAMETS: Call next Case 7352.

MR. PEARCE: Application of Yates Petroleum Corporation for designation of a tight formation, Eddy County, New Mexico.

MR. STAMETS: At the request of the applicant, this case will be continued until the October 21st, Examiner Hearing.

(Hearing concluded.)

CERTIFICATE

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

Sally W. Boyd CSR

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 7352 heard by me on 9-23 1981.

Richard L. Stamets, Examiner
Oil Conservation Division

SALLY W. BOYD, C.S.R.
Rt. 1 Box 193-B
Santa Fe, New Mexico 87501
Phone (505) 455-7409

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO
23 September 1981

EXAMINER HEARING

IN THE MATTER OF:

Application of Yates Petroleum Corporation for designation of a tight formation, Eddy County, New Mexico.

CASE 7352

BEFORE: Richard L. Stamets

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Oil Conservation Division: W. Perry Pearce, Esq.
Legal Counsel to the Division
State Land Office Bldg.
Santa Fe, New Mexico 87501

For the Applicant:

MR. STAMETS: Call next Case 7352.

MR. PEARCE: Application of Yates Petroleum Corporation for designation of a tight formation, Eddy County, New Mexico.

MR. STAMETS: At the request of the applicant, this case will be continued until the October 21st, Examiner Hearing.

(Hearing concluded.)

C E R T I F I C A T E

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

Sally W. Boyd CSR

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. ______, heard by me on ______________ 19____.

______________________, Examiner
Oil Conservation Division

SALLY W. BOYD, C.S.R.
Rt. 1 Box 193-B
Santa Fe, New Mexico 87501
Phone (505) 455-7409

LAW OFFICES
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A. J. LOSEE
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CHAD DICKERSON
DAVID R. VANOIVER

AREA CODE 505
746-3508

RECEIVED
SEP 18 1981
OIL CONSERVATION DIVISION
SANTA FE

September 16, 1981

Mr. Joe D. Ramey
Energy and Minerals Department
Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501

Re: Case No. 7352

Dear Mr. Ramey:

Enclosed for filing, please find three copies of the Amended Application of Yates Petroleum Corporation for Tight Formation Designation, Eddy County, New Mexico.

We ask that this case be continued until the October 21, 1981 Examiner Hearing.

Thank you.

Sincerely yours,

LOSEE, CARSON & DICKERSON, P.A.

Chad Dickerson

Chad Dickerson

CD:pvm
Enclosures

RECEIVED
SEP 18 1981
OIL CONSERVATION DIVISION
SANTA FE

BEFORE THE OIL CONSERVATION DIVISION

OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF YATES PETROLEUM CORPORATION FOR TIGHT FORMATION DESIGNATION, EDDY COUNTY, NEW MEXICO	: : : : :	CASE NO. 7352

AMENDED APPLICATION

COMES NOW Yates Petroleum Corporation, by its attorneys, and states:

1. Applicant is the owner of interests in the Permo-Penn formation underlying portions of the lands described in Exhibit "A" attached hereto and incorporated by reference. For purposes hereof, the Permo-Penn formation is defined as that interval between the top of the marker named the Third Sister Cycle of the Wolfcamp Series of the Permian System, and the top of the Canyon Series of the Pennsylvanian System.

2. Said formation underlying the lands described in Exhibit "A" is expected to have an average <u>in situ</u> gas permeability throughout the pay section of 0.1 millidarcy or less.

3. The average depth to the top of said formation is 5,827 feet. The stabilized production rate, either at atmospheric pressure or calculated against atmospheric pressure of wells completed for production in the formation without stimulation, is not expected to exceed 188 MCF of gas per day.

4. No well drilled into said formation underlying the lands described on Exhibit "A" is expected to produce more than five barrels of crude oil per day prior to application of stimulation techniques or processes.

WHEREFORE, Applicant prays that the Division enter its Order recommending to the Federal Energy Regulatory Commission that, pursuant to Section 107 of the Natural Gas Policy Act of 1978, and 18 C.F.R. §271.701, the Permo-Penn Reservoir underlying the lands described in Exhibit "A" be

designated as a tight formation, together with such other and further relief as the Division deems proper.

YATES PETROLEUM CORPORATION

By: Chad Dickerson
Chad Dickerson

LOSEE, CARSON & DICKERSON, P.A.
P. O. Drawer 239
Artesia, New Mexico 88210

Attorneys for Applicant

EXHIBIT "A"

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All Sections

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Township 21 South, Range 22 East, N.M.P.M.

All Sections

Township 22 South, Range 21 East, N.M.P.M.

Sections 1 through [illegible]

Township 22 South, Range [illegible] East, N.M.P.M.

Sections 1 through [illegible]

Eddy County, New Mexico.

BEFORE THE OIL CONSERVATION DIVISION

OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF YATES PETROLEUM CORPORATION FOR TIGHT FORMATION DESIGNATION, EDDY COUNTY, NEW MEXICO	CASE NO. 7352

AMENDED APPLICATION

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designated as a tight formation, together with such other and further relief as the Division deems proper.

YATES PETROLEUM CORPORATION

By: Chad Dickerson
Chad Dickerson

LOSEE, CARSON & DICKERSON, P.A.
P. O. Drawer 239
Artesia, New Mexico 88210

Attorneys for Applicant

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Township 22 South, Range 21 East, N.M.P.M.

Sections 1 through 12

Township 22 South, Range 22 East, N.M.P.M.

Sections 1 through 12

in Eddy County, New Mexico.

Docket Nos. 34-81 and 35-81 are tentatively set for October 21 and November 4, 1981. Applications for hearing must be filed at least 22 days in advance of hearing date.

DOCKET: COMMISSION HEARING - WEDNESDAY - OCTOBER 14, 1981

9 A.M. - OIL CONSERVATION COMMISSION - ROOM 205
STATE LAND OFFICE BUILDING, SANTA FE, NEW MEXICO

(The following cases are continued from the October 14, 1981, Commission hearing to October 16, 1981.)

CASE 7345: (Continued and Readvertised)

Application of Bass Enterprises Production Company for compulsory pooling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the San Andres, Bone Springs and Pennsylvanian formations, Lovington Field, underlying the N/2 NE/4 of Section 13, Township 16 South, Range 36 East, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7323: (DE NOVO)

Application of Clements Energy, Inc., for compulsory pooling, Chaves County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests underlying the E/2 of Section 32, Township 15 South, Range 27 East, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision. Also to be considered will be the designation of applicant as operator of the well and a charge for risk involved in drilling said well.

Upon application of Southland Royalty Company, this case will be heard DE NOVO pursuant to the provisions of Rule 1220.

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Docket No. 34-81

DOCKET: EXAMINER HEARING - WEDNESDAY - OCTOBER 21, 1981

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

The following cases will be heard before Richard L. Stamets, Examiner, or Daniel S. Nutter, Alternate Examiner:

ALLOWABLE: (1) Consideration of the allowable production of gas for November, 1981, from fifteen prorated pools in Lea, Eddy, and Chaves Counties, New Mexico.

(2) Consideration of the allowable production of gas for November, 1981, from four prorated pools in San Juan, Rio Arriba, and Sandoval Counties, New Mexico.

CASE 7373: Application of J. C. Williamson for Amendment of Division Order No. R-6738, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the Amendment of Division Order No. R-6738, which approved an unorthodox location for a well 1560 feet from the North line and 1830 feet from the West line of Section 10, Township 23 South, Range 34 East. Applicant seeks the Amendment of said order to reflect the corrected location of said well at a point 1580 feet from the North line and 2614 feet from the West line of said Section 10.

CASE 7374: Application of Dugan Production Corporation for an unorthodox gas well location, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of a Farmington formation well located 330 feet from the South line and 990 feet from the East line of Section 9, Township 28 North, Range 11 West, the E/2 of said Section 9 to be dedicated to the well.

CASE 7375: Application of Dugan Production Corporation for downhole commingling, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of Angel Peak Gallup-Basin Dakota production in the wellbore of its McAdams Well No. 2 located in Unit P of Section 34, Township 27 North, Range 10 West.

CASE 7376: Application of Dugan Production Corporation for downhole commingling, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of Basin-Dakota and Bisti-Lower Gallup production in the wellbore of its Big 8 Well No. 1-E, located in Unit O of Section 8, Township 24 North, Range 9 West.

CASE 7377: Application of Dugan Production Corporation for downhole commingling, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of undesignated Gallup and Basin-Dakota production in the wellbore of its July Jubilee Well No. 1 located in Unit G of Section 30, Township 24 North, Range 9 West.

CASE 7378: Application of Jerome P. McHugh for downhole commingling, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of Wildhorse-Gallup and Basin-Dakota production in the wellbore of his Apache E Well No. 1, located in Unit A of Section 18, Township 26 North, Range 3 West.

CASE 7356: (Continued from September 23, 1981, Examiner Hearing)

Application of S & I Oil Company for compulsory pooling, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the W/2 SW/4 of Section 12, Township 29 North, Range 15 West, Cha Cha-Gallup Oil Pool, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7379: Application of JEM Resources, Inc., for vertical pool extension and special GOR limit, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks the vertical extension of the Cave-Grayburg Pool to include the San Andres formation, and the establishment of a special gas-oil ratio limit for said pool to 6000 to one or, in the alternative, the abolishment of the gas-oil ratio limit in said pool, all to be effective October 1, 1981.

CASE 7380: Application of Bird Oil Corporation for an unorthodox location, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox Entrada location of a well to be drilled 2310 feet from the North line and 1325 feet from the East line of Section 10, Township 22 North, Range 9 West, the SW/4 NE/4 of said Section 10 to be dedicated to the well.

CASE 7381: Application of H. L. Brown, Jr., for an unorthodox gas well location, Roosevelt County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of a well to be drilled 330 feet from the South line and 2310 feet from the East line of Section 34, Township 7 South, Range 37 East, Bluitt-Wolfcamp Gas Pool, the E/2 of said Section 34 to be dedicated to the well.

CASE 7382: Application of TXO Production Corporation for an unorthodox gas well location, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of a Morrow well to be drilled 660 feet from the South and West lines of Section 20, Township 17 South, Range 28 East, the W/2 of said Section 20 to be dedicated to the well.

CASE 7383: Application of Amoco Production Company for compulsory pooling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Upper Pennsylvanian formation underlying the NW/4 of Section 19, Township 19 South, Range 25 East, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7384: Application of Morris R. Antweil for compulsory pooling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests from the surface to the base of the Abo formation underlying the NE/4 SW/4 of Section 5, Township 20 South, Range 38 East, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7385: Application of El Paso Natural Gas Company for downhole commingling, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of Blanco-Mesaverde and Basin-Dakota production in the wellbore of its San Juan 27-5 Unit Well No. 59, located in Unit A of Section 6, Township 27 North, Range 5 West.

CASE 7386: Application of El Paso Natural Gas Company for downhole commingling, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of South Blanco-Pictured Cliffs and Blanco-Mesaverde production in the wellbore of its San Juan 27-5 Unit Well No. 54, located in Unit L of Section 31, Township 27 North, Range 5 West.

CASE 7387: Application of Sun Oil Company for an unorthodox oil well location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of a well to be drilled 660 feet from the North and East lines of Section 32, Township 9 South, Range 37 East, West Sawyer-San Andres Pool, the N/2 NE/4 of said Section 32 to be dedicated to the well.

CASE 7388: Application of Sun Oil Company for an unorthodox oil well location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of a well to be drilled in the Northeast Lusk Yates Pool, 2500 feet from the North line and 1880 feet from the East line of Section 15, Township 19 South, Range 32 East the SW/4 NE/4 of said Section 15 to be dedicated to the well.

CASE 7389: Application of Yates Petroleum Corporation for an Amendment to Division Order No. R-4365, Eddy County, New Mexico. Applicant, in the above-styled cause seeks the amendment of Division Order No. R-4365, which promulgated special rules and regulations for the Penasco Draw San Andres-Yeso Pool, by amending Rule 5 to permit the simultaneous dedication of gas wells and oil wells and amending Rule 9 to provide for annual gas-liquid ratio tests in lieu of semi-annual tests.

CASE 7365: (Continued from October 7, 1981, Examiner Hearing)

Application of Yates Petroleum Corporation for the amendment of Order No. R-6406, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks the amendment of Order No. R-6406, to permit recompletion of its State "JM" No. 2 Well, drilled at an unorthodox Morrow location 660 feet from the South line and 660 feet from the East line of said Section 25, Township 18 South, Range 24 East, in any and all Wolfcamp and Pennsylvanian pays in said well.

CASE 7390: Application of Harvey E. Yates Company for compulsory pooling, Chaves County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Mississippian formation underlying the W/2 of Section 18, Township 9 South, Range 27 East to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7391: Application of Harvey E. Yates Company for statutory unitization, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an order unitizing, for the purposes of a secondary recovery project, all mineral interests in the Travis Penn Unit encompassing 480 acres, more or less, underlying all or portions of Sections 12 and 13, Township 18 South, Range 28 East, Eddy County, New Mexico.

The unitized interval would be the Cisco-Canyon formation between the depths of 9815 feet and 9935 feet in Harvey E. Yates Company's Travis Deep Unit No. 2 Well. Among the matters to be considered at the hearing will be the necessity of unit operations; the designation of a unit operator; the determination of the horizontal and vertical limits of the unit area; the determination of the fair, reasonable, and equitable allocation of production and costs of production, including capital investment, to each of the various tracts in the unit area; the determination of credits and charges to be made among the various owners in the unit area for their investment in well and equipment; and such other matters as may be necessary and appropriate for carrying on efficient unit operations, including, but not limited to, unit voting procedures, selection, removal, or substitution of unit operator, and time of commencement and termination of unit operations.

CASE 7392: Application of Sam H. Snoddy, for an unorthodox gas well location in the Oil-Potash Area, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the location of a Pennsylvanian well to be drilled 660 feet from the North and East lines of Section 26, Township 20 South, Range 32 East, Oil-Potash Area, the N/2 of said Section 26 to be dedicated to the well.

CASE 7393: Application of Uriah Exploration Incorporated for compulsory pooling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Cisco, Canyon and Morrow formations underlying the W/2 of Section 13, Township 22 South, Range 24 East, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7394: Application of Supron Energy Corporation for an unorthodox gas well location, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of a Pennsylvanian well to be drilled 467 feet from the North line and 1650 feet from the West line of Section 13, Township 22 South, Range 24 East, the N/2 of said Section 13 to be dedicated to the well.

CASE 7395: Application of Curtis J. Little for Designation of a Tight formation, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks the designation of the Pictured Cliffs formation underlying portions of Townships 25 and 26 North, Ranges 6 and 7 West containing a total of 14,400 acres, more or less, as a tight formation pursuant to Section 107 of the Natural Gas Policy Act and 18 CFR Section 271. 701-705.

CASE 7300: (Reopened and Readvertised)

Application of Dome Petroleum Corporation for designation of a tight formation, Sandoval County, New Mexico. Applicant, in the above-styled cause, seeks the designation of the Chacra formation underlying portions of Townships 21 and 22 North, Ranges 5,6, and 7 West, containing 73,018 acres, more or less, as a tight formation pursuant to Section 107 of the Natural Gas Policy Act and 18 CFR Section 271. 701-705.

CASE 7352: (Continued from September 23, 1981, Examiner Hearing)

Application of Yates Petroleum Corporation for designation of a tight formation, Eddy County, New Mexico. Applicant, in the above-styled cause, pursuant to Section 107 of the Natural Gas Policy Act 18-CFR Section 271. 701-705, seeks the designation as a tight formation of the Permo-Penn formation underlying all of the following townships:

Township 17 South, Ranges 24 thru 26 East;

18 South, 24 and 25 East,

19 South, 23 thru 25 East;

20 South, 21 thru 24 East;

20 1/2 South, 21 and 22 East;

21 South, 21 and 22 East;

Also Sections 1 thru 12 in

22 South, 21 and 22 East,

All of the above containing a total of 315,000 acres more or less.

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO
9 September 1981

EXAMINER HEARING

IN THE MATTER OF:

Application of Yates Petroleum Corporation for designation of a tight formation, Eddy County, New Mexico.

CASE 7352

BEFORE: Daniel S. Nutter

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Oil Conservation Division:

W. Perry Pearce, Esq.
Legal Counsel to the Division
State Land Office Bldg.
Santa Fe, New Mexico 87501

For the Applicant:

MR. NUTTER: Call next Case Number 7352.

MR. PEARCE: Application of Yates Petroleum Corporation for designation of a tight formation, Eddy County, New Mexico.

MR. NUTTER: Applicant has requested continuance.

Case Number 7352 will be continued to the Examiner Hearing scheduled to be held at this same place at 9:00 o'clock a. m. September 23rd, 1981.

(Hearing concluded.)

C E R T I F I C A T E

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

Sally W. Boyd CSR

SALLY W. BOYD, C.S.R.
Rt. 1 Box 193-B
Santa Fe, New Mexico 87501
Phone (505) 455-7409

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 7353 heard by me on 9/9 1981.

_______________, Examiner
Oil Conservation Division

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
STATE LAND OFFICE BLDG.
SANTA FE, NEW MEXICO
9 September 1981

EXAMINER HEARING

IN THE MATTER OF:

Application of Yates Petroleum Corporation for designation of a tight formation, Eddy County, New Mexico.

CASE
7352

BEFORE: **Daniel S. Nutter**

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Oil Conservation Division:

W. Perry Pearce, Esq.
Legal Counsel to the Division
State Land Office Bldg.
Santa Fe, New Mexico 87501

For the Applicant:

MR. NUTTER: Call next Case Number 7352.

MR. PEARCE: Application of Yates Petroleum Corporation for designation of a tight formation, Eddy County, New Mexico.

MR. NUTTER: Applicant has requested continuance.

Case Number 7352 will be continued to the Examiner Hearing scheduled to be held at this same place at 9:00 o'clock a. m. September 23rd, 1981.

(Hearing concluded.)

C E R T I F I C A T E

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

Sally W. Boyd CSR

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 7352 heard by me on 9/9 1981.

_______________, Examiner
Oil Conservation Division

SALLY W. BOYD, C.S.R.
Rt. 1 Box 193-B
Santa Fe, New Mexico 87501
Phone (505) 455-7409

Dockets Nos. 29-81 and 30-81 are tentatively set for September 23 and October 7, 1981. Applications for hearing must be filed at least 22 days in advance of hearing date.

DOCKET: EXAMINER HEARING - WEDNESDAY - SEPTEMBER 9, 1981

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

The following cases will be heard before Daniel S. Nutter, Examiner, or Richard L. Stamets, Alternate Examiner:

CASE 7341: Application of Superior Oil Company for downhole commingling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of South Carlsbad Strawn and Morrow production in the wellbore of its Collatt State Com Well No. 1 located in Unit J of Section 1, Township 23 South, Range 26 East.

CASE 7342: Application of Arco Oil and Gas Company for downhole commingling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the downhole commingling of Blinebry and Drinkard production in the wellbore of its State 367 Well No. 2 located in Unit L of Section 36 and its Roy Barton Well No. 2 located in Unit B of Section 23, both in Township 21 South, Range 37 East.

CASE 7343: Application of Caribou Four Corners, Inc. for compulsory pooling, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Cha Cha Gallup - Oil Pool underlying the E/2 NW/4 of Section 18, Township 29 North, Range 14 West, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7344: Application of Read & Stevens, Inc. for compulsory pooling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Morrow formation underlying the W/2 of Section 19, Township 23 South, Range 28 East, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7345: Application of Bass Enterprises Production Company for compulsory pooling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Lovington Penn Pool underlying the N/2 NE/4 of Section 13, Township 16 South, Range 36 East, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7346: Application of Cibola Energy Corporation for compulsory pooling, Chaves County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Wolfcamp through Devonian formations underlying the W/2 of Section 19, Township 10 South, Range 29 East, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7347: Application of Tenneco Oil Company for an unorthodox gas well location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of a well to be drilled 660 feet from the South Line and 860 feet from the West Line of Section 20, Township 16 South, Range 34 East, Kemnitz-Morrow Gas Pool, the W/2 of said Section 20 to be dedicated to the well.

CASE 7348: Application of Apollo Oil Company for salt water disposal, Lea County, New Mexico. Applicant, in the above-styled cause, seeks authority to dispose of produced salt water into the Abo formation in the interval from 8834 feet to 8968 feet in its Lovington State 9 Well No. 2 in Unit N of Section 9, Township 17 South, Range 37 East, Midway-Abo Pool.

CASE 7349: Application of Apollo Oil Company for salt water disposal, Lea County, New Mexico. Applicant, in the above-styled cause, seeks authority to dispose of produced salt water into the Bough C Formation in the interval from 9645 feet to 9654 feet in its Jack Markham Well No. 2 in Unit P of Section 11, Township 9 South, Range 35 East, Bough-Permo Pennsylvanian Pool.

CASE 7350: Application of Conoco, Inc. for salt water disposal, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks authority to dispose of produced salt water into the Cisco formation in the interval from 8144 feet to 8160 feet in its Levers Federal Well No. 2 in Unit R of Section 2, Township 20 South, Range 25 East, Springs-Upper Penn Gas Pool.

CASE 7351: Application of Mid-America Petroleum, Inc. for compulsory pooling and the rescission of Order No. R-6722, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Pennsylvanian formations underlying the W/2 of Section 12, Township 23 South, Range 34 East, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well. Applicant further seeks rescission of Order No. R-6722 which approved an unorthodox location for the subject well based on dedication of the S/2 of said Section 12.

CASE 7352: Application of Yates Petroleum Corporation for designation of a tight formation, Eddy County, New Mexico. Applicant, in the above-styled cause, pursuant to Section 107 of the Natural Gas Policy Act 18-CFR Section 271.701-705, seeks the designation as a tight formation of the Permo-Penn and formation underlying all of the following townships:

Township 17 South, Ranges 24 thru 26 East;

18 South, 24 and 25 East;

19 South, 23 thru 25 East;

20 South, 21 thru 24 East;

20 ½ South, 21 and 22 East;

21 South, 21 and 22 East;

Also Sections 1 thru 12 in 22 South, 21 and 22 East,

All of the above containing a total of 315,000 acres more or less.

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Docket No. 28-91

DOCKET: EXAMINER HEARING - WEDNESDAY - SEPTEMBER 16, 1981

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

The following cases will be heard before Richard L. Stamets, Examiner, or Daniel S. Nutter, Alternate Examiner:

ALLOWABLE: (1) Consideration of the allowable production of gas for October, 1981, from fifteen prorated pools in Lea, Eddy, and Chaves Counties, New Mexico.

(2) Consideration of the allowable production of gas for October, 1981, from four prorated pools in San Juan, Rio Arriba, and Sandoval Counties, New Mexico.

Dockets Nos. 31-81 and 32-81 are tentatively set for [illegible], and October 21, 1981. Applications for hearing must be filed at least 22 days in advance of hearing date.

DOCKET: EXAMINER HEARING - WEDNESDAY - [illegible]

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

The following cases will be heard before Richard L. Stamets, Examiner, or [illegible] Nutter, Alternate Examiner:

CASE 7353: Application of Texaco, Inc., for the amendment of Division Order No. R-5530, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the amendment of Order No. R-5530, which authorized its Central Vacuum Unit Area Pressure Maintenance Project, to increase the total project area allowable, or as an alternative, to reclassify the project as a waterflood project.

CASE 7354: Application of Corona Oil Company, for a pilot steam-enhanced oil recovery project, Guadalupe County, New Mexico.
Applicant, in the above-styled cause, seeks authority to institute a pilot steam-enhanced oil recovery project in the Santa Rosa formation by using two existing wells and three additional wells to be drilled to complete a five spot pattern located in the NE/4 NW/4 of Section 17, Township 11 North, Range 26 East.

CASE 7355: Application of Doyle Hartman for directional drilling and an unorthodox location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks authority to drill his Bates Well No. 3, the surface location of which is 1635 feet from the South line and 1210 feet from the West line of Section 20, Township 25 South, Range 37 East, in such a manner as to bottom it at a depth of 3500 feet in the Jalmat Gas Pool at an unorthodox location 2310 feet from the South line and 1650 feet from the West line of Section 20. The SW/4 of said Section 20 would be dedicated to the well.

CASE 7356: Application of S & I Oil Company for compulsory pooling, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the W/2 SW/4 of Section 12, Township 29 North, Range 15 West, Cha Cha-Gallup Oil Pool, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7357: Application of Union Oil Company of California for compulsory pooling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Atoka and Morrow formations underlying the W/2 of Section 16, Township 22 South, Range 33 East, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7343: (Continued from September 9, 1981, Examiner Hearing)

Application of Caribou Four Corners, Inc. for compulsory pooling, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Cha Cha Gallup Oil Pool underlying the E/2 NW/4 of Section 18, Township 29 North, Range 14 West, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7358: Application of John Yuronka for compulsory pooling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Langley Mattix Pool underlying the SW/4 of Section 6, Township 23 South, Range 37 East, to form four 40-acre tracts, each to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said wells and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the wells, and a charge for risk involved in drilling said wells.

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CASE 7359: Application of Energy Reserves Group for creation of a new gas pool and an unorthodox location, Roosevelt County, New Mexico.

Applicant, in the above-styled cause, seeks creation of a new Cisco gas pool for its Miller Com Well No. 1, located in Unit M of Section 12, Township 6 South, Range 33 East.

Applicant further seeks approval of an unorthodox location for its Miller "A" Well No. 1-Y, to be drilled 1600 feet from the South line and 1700 feet from the East line of Section 11 of the same township. The S/2 of said Section 11 to be dedicated to the well.

CASE 7345: (Continued from September 9, 1981, Examiner Hearing)

Application of Bass Enterprises Production Company for compulsory pooling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Lovington Penn Pool underlying the N/2 NE/4 of Section 13, Township 16 South, Range 36 East, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.

CASE 7360: Application of L. J. Buck for salt water disposal, Lea County, New Mexico. Applicant, in the above-styled cause seeks authority to dispose of produced salt water into the Seven Rivers formation in the interval from 3221 feet to 3250 feet in his Monco Well No. 2 in Unit M of Section 25, Township 25 South, Range 36 East.

CASE 7352: (Continued from September 9, 1981 Examiner Hearing)

Application of Yates Petroleum Corporation for designation of a tight formation, Eddy County, New Mexico. Applicant, in the above-styled cause, pursuant to Section 107 of the Natural Gas Policy Act 18-CFR Section 271.701-705, seeks the designation as a tight formation of the Permo-Penn and formation underlying all of the following townships:

Township 17 South, Ranges 24 thru 26 East;

18 South, 24 and 25 East;

19 South, 23 thru 25 East;

20 South, 21 thru 24 East;

20½ South, 21 and 22 East;

21 South, 21 and 22 East;

Also Sections 1 thru 12 in 22 South, 21 and 22 East,

All of the above containing a total of 315,000 acres more or less.

CASE 7329: (Readvertised)

Application of Loco Hills Water Disposal Company for an exception to Order No. R-3221, Eddy County, New Mexico

Applicant, in the above-styled cause, seeks an exception to Order No. R-3221 to permit the commercial disposal of produced brine into several unlined surface pits located in the N/2 SW/4 SW/4 of Section 16, Township 17 South, Range 30 East.

Dockets Nos. 31-81 and 32-81 are tentatively set for October 7, and October 21, 1981. Applications for hearing must be filed at least 22 days in advance of hearing date.

DOCKET: COMMISSION HEARING - TUESDAY - SEPTEMBER 29, 1981

9 A.M. - OIL CONSERVATION DIVISION - MORGAN HALL
STATE LAND OFFICE BUILDING, SANTA FE, NEW MEXICO

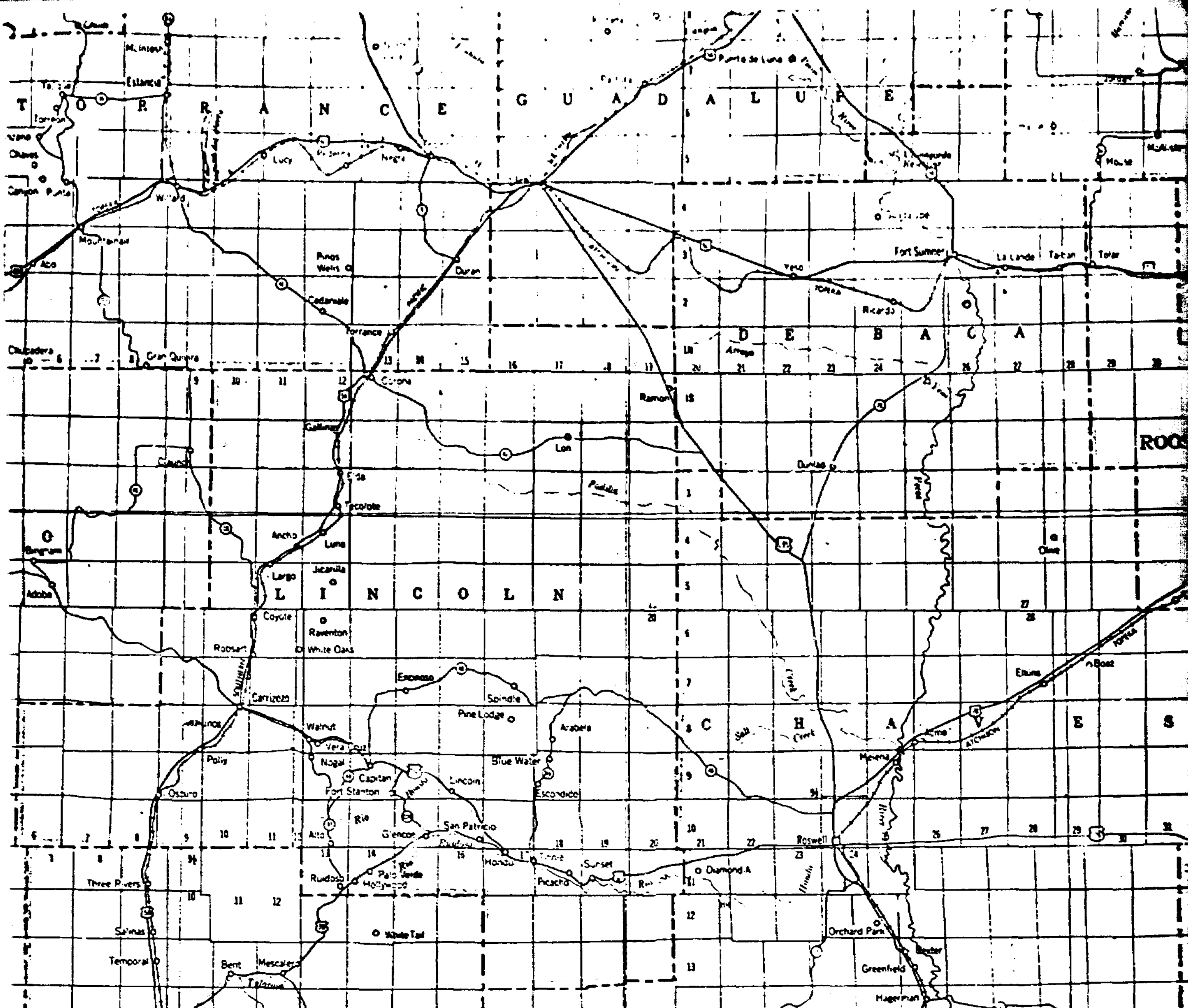
CASE 7116: (DE NOVO)

Application of Southland Royalty Company for designation of a tight formation, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks the designation of the Dakota formation underlying portions of Township 31 and 32 North, Ranges 10, 11, 12, and 13 west, containing 93,860 acres, more or less, as a tight formation pursuant to Section 107 of the Natural Gas Policy Act and 18 CFR Section 271.701-705.

Upon application of Consolidated Oil & Gas, Inc., this case will be heard De Novo pursuant to the provisions of Rule 1220.

CASE 7361: Application of Southland Royalty Company for designation of a tight formation, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks the designation of the Dakota formation underlying all or portions of Township 31 North, Ranges 10 and 11 West, and Township 32 North, Ranges 10, 11, 12, and 13 West, containing 92,871 acres more or less, as a tight formation pursuant to Section 107 of the Natural Gas Policy Act and 18 CFR Section 271. 701-705.

CASE 7362: Application of R. A. Mendenhall Associates, Ltd., for compulsory pooling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Delaware Mountain Group formation underlying the NW/4 SE/4 of Section 10, Township 22 South, Range 27 East, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision, designation of applicant as operator of the well, and a charge for risk involved in drilling said well.



TORRANCE
GUADALUPE
DE BACA
LINCOLN
CHAVES
OTERO
EDDY
Estancia
Willard
Mountainair
Abo
Lucy
Negra
Duran
Torrance
Cedarvale
Pinos Wells
Gran Quivira
Claunch
Corona
Gallinas
Tecolote
Ancho
Luna
Jicarilla
Largo
Coyote
Raventon
White Oaks
Robsart
Bingham
Adobe
Carrizozo
Walnut
Vera Cruz
Nogal
Capitan
Fort Stanton
Lincoln
Blue Water
Escondido
Arabela
Spindle
Pine Lodge
Encinoso
Lon
Ramon
Dunlap
Puerto de Luna
Fort Sumner
Yeso
Ricardo
La Lande
Taiban
Tolar
Olive
Elkins
Boaz
Acme
Roswell
Diamond A
Orchard Park
Dexter
Greenfield
Hagerman
Lake Arthur
Espuela
Artesia
Hope
Loco Hills
Carlsbad
Polly
Oscuro
Three Rivers
Salinas
Temporal
Bent
Mescalero
Tularosa
Alto
Ruidoso
Hollywood
Glencoe
San Patricio
Hondo
Tinnie
Picacho
Sunset
White Tail
Flying H
La Luz
Mountain Park
Cloudcroft
Mayhill
Elk
Russia
Marcia
Sacramento
Weed
Duncan
Alamogordo
White Sands
Valmont
Escondida
Orogrande
Desert

WELL NAME: La Cama #1

LOCATION: 20-18S-25E

DST INTERVAL: 6812-7000

$p^* = 2418$ psi slope (M) = 392 psi/cycle

$T_c = 374°R$ $P_c = 677$ psi

$T = 128 + 460° = 588°R$ $P_{wf} = 551$ psi

$$P_{avg} = \frac{P^* + P_{wf}}{2} = \frac{2418 + 551}{2} = 1484.5 \text{ psi (Note 1)}$$

$$T_r = \frac{T}{T_c} = \frac{588}{374} = 1.57$$

$$P_r = \frac{P_{avg}}{P_c} = \frac{1484.5}{667} = 2.23$$

$Z = 0.84$ $T_{sc} = 520°R$ $P_{sc} = 13.3$ psi

$$B_g = Z \cdot \frac{T}{T_{sc}} \cdot \frac{P_{sc}}{P_{avg}} = 0.84 \cdot \frac{588}{520} \cdot \frac{13.3}{1484.5} = 0.0085 \text{ (Note 1)}$$

$q = 390$ mcfd $\cdot$ 178.1 = 69459 b/d (Note 2)

$u = (1.26)\ (0.0112) = 0.0141$ cp (Note 3)

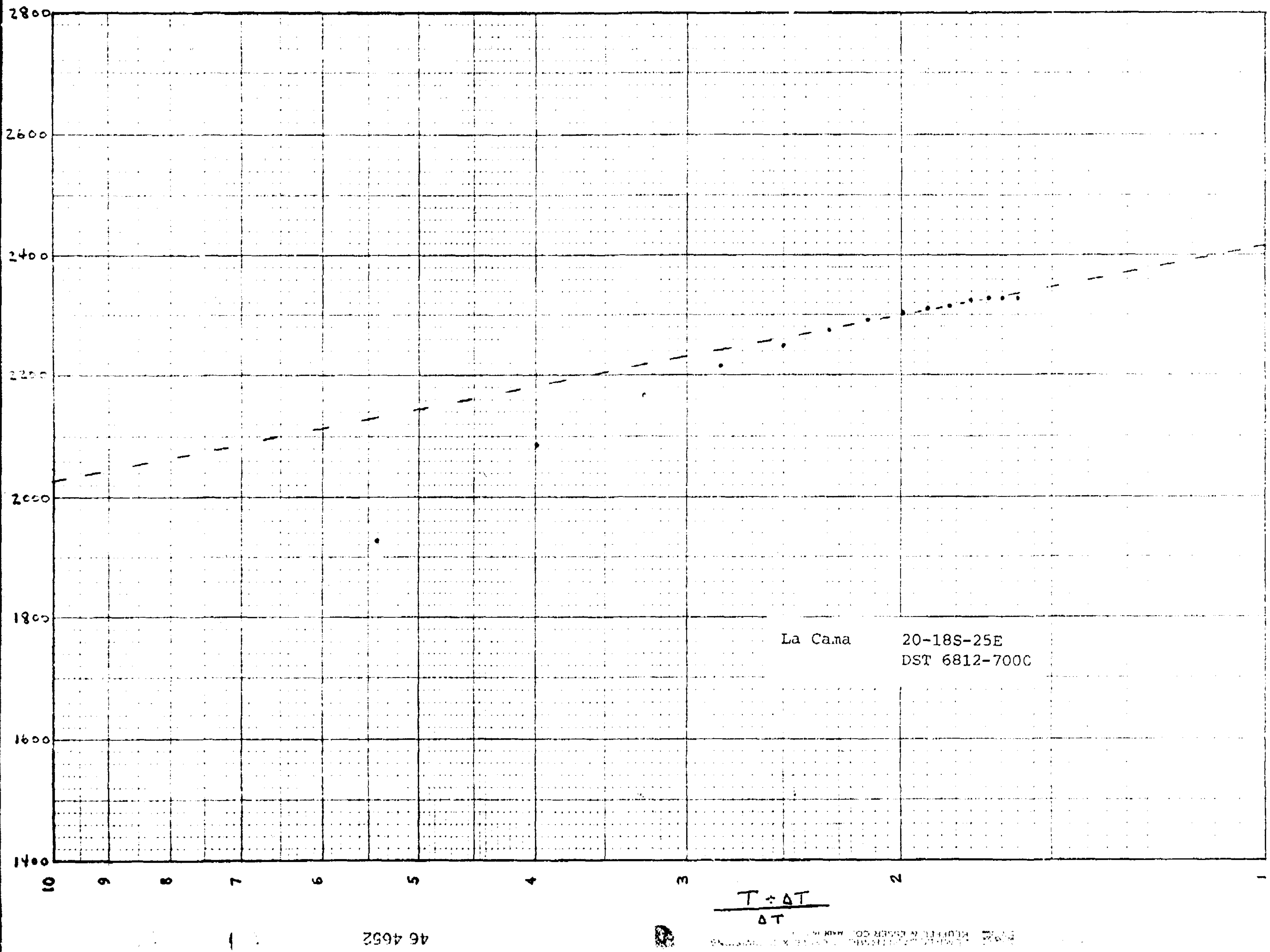
$$kh = \frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6\ (69459)\ (0.0141)\ (0.0085)}{392}$$

$kh = 345$ md $\cdot$ ft

$h = 38$ ft (Note 4)

$k = 0.091$ md

1) C.S. Matthews - D.G. Russell eqn. 3.21a
2) Flow rate is natural flow rate as reported on Drilling Report. Flow during DST was actually less.
3) C.S. Matthews - D.G. Russell Fig. G.3A&B
4) h estimated from Log



2800
2600
2400
2200
2000
1800
1600
1400
10
9
8
7
6
5
4
3
2
1
La Cama
20-18S-25E
DST 6812-7000
T + ΔT
ΔT
46 4652

FLUID SAMPLE DATA		Date 10-9-77	Ticket Number 139167
Sampler Pressure ____ P.S.I.G. at Surface		Kind of Job OPEN HOLE TEST	Halliburton District ARTESIA
Recovery: Cu. Ft. Gas		Tester RAINES	Witness J. MC DONALD
cc. Oil		Drilling Contractor MORAN BROTHERS DRILLING COMPANY PW	
cc. Water			
cc. Mud			
Tot. Liquid cc			

EQUIPMENT & HOLE DATA

Formation Tested	Cisco
Elevation	3578' Ft.
Net Productive Interval	16' Ft.
All Depths Measured From	Kelly Bushing- AGL 3593'
Total Depth	7000' Ft.
Main Hole/Casing Size	7 7/8"
Drill Collar Length	379' ? I.D. 2.250"
Drill Pipe Length	6448' I.D. 3.340"
Packer Depth(s)	6800'- 6806' - 6812' Ft.
Depth Tester Valve	6775' Ft.

Gravity ____ ° API @ ____ °F.

Gas/Oil Ratio ____ cu. ft./bbl.

	RESISTIVITY		CHLORIDE CONTENT
Recovery Water	@	°F.	ppm
Recovery Mud	@	°F	ppm
Recovery Mud Filtrate	@	°F.	ppm
Mud Pit Sample	@	°F.	ppm
Mud Pit Sample Filtrate	@	°F.	ppm

Mud Weight 9.3 vis ____ sec

Cushion TYPE ____ AMOUNT ____ Ft. Depth Back Pres. Valve ____ Surface Choke 3/8" Bottom Choke .75"

Recovered 1383 Feet of drilling mud - 500' of water.

Recovered ____ Feet of

Recovered ____ Feet of

Recovered ____ Feet of

Recovered ____ Feet of

Meas. From Tester Valve

Remarks

SEE PRODUCTION TEST DATA SHEET.....

TEMPERATURE	Gauge No. 1114 Depth: 6784 Ft.		Gauge No. 1113 Depth: 6844 Ft.		Gauge No. Depth: Ft.		TIME	
Est. °F.	24 Hour Clock Blanked Off No		24 Hour Clock Blanked Off no		Hour Clock Blanked Off		Tool Opened 1315 A.M. P.M.	
Actual 127 °F.	Pressures		Pressures		Pressures		Opened Bypass 2330 A.M. P.M.	
	Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic	3461	3286	3320	3299				
First Period Flow Initial	249	269	282	366			—	—
First Period Flow Final	392	400	405	405			45	45
First Period Closed in	2178	2157	2149	2149			90	90
Second Period Flow Initial	392	555	370	594			—	—
Second Period Flow Final	551	551	563	549			180	179
Second Period Closed in	2320	2327	2324	2327			300	301
Third Period Flow Initial							—	—
Third Period Flow Final								
Third Period Closed in								
Final Hydrostatic	3264	3273	3285	3288			—	—

Legal Location Sec. - Twp. - Rng. 20 - 18 - 25

Field Area DINKUS RANCH

County EDDY

State NEW MEXICO

Well No. 1

Test No.

Tested Interval 6812' - 7000'

Lease Owner/Company Name

FORMATION TEST DATA

FORM 181-R2—PRINTED IN U.S.A. LITTLE'S 102548 5M 8/76

11

Gauge No. 1114 | Depth 6784' | Clock No. 4365 | 24 hour | Ticket No. 139167

	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.
0	.000	269	.000		400	.000	555	.000		551					
1	.0164*	254	.0298		1048	.0969**	415	.0692***		1585					
2	.0428	295	.0596		1433	.197[illegible]	448	.1351		1926					
3	.0691	317	.0894		1658	.2973	488	.2010		2086					
4	.0954	349	.1192		1809	.3975	514	.2669		2164					
5	.1217	377	.1490		1913	.4978	535	.3329		2217					
6	.1480	400	.1788		1989	.5980	551	.3988		2251					
7			.2086		2046			.4646		2276					
8			.2384		2091			.5306		2292					
9			.2682		2128			.5965		2304					
10			.2980		2157			.6624		2313					
11								.7283		2318					
12								.7942		2324					
13								.8601		2326					
14								.9260		2327					
15								.9920		2327					

Gauge No. 1113 | Depth 6844' | Clock No. 13433 | 24 hour

	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
0	.000	366	.000		405	.000	594	.000		549					
1	.0167*	271	.0300		1044	.0964**	415	.0698***		1552					
2	.0433	305	.0600		1422	.1961	449	.1362		1908					
3	.0700	322	.0900		1646	.2958	484	.2027		2066					
4	.0967	352	.1200		1796	.3956	512	.2691		2156					
5	.1234	379	.1500		1901	.4953	533	.3356		2210					
6	.1500	405	.1800		1977	.5950	549	.4020		2247					
7			.2100		2038			.4685		2271					
8			.2400		2084			.5349		2288					
9			.2700		2121			.6014		2301					
10			.3000		2149			.6678		2311					
11								.7343		2316					
12								.8007		2320					
13								.8672		2323					
14								.9336		2325					
15								1.0000		2327					
Reading Interval	8		9			30		20							Minutes

REMARKS: * = 5 minute interval. ** = 29 minute interval. *** = 21 minute interval.

SPECIAL PRESSURE DATA

Casing perfs.	Bottom choke .75"	Surf. temp. °F	Ticket No. 139167
Gas gravity	Oil gravity	GOR	
Spec. gravity	Chlorides ppm	Res. @ °F	

INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED

Date Time a.m. p.m.	Choke Size	Surface Pressure psi	Gas Rate MCF	Liquid Rate BPD	Remarks
1315	3/8"	1#			Opened tool with a good blow.
1320	"	5			Good blow.
1325	"	15			Good blow - no gas.
1330	"	20			"
1335	"	23	129.20		Gas to the surface in 20 minutes.
1340	"	24	132.60		Flared gas.
1345	"	24	132.60		"
1350	"	"	"		"
1355	"	23	129.20		"
1400	"	"	"		" Closed tool.
1530	"	2			Reopened tool with a good blow.
1535	"	28	146		Gas to flare in 3 minutes.
1545	"	43	197		Gas flare.
1600	"	34	166		"
1615	"	25	136		"
1630	"	20	119		"
1645	"	17	108		"
1700	"	18	112		"
1730	"	23	129		"
1800	"	24	132		Slight increase.
1830	"	25	136		Closed tool.
2330					Opened bypass - pulled loose.

FORM 182-R1—PRINTED IN U.S.A.

PRODUCTION TEST DATA

LITTLE'S 35872 5M 8/74

NEUTRON
FORMATION DENSITY

COUNTY	EDDY
FIELD	DINKUS RANCH
LOCATION	
WELL	LA CAMA # 1
COMPANY	MORRIS R. ANTWEIL

COMPANY MORRIS R. ANTWEIL

WELL LA CAMA # 1

FIELD DINKUS RANCH

COUNTY EDDY STATE NEW MEXICO

LOCATION 1980' FNL & 1980' FWL

SEC.	TWP	RANGE
20	18-S	25-E

Other Services: DLL

Permanent Datum: G.L. Elev.: 3578
Log Measured From K.B. 15 Ft. Above Perm. Datum
Drilling Measured From K.B.

Elev.: K.B. 3593
D.F. 3592
G.L. 3578

Date	10-5-77			
Run No.	ONE			
Depth Driller	8750			
Depth Logger	8742			
Btm. Log Interval	8741			
Top Log Interval	SURFACE			
Casing Driller	8 5/8 @ 1200	@	@	@
Casing Logger	1203			
Bit Size	7 7/8			
Type Fluid in Hole	BRINE-GEL			
Dens. / Visc.	9.3 / 60			
pH / Fluid Loss	10 / 6 ml	ml	ml	ml
Source of Sample	PIT			
Rm @ Meas. Temp.	.11 @ 86 °F	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	.082 @ 86 °F	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	.16 @ 86 °F	@ °F	@ °F	@ °F
Source: Rmf / Rmc	M / C			
Rm @ BHT	.066 @ 148 °F	@ °F	@ °F	@ °F
TIME Circulation Stopped	0630			
TIME Logger on Bottom	1230			
Max. Rec. Temp.	148 °F	°F	°F	°F
Equip. / Location	7732 / HOBBS			

FOLD HERE

The well name, location and borehole reference data were furnished by the customer.

CALIPER DIAM. IN INCHES 16

GAMMA RAY API UNITS 100

0 200

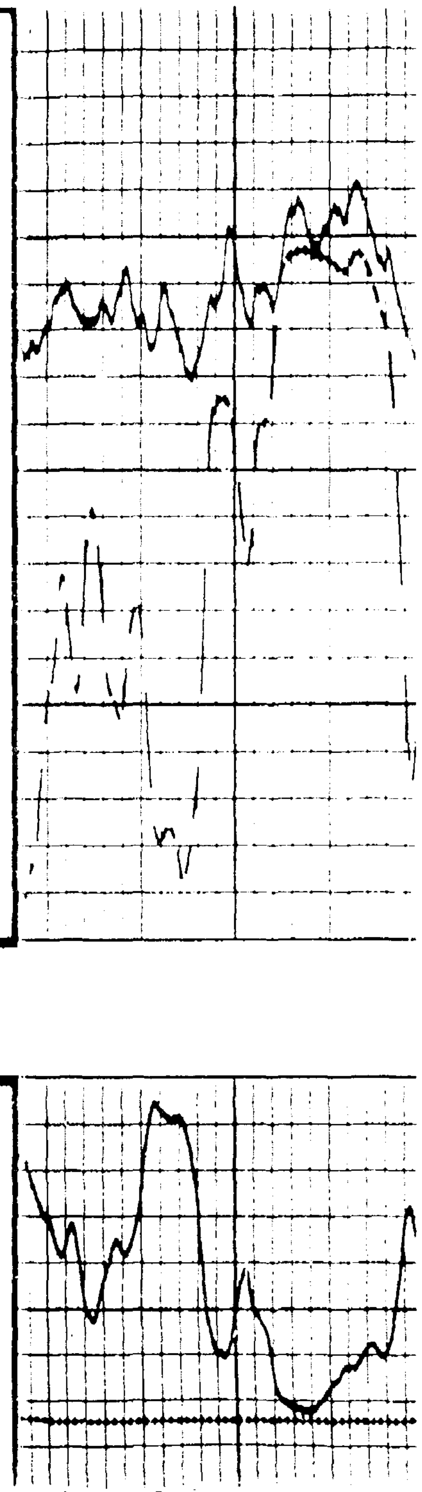
POROSITY INDEX (%) LIME MATRIX

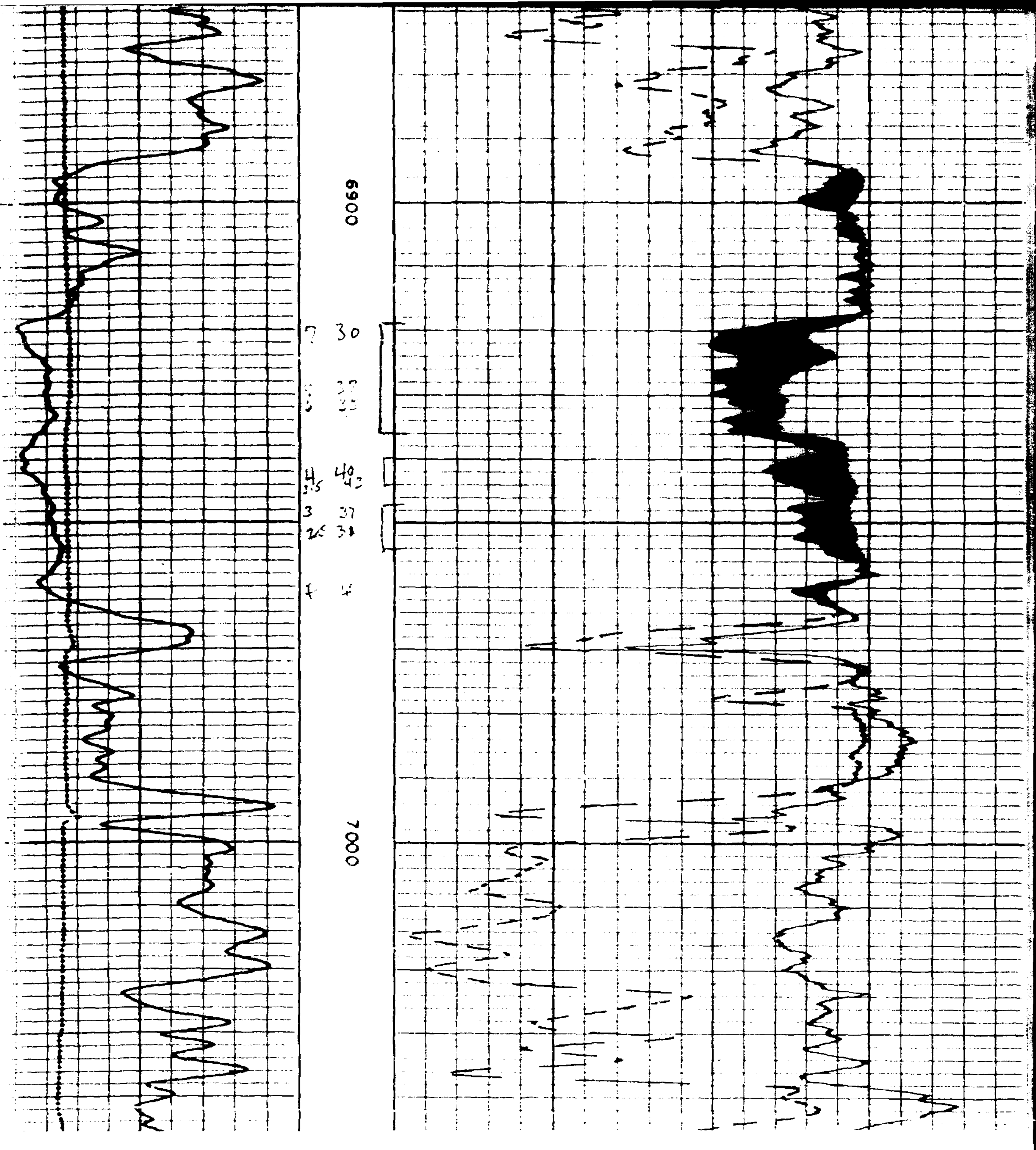
COMPENSATED FORMATION DENSITY POROSITY

30 20 10 0 -10

COMPENSATED NEUTRON POROSITY

30 20 10 0 -10




6900
7000

EL PASO NATURAL GAS COMPANY

RPT-ASL 314 CHROMATOGRAPHIC GAS ANALYSIS REPORT

RPT DATE 02 03 81 METER STA 61894
ANAL DATE 01 29 81 METER STATION NAME OPER 9841
LA CAMA COM #1

TYPE CODE	SAMPLE DATE	EFF. DATE	USE MOS.	SCALE	H2S GRAINS	LOCATION
00	01 21 81	02 03 81	06		0000*	1 J 16

	NORMAL MOL%	GPM
C O 2	00.00	0.000
H 2 S	00.00*	0.000
N2	01.74	0.000
METHANE	83.51	0.000
ETHANE	08.93	2.387
PROPANE	03.21	0.883
ISO-BUTANE	00.36	0.118
NORM-BUTANE	01.14	0.359
ISO-PENTANE	00.34	0.124
NORM-PENTANE	00.35	0.127
HEXANE PLUS	00.42	0.183
TOTALS	100.00	4.181

SPECIFIC GRAVITY 0.684

MIXTURE HEATING VALUE
(BTU/CF @ 14.73 PSIA,60 DEGREES,DRY) 1187

RATIO OF SPECIFIC HEATS 1.287

* NO TEST SECURED FOR DETERMINATION H2S CONTENT.

WELL NAME: Box Canyon #4A

LOCATION: 23-21S-21E

DST INTERVAL: 5876-6051

$P^* = 1904$ psi   slope (M) = 92 psi/cycle

$T_c = 365\ ^\circ R$ $P_c = 670$ psi

$T = 130 + 460^\circ = 590^\circ R$ $P_{wf} = 1592$ psi

$$P_{avg} = \frac{P^* + P_{wf}}{2} = \frac{1904 + 1592}{2} = 1748 \text{ psi} \quad \text{(Note 1)}$$

$$T_r = \frac{T}{T_c} = \frac{590}{365} = 1.62$$

$$P_r = \frac{P_{avg}}{P_c} = \frac{1748}{670} = 2.61$$

$Z = 0.84$ $T_{sc} = 520^\circ R$ $P_{sc} = 13.3$ psi

$$B_g = Z \cdot \frac{T}{T_{sc}} \cdot \frac{P_{sc}}{P_{avg}} = 0.84 \cdot \frac{590}{520} \cdot \frac{13.3}{1748} = 0.0073 \quad \text{(Note 1)}$$

$q = 25$ mcfd $\cdot$ 178.1 = 4452.50 b/d

$u = (0.0114)\ (1.3) = 0.0148$ cp (Note 2)

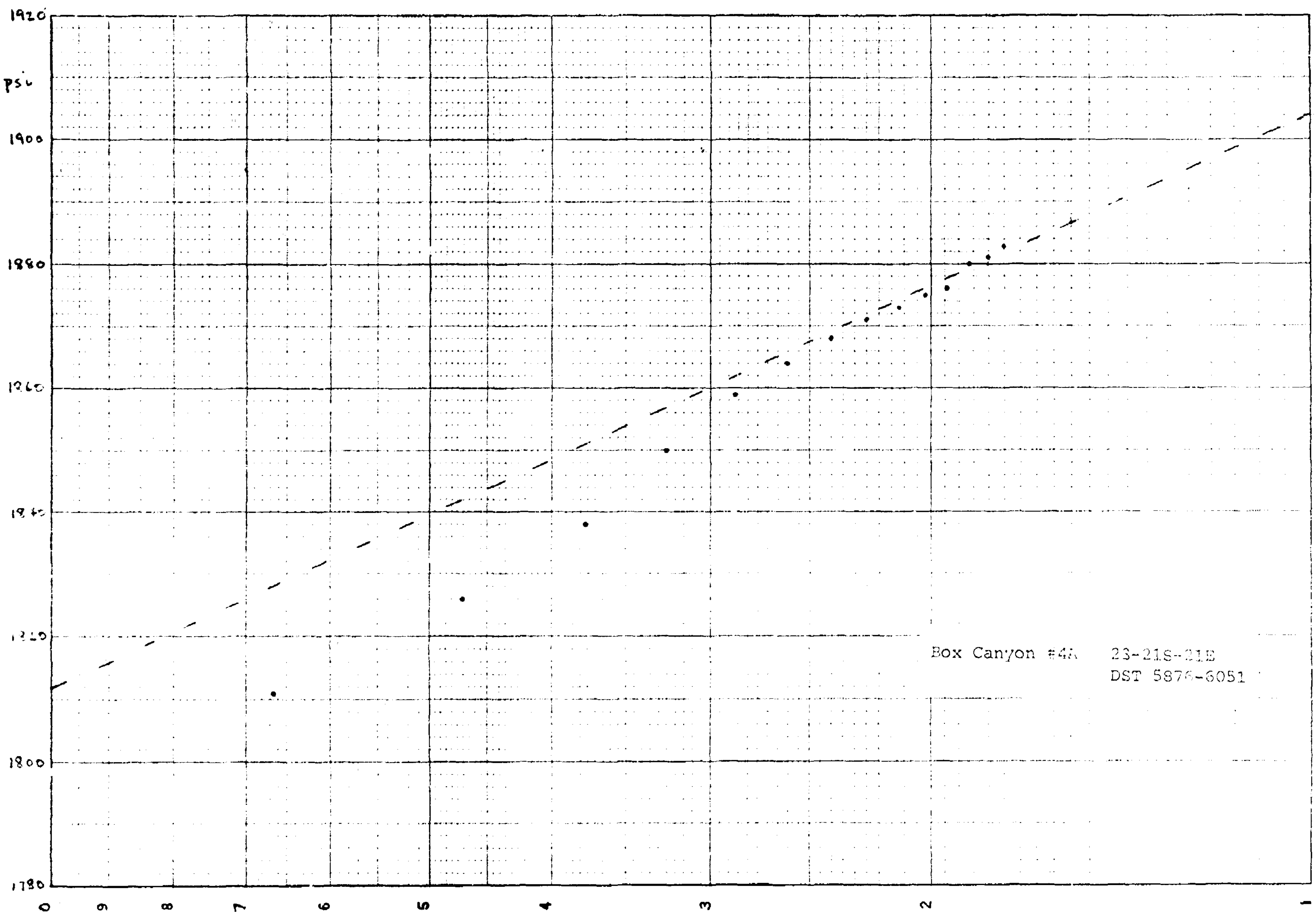
$$kh = \frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6\ (\ 4452.5\ )\ (\ 0.0148\ )\ (\ 0.0073)}{92}$$

$kh = 0.8502$ md $\cdot$ ft

$h = 40$ ft (Note 3)

$k = 0.021$ md

1) C.S. Matthews - D.G. Russell eqn 3.21a
2) C.S. Matthews - D.G. Russell Fig. G.3A&B
3) h estimated from log



K&E SEMI-LOGARITHMIC 1 CYCLE X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 4652

EL PASO NATURAL GAS COMPANY

RPT-AGE [illegible] CHROMATOGRAPHIC GAS ANALYSIS REPORT

RPT DATE 07 27 79 — METER STA 61929

ANAL DATE [illegible] 79 — METER STATION NAME — OPER 9641

[illegible] CANYON [illegible]

TYPE CODE	SAMPLE DATE	EFF. DATE	USE ADJ.	SCALE	H2S GRAINS	LOCATION
00	07 10 79	07 [illegible] 79	00		0000*	1 J 13

	NORMAL MOLES	GPM
C O 2	00.00	0.000
H 2 S	00.00*	0.000
N2	01.09	0.000
METHANE	90.35	0.000
ETHANE	05.34	1.427
PROPANE	01.83	0.503
ISO-BUTANE	00.33	0.106
NORM-BUTANE	00.51	0.161
ISO-PENTANE	00.17	0.062
NORM-PENTANE	00.14	0.051
HEXANE PLUS	00.24	0.105
TOTALS	100.00	2.41[illegible]

SPECIFIC GRAVITY 0.62[illegible]

MIXTURE HEATING VALUE
(BTU/CF @ 14.7[illegible] PSIA, [illegible] DEGREES, DRY) 1111

RATIO OF SPECIFIC HEATS 1.299
* NO TEST [illegible] FOR DETERMINATION H2S CONTENT.

FLUID SAMPLE DATA

Sampler Pressure 1850 P.S.I.G. at Surface
Recovery: Cu. Ft. Gas 3.2
cc. Oil
cc. Water 1800
cc. Mud
Tot. Liquid cc 1800
Gravity ° API @ °F.
Gas/Oil Ratio cu. ft./bbl.

	RESISTIVITY		CHLORIDE CONTENT
Recovery Water	@	°F.	ppm
Recovery Mud	@	°F.	ppm
Recovery Mud Filtrate	@	°F.	ppm
Mud Pit Sample	@	°F.	25,000 ppm
Mud Pit Sample Filtrate	@	°F.	ppm

Mud Weight 9 vis 42 sec

Date 2-4-78 Ticket Number 253334
Kind of Job STRADDLE OPEN HOLE Halliburton District ARTESIA
Tester PITTMAN LAMAR Witness JONAS
Drilling Contractor MORANCO RIG # 5 DR

EQUIPMENT & HOLE DATA

Formation Tested Upper Canyon
Elevation 4592' Ft.
Net Productive Interval 32 Ft.
All Depths Measured From Kelly Drive Bushing (13')
Total Depth 8400' Ft.
Main Hole/Casing Size 7 7/8"
Drill Collar Length 430' I.D. 2.25"
Drill Pipe Length 5404' I.D. 3.826"
Packer Depth(s) 5870-5876-6051-6057' Ft.
Depth Tester Valve 5863' Ft.

Lease Location Sec. - Twp. - Rng. 23-21-21
Field Area WILDCAT
County EDDY
State NEW MEXICO

Cushion TYPE AMOUNT Depth Back Pres. Valve Ft. Surface Choke 1" Adj. Bottom Choke .75"

Recovered Approximately 200 Feet of drilling mud
Recovered Approximately 2000 Feet of formation fluid
Recovered Feet of
Recovered Feet of
Recovered Feet of
Meo. From Tester Valve

Remarks SEE PRODUCTION TEST DATA SHEET

TEMPERATURE	Gauge No. 512 Depth: 5964 Ft.		Gauge No. 113 Depth 5905 Ft.		Gauge No. Depth: Ft.		TIME	
Calc. Est. 130 °F.	24 Hour Clock Blanked Off No		24 Hour Clock Blanked Off Yes		Hour Clock Blanked Off		Tool Opened 1000 A.M./P.M. Opened 1530 Bypass A.M./P.M.	
Actual °F.	Pressures		Pressures		Pressures			
	Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic	2836	2817	2857	2846				
First Period Flow Initial	355	446	398	575			—	—
First Period Flow Final	801	781	519	811			30	30
First Period Closed in	1895	1896	1904	1909			90	90
Second Period Flow Initial	749	733	767	759			—	—
Second Period Flow Final	1591	1592	1626	1622			90	90
Second Period Closed in	1895	1883	1904	1893			120	120
Third Period Flow Initial							—	—
Third Period Flow Final								
Third Period Closed in								
Final Hydrostatic	2809	2800	2830	2829			—	—

FORM ... PRINTED IN U.S.A.   FORMATION TEST DATA   ... /3

Gauge No. 512			Depth 5864'					Clock No. 13736			24 hour		Ticket No. 253334		
	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$\text{Log}\,\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$\text{Log}\,\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$\text{Log}\,\frac{t+\theta}{\theta}$	PSIG Temp. Corr.
0	.000	446	.000		781	.000	733	.000		1592					
1	.0167	396	.0201		1745	.0503	797	.0269		1788					
2	.0333	485	.0403		1805	.1007	1158	.0537		1811					
3	.0500	526	.0604		1832	.1510	1318	.0806		1826					
4	.0667	628	.0805		1850	.2013	1435	.1075		1838					
5	.0834	720	.1007		1860	.2517	1525	.1344		1850					
6	.1000	781	.1208		1864	.3020	1592	.1612		1859					
7			.1409		1868			.1881		1864					
8			.1610		1868			.2150		1868					
9			.1812		1869			.2418		1871					
10			.2013		1873			.2687		1873					
11			.2214		1877			.2956		1875					
12			.2416		1884			.3224		1876					
13			.2617		1888			.3493		1880					
14			.2818		1892			.3762		1881					
15			.3020		1896			.4030		1883					

Gauge No. 113					Depth 5905'			Clock No. 13528			hour 24				
0	.000	575	.000		811	.000	759	.000		1622					
1	.0172	422	.0203		1765	.050	996	.0272		1804					
2	.0343	519	.0405		1816	.100	1180	.0544		1827					
3	.0515	549	.0608		1848	.150	1334	.0816		1841					
4	.0687	656	.0811		1865	.200	1455	.1088		1855					
5	.0859	739	.1014		1874	.250	1549	.1360		1862					
6	.1030	811	.1216		1880	.300	1622	.1632		1872					
7			.1419		1882			.1904		1878					
8			.1622		1884			.2176		1881					
9			.1824		1885			.2448		1884					
10			.2027		1889			.2720		1885					
11			.2230		1893			.2992		1886					
12			.2432		1898			.3264		1889					
13			.2635		1902			.3536		1890					
14			.2838		1906			.3808		1892					
15			.3040		1909			.4080		1893					
Reading Interval		5		6			15		8						Minutes

REMARKS:

3

Casing perfs. ______ Bottom choke .75" Surf. temp ______ °F Ticket No. 253334

Gas gravity ______ Oil gravity ______ GOR ______

Spec. gravity ______ Chlorides ______ ppm Res. ______ @ ______ °F

INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED 1/4 x 60 PSI gauge

Date Time a.m. p.m.	Choke Size	Surface Pressure psi	Gas Rate MCF	Liquid Rate BPD	Remarks
1000		1 1/2#			Opened tool with a good blow
1005	1/4"	35	73.50		Opened on 1/4" choke
1010	"	53	99.96		Gas to surface
1015	"	55	102.90		
1020	"	57	105.84		Started losing pressure
1025	"	52	98.49		-
1030	"	43	85.26		Closed tool
1200	"	0	-		Opened tool
1205	"	0	-		
1210	"	0	-		
1215	"	0	-		
1230	"	2	24.99		Pressure climbing
1245	"	5	29.40		
1200	"	2	24.99		
1215	"	2	24.99		
1330	"	2	24.99		Closed tool
1530					Pulled loose and started out of hole.
1600					Pulled 7 stands and reversed out.
					NOTE: Attemped to straddle section at
					6304'-6490', could not hook, came up
					and straddled section at 5876'-6051'.
					Got hook to set and went on with test.

FORM 132-R1—PRINTED IN U.S.A.

PRODUCTION TEST DATA

LITTLE'S 36612 5M 8/74

Schlumberger

COMPENSATED NEUTRON-FORMATION DENSITY

COMPANY Yates Petroleum Company

WELL Box Canyon 9 "QA" #2

FIELD Box Canyon

COUNTY Eddy STATE New Mexico

LOCATION 660 FNL + 1950 FEL

Other Services: DLL Rxo

API SERIAL NO.	SEC.	TWP.	RANGE
	23	21S	21E

Permanent Datum: GL ; Elev.: 4592
Log Measured From KB , 13 Ft. Above Perm. Datum
Drilling Measured From KB

Elev.: K.B. 4605
D.F.
G.L. 4592

Date	2-2-78			
Run No.	ONE			
Depth - Driller	8400			
Depth - Logger	8401			
Btm. Log Interval	8400			
Top Log Interval	Surface			
Casing - Driller	8 5/8 @ ~~1486~~ 1498	@	@	@
Casing - Logger	1492			
Bit Size	7 7/8			
Type Fluid in Hole	Salt Mud			
Dens. | Visc.	8.8 | 42			
pH | Fluid Loss	8.5 | 8.0 ml	ml	ml	ml
Source of Sample	Pit			
Rm @ Meas. Temp.	.232 @ 62 °F	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	.186 @ 62 °F	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	— @ — °F	@ °F	@ °F	@ °F
Source: Rmf | Rmc	M | —			
Rm @ BHT	.114 @ 126 °F	@ °F	@ °F	@ °F
TIME Circulation Stopped	1745 (2-2)			
TIME Logger on Bottom	5:50 (2-3)			
Max. Rec. Temp.	126 °F	°F	°F	°F
Equip. | Location	2620 | Hobbs			

The well name, location and borehole reference data were furnished by the customer.

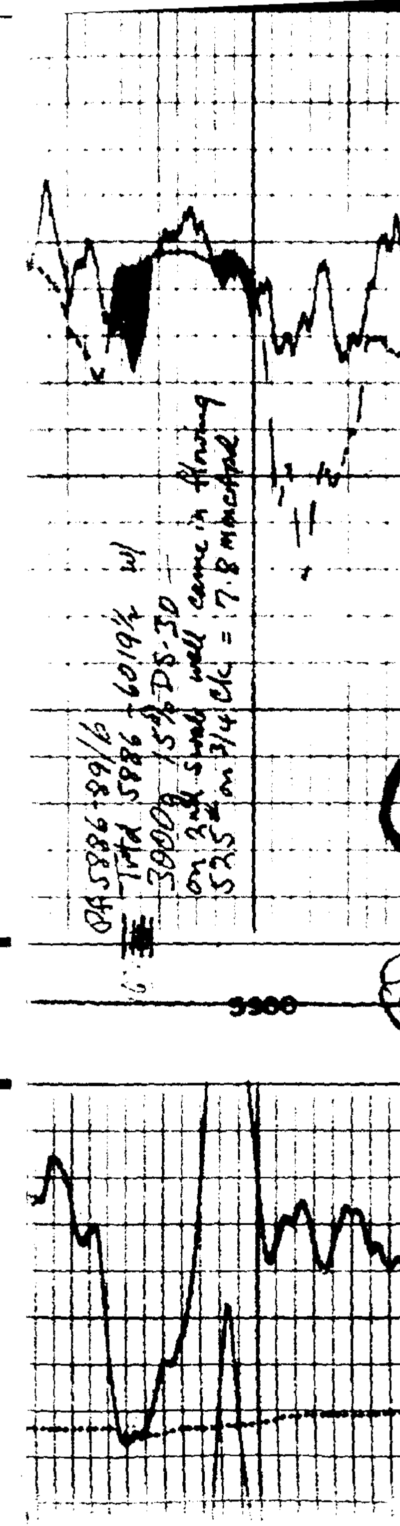
POROSITY INDEX % Limestone MATRIX
COMPENSATED FORMATION DENSITY POROSITY

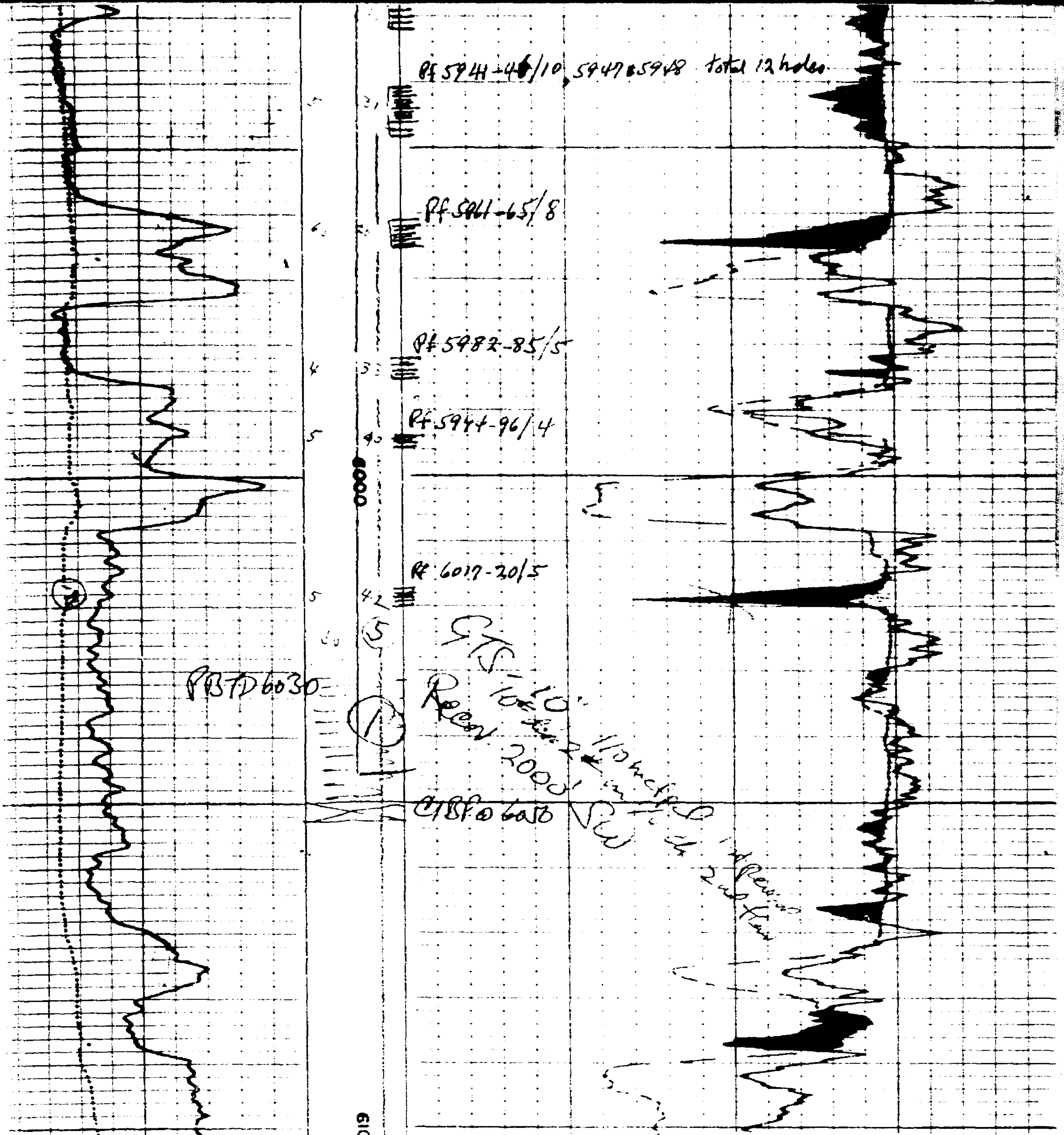
COMPENSATED NEUTRON POROSITY

DEPTH

CALIPER DIAM. IN INCHES

GAMMA RAY API UNITS





Pf 5941-46/10, 5947 & 5948 total 12 holes
Pf 5961-65/8
Pf 5982-85/5
Pf 5994-96/4
6000
Pf 6017-20/5
PBTD 6030
Recov 2000' SW
CIBP @ 6050
6100

WELL NAME: Cities JG State #1

LOCATION: 13-18S-24E

DST INTERVAL: 6544-6865

$P^* = 2312$ psi slope (M) = 260 psi/cycle

$Tc = 377\ ^\circ R$ Pc = 669 psi

$T = 122 + 460^\circ = 582\ ^\circ R$ Pwf = 116 psi

$$Pavg = \frac{P^* + Pwf}{2} = \frac{2312 + 116}{2} = 1214 \text{ psi} \quad \text{(Note 1)}$$

$$Tr = \frac{T}{Tc} = \frac{582}{377} = 1.54$$

$$Pr = \frac{Pavg}{Pc} = \frac{1214}{669} = 1.81$$

$Z \doteq 0.885$ Tsc = 520°R Psc = 13.3 psi

$$Bg = Z \cdot \frac{T}{Tsc} \cdot \frac{Psc}{Pavg} = 0.885 \cdot \frac{582}{520} \cdot \frac{13.3}{1214} = 0.0109 \quad \text{(Note 1)}$$

$q = 189$ mcfd $\cdot$ 178.1 = 33660.9 b/d

$u = (1.2)\ (0.0114) = 0.0137$ cp (Note 2)

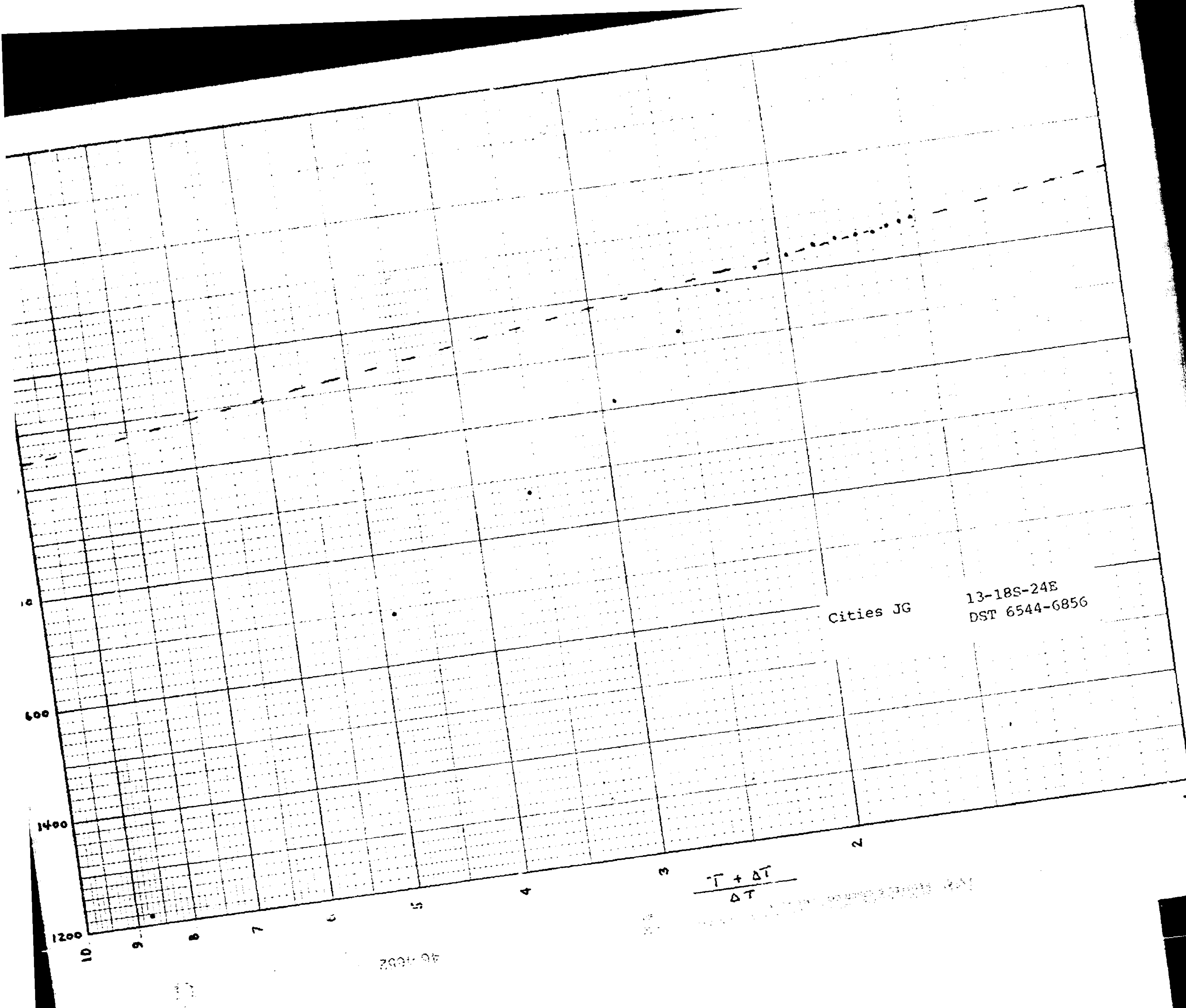
$$kh = \frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6\ (33660.9)\ (0.0137)\ (0.0109)}{260}$$

$kh = 3.144$ md $\cdot$ ft

$h = 45$ ft (Note 3)

$k = 0.69$ md

1) C.S. Matthews - D.G. Russell eqn. 3.21a
2) C.S. Matthews - D.G Russell Fig. G.3A&B
3) h estimated from Log


Cities JG
13-18S-24E
DST 6544-6856
T + ΔT / ΔT
1200
1400
10
9
8
7
6
5
4
3
2

FLUID SAMPLE DATA

Sampler Pressure 85 P.S.I.G. at Surface
Recovery: Cu. Ft. Gas .107
cc. Oil
cc. Water
cc. Mud 500
Tot. Liquid cc
Gravity ° API @ °F
Gas/Oil Ratio cu. ft./bbl.

	RESISTIVITY		CHLORIDE CONTENT
Recovery Water	@	°F.	ppm
Recovery Mud	@	°F.	ppm
Recovery Mud Filtrate	@	°F.	ppm
Mud Pit Sample	@	°F.	ppm
Mud Pit Sample Filtrate	@	°F.	ppm

Mud Weight 8.6 vis 28 sec

Date 11-14-78 Ticket Number 520451
Kind of Job OPEN HOLE Halliburton District ARTESIA
Tester RICHARD PEPPERS Witness J. JONAS
Drilling Contractor LANDIS DRILLING # 4 DR

EQUIPMENT & HOLE DATA

Formation Tested Lower Cisco
Elevation 3651' Ft.
Net Productive Interval 20' Ft.
All Depths Measured From Kelly Bushing
Total Depth 6856' Ft.
Main Hole/Casing Size 7 7/8"
Drill Collar Length 352' I.D. 1.25"
Drill Pipe Length 6156' I.D. 3.826"
Packer Depth(s) 6538-6544' Ft.
Depth Tester Valve 6518' Ft.

Cushion TYPE AMOUNT Ft. Depth Back Pres. Valve Surface Choke 5/8" Bottom Choke .75"

Recovered 442 Feet of drilling mud
Recovered Feet of
Recovered Feet of
Recovered Feet of
Recovered Feet of
(Meas. From Tester Valve)

Remarks SEE PRODUCTION TEST DATA SHEET

Legal Location Sec. - Twp. - Rng.: 13-18S-24E
Lease Name: CITY "JG" STATE COMM.
Well No.: 1
Test No.: 1
Field Area:
Tested Interval: 6544-6856'
County: EDDY
Lease Owner/Company Name: YATES PETROLEUM CORPORATION
State: NEW MEXICO

TEMPERATURE	Gauge No. 1114		Gauge No. 1113		Gauge No.		TIME	
	Depth: 6522 Ft.		Depth: 6852 Ft.		Depth: Ft.			
	24 Hour Clock		24 Hour Clock		Hour Clock		Tool Opened 0800 A.M./P.M.	
Est. °F.	Blanked Off No		Blanked Off Yes		Blanked Off		Opened Bypass 1300 A.M./P.M.	
Actual 122 °F.	Pressures		Pressures		Pressures			
	Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic	2993	2964	3153	3106				
First Period Flow Initial	125	226	214	416			—	—
First Period Flow Final	178	178	285	312			30	31
First Period Closed in	2300	2297	2477	2429			90	89
Second Period Flow Initial	178	395	267	382			—	—
Second Period Flow Final	125	116	231	246			60	60
Second Period Closed in	2265	2265	2406	2394			120	120
Third Period Flow Initial							—	—
Third Period Flow Final								
Third Period Closed in								
Final Hydrostatic	2975	2952	3135	3099			—	—

FORM 185-R2—PRINTED IN U.S.A.

FORMATION TEST DATA

Casing perfs.__________ Bottom choke__________ Surf. temp.______ °F Ticket No. 520451
Gas gravity__________ Oil gravity__________ GOR__________
Spec. gravity__________ Chlorides__________ ppm Res.______ @______ °F
INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED__________

Date Time a.m. p.m.	Choke Size	Surface Pressure psi	Gas Rate MCF	Liquid Rate BPD	Remarks
0800	1/8"				Opened tool with a good blow
0805	"	18			Good blow, no gas
0810	"	28			"
0815	"	38			"
0820	"	49			"
0825	"	60			"
0830	"	70			Closed tool
0834					Gas to surface
1000	5/8"				Opened tool, gas flare
1005	"	15	299		
1010	"	10	249		Gas depleating
1015	"	6	209		Gas Stabilized
1020	"	6	209		"
1025	"	6	209		"
1030	"	6	209		"
1035	"	6	209		"
1040	"	6	209		"
1045	"	6	209		"
1050	"	5	199		Gas depleating
1055	"	4	189		"
1100	"	4	189		Closed tool
1300					Pulled tool loose

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PRODUCTION TEST DATA

Gauge No. 1114 | Depth 6522' | Clock No. 13428 | 24 hour | Ticket No. 520451

	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.
0	.000	336	.000		178	.000	395 Q	.000		116					
1	.0197	89*	.0165		848**	.0342	121	.0265		1219					
2	.0362	110	.0363		1502	.0683	107	.0531		1693					
3	.0526	132	.0562		1850	.1025	112	.0796		1876					
4	.0691	148	.0760		1970	.1367	114	.1061		2018					
5	.0855	164	.0958		2057	.1709	116	.1327		2124					
6	.1020	178	.1156		2125	.2050	116	.1592		2186					
7			.1354		2180			.1857		2219					
8			.1553		2217			.2122		2235					
9			.1751		2246			.2388		2246					
10			.1949		2263			.2653		2251					
11			.2147		2276			.2918		2253					
12			.2345		2284			.3184		2256					
13			.2544		2290			.3449		2260					
14			.2742		2293			.3714		2263					
15			.2940		2297			.3980		2265					

Gauge No. 1113 | Depth 6852' | Clock No. 4365 | hour 24

	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
0	.000	416	.000		312	.000	382	.000		246					
1	.0199	218*	.0167		1033**	.0332	237	.0267		1371					
2	.0366	244	.0367		1643	.0663	232	.0533		1807					
3	.0532	263	.0567		1957	.0995	239	.0800		2005					
4	.0698	279	.0768		2086	.1327	244	.1067		2145					
5	.0864	296	.0968		2178	.1659	246	.1334		2244					
6	.1030	312	.1168		2253	.1990	246	.1600		2310					
7			.1368		2314			.1867		2348					
8			.1558		2355			.2134		2368					
9			.1769		2383			.2400		2376					
10			.1969		2402			.2667		2383					
11			.2169		2411			.2934		2385					
12			.2369		2420			.3200		2389					
13			.2569		2427			.3467		2392					
14			.2769		2429			.3734		2394					
15			.2970		2429			.4000		2394					
Reading Interval	5		6			10		8							Minutes

REMARKS: *-6 minutes **-5 minutes Q-Questionable

6

FORM 193 R1--PRINTED IN U.S.A.

SPECIAL PRESSURE DATA

FORMATION DENSITY

COMPANY Yates Petroleum Corp.

WELL ... State Com #1

FIELD Wildcat

COUNTY Eddy STATE New Mexico

LOCATION 660' F... & ... EL

API SERIAL NO. / SEC / TWP / RGE

Other Services:

COUNTY
FIELD
LOCATION
WELL
COMPANY

Permanent Datum: GL

Log Measured From KB Elev.: ...

Drilling Measured From KB ... Ft. Above Perm. Datum

Elev.: K.B. 366...

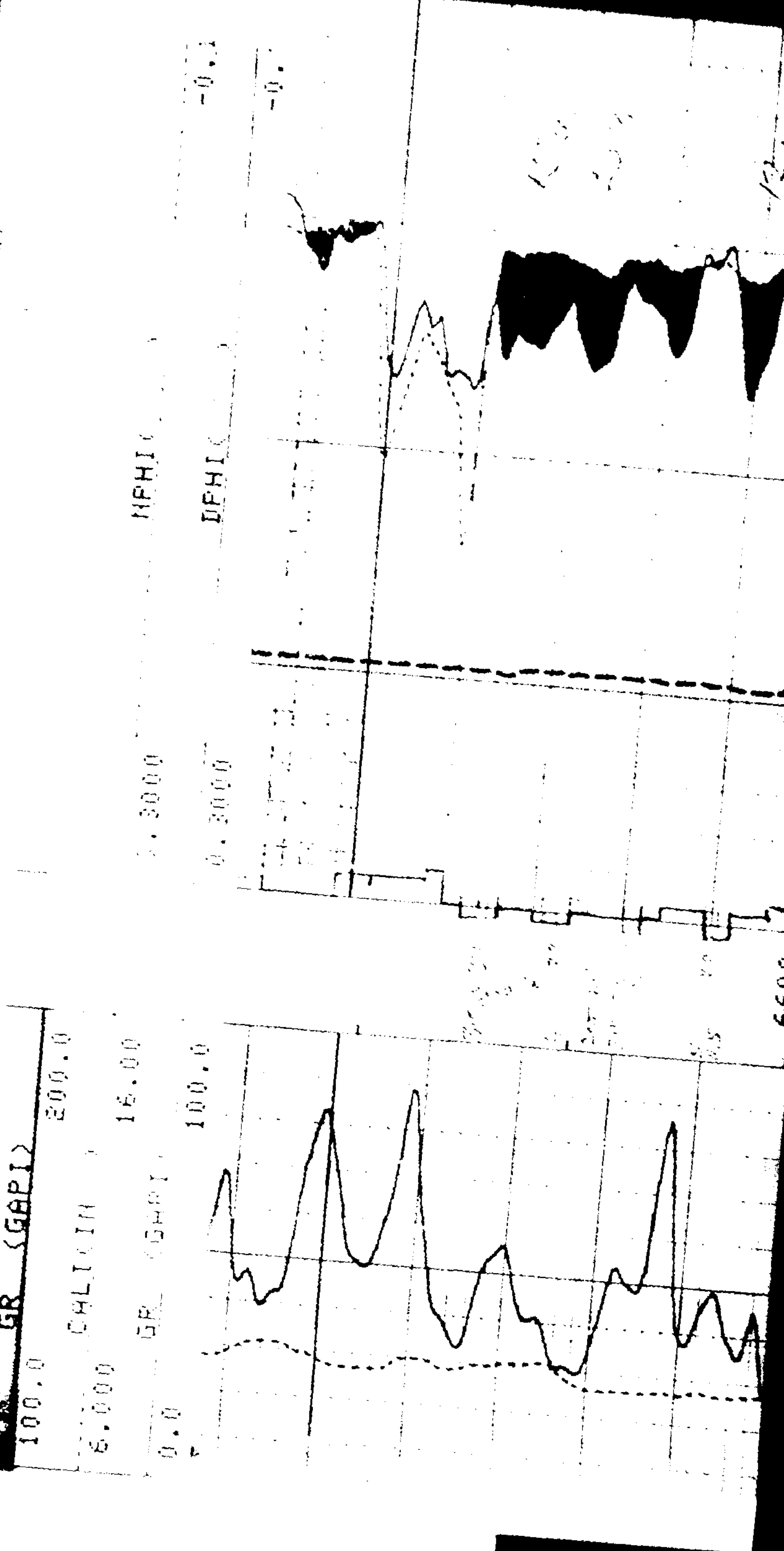
D.F.

G.L. 3651

Date	.../.../78			
Run No.				
Depth–Driller	...			
Depth–Logger	2100			
Btm. Log Interval	...			
Top Log Interval	...			
Casing–Driller	8 5/8 @ ...	@	@	@
Casing–Logger	...			
Bit Size	...			
Type Fluid in Hole	...			
Dens. | Visc.	... | ...			
pH | Fluid Loss	10.4 | ... ml	ml	ml	ml
Source of Sample	...			
Rm @ Meas. Temp.	... @ ... F	@ F	@ F	@ F
Rmf @ Meas. Temp.	... @ ... F	@ F	@ F	@ F
Rmc @ Meas. Temp.	... @ ... F	@ F	@ F	@ F
Source: Rmf | Rmc	...			
Rm @ BHT	.049 @ ... F	@ F	@ F	@ F
TIME Circulation Stopped	...			
TIME Logger on Bottom	...			
Max. Rec. Temp.	... F	F	F	F
Equip. | Location	2063 | Hobbs			
Recorded By				

FIELD PRINT

The well name, location and borehole reference data were furnished by the customer.



Schlumberger

COMPENSATED NEUTRON FORMATION DENSITY

COMPANY Yates Petroleum Corp.

WELL ... State Com. #1

FIELD Wildcat

COUNTY Eddy STATE New Mexico

LOCATION 660' FS & FL

Other Services:

Permanent Datum: ... Elev.: ...

Log Measured From K.B. ... Ft. Above Perm. Datum

Drilling Measured From K.B.

Elev.: K.B. 366...

D.F.

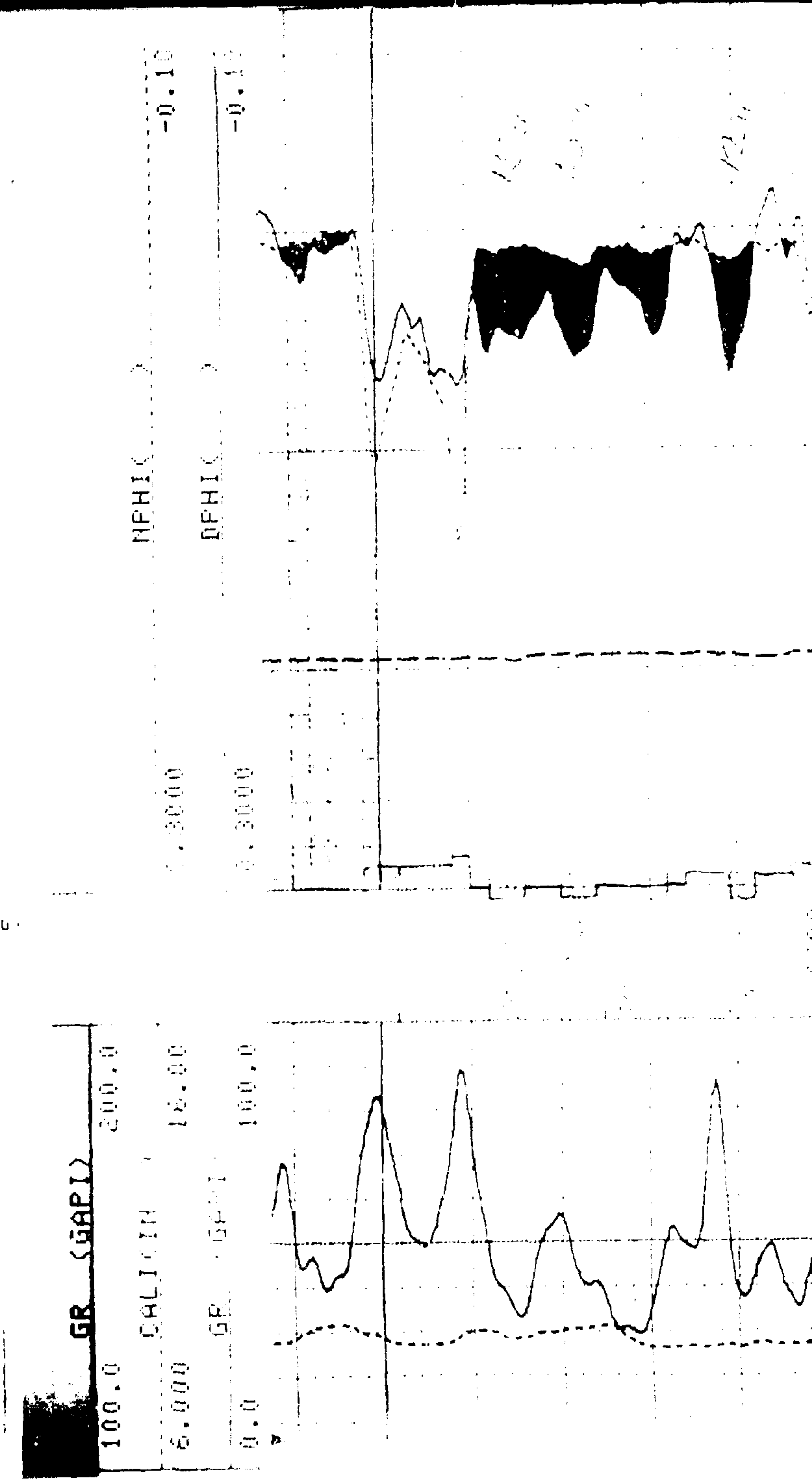
G.L. 3651

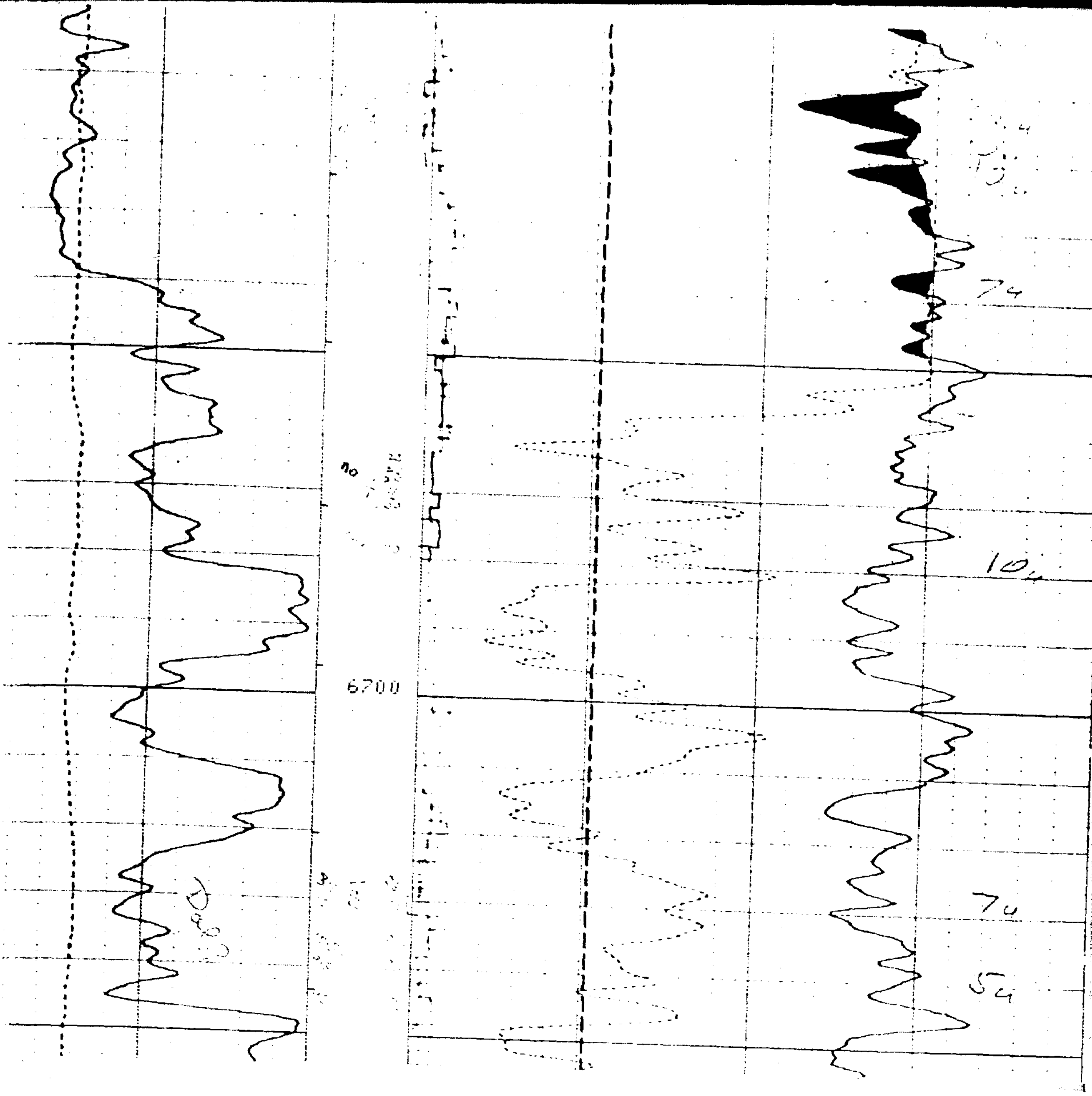
Date	.../78			
Run No.				
Depth Driller				
Depth Logger				
Btm. Log Interval				
Top Log Interval	0			
Casing Driller	8 5/8 @	@	@	@
Casing Logger				
Bit Size				
Type Fluid in Hole				
Dens. / Visc.				
pH / Fluid Loss	ml	ml	ml	ml
Source of Sample				
Rm @ Meas. Temp.	@ F	@ F	@ F	@ F
Rmf @ Meas. Temp.	@ F	@ F	@ F	@ F
Rmc @ Meas. Temp.	@ F	@ F	@ F	@ F
Source: Rmf / Rmc				
Rm @ BHT	@ F	@ F	@ F	@ F
TIME Circulation Stopped				
TIME Logger on Bottom				
Max. Rec. Temp.	F	F	F	F
Equip. / Location	/ Hobbs			

FIELD PRINT

FOLD HERE

The well name, location and borehole reference data were furnished by the customer




6700
74
10
70
54

TW

GAS QUALITY TEST REPORT

COMPANY SELLER Yates Pet. Co.

FIELD OR LOCATION

SOURCE OR RESERVOIR

WELL OR STATION NAME Cities "JG"

STA. NO. 1232-2

CONTRACT NO.

TEST DATE 04,01,80

LAB 4

COMPOUND COMPONENTS	COMPONENT SPECIFIC GRAVITY	COMPONENT MOLE FRACTION
NITROGEN	.9672	.0126
CARBON DIOXIDE	1.5195	.0019
HELIUM	.1382	.
OXYGEN	1.1048	.0002
HYDROGEN SULFIDE	1.1766	.
WATER VAPOR	.6220	.
HYDROCARBON DILUENTS		(.0147)
METHANE	.5539	.8632
ETHANE	1.0382	.0710
PROPANE	1.5225	.0290
ISO-BUTANE	2.0068	.0039
N-BUTANE	2.0068	.0085
ISO-PENTANE	2.4910	.0024
N-PENTANE	2.4910	.0021
HEXANES	2.9753	.0028
HEPTANES +	3.7018	.0020
COMPOSITION		1.0000

LIQUEFIABLE HYDROCARBONS	COMPONENT G.P.M.	MOLE FRACTION	G.P.M. CONTENT
PROPANE	27.514	.	
ISO-BUTANE	32.698	.	
N-BUTANE	31.510	.	
LPG			
ISO-PENTANE	36.582	.	
N-PENTANE	36.213	.	
HEXANES	41.111	.	
HEPTANES +	46.126	.	
NATURAL GASOLINE			
TOTAL LIQUEFIABLE GPM			

WATER VAPOR CONTENT:

Gas Mixture Static Pressure PSI

Hydrocarbon Dew Point °F

Water Vapor Dew Point °F

Lbs Water Vapor per MMCF

Conversion Constant X 0.000021

Water Vapor Mole Fraction .

Moisture recorder reading

Make or type

MIXTURE SPECIFIC GRAVITY:

Calculated From Analysis .664

Determined by Test Instrument .663

Instrument Make or Type Rx

SULFUR CONTENT:

H_2S – Hydrogen Sulfide, Gr./100 cf		.00
RSH – Mercaptans	"	.02
RSR – Sulfides	"	.24
RSSR – Residuals	"	.
Total Sulfur, Gr./100 cf		.26
H_2S Grains to fraction conversion		X 0.0000157
H_2S Mole Fraction		

MIXTURE HEATING VALUE:
(Btu/cf at 14.73 Psia, 60°F, Sat.)

Calculated From Analysis 1140

Determined by Calorimeter

Calorimeter Verified ( )

by G.R.T.

Critical Pressure 668.7 Critical Temperature 376.5

REMARKS

MEASUREMENT AREA Roswell

GAS ANALYST Friston

21

WELL NAME: Irish Hills KW #2

LOCATION: 2-19S-24E

DST INTERVAL: 6532-6640

$P^* = 2440$ psi   slope (M) = 2305 psi/cycle

$Tc = 370°R$ $Pc = 670$ psi

$T = 125 + 460° = 585°R$ $Pwf = 77.4$ psi

$$Pavg = \frac{P^* + Pwf}{2} = \frac{2440 + 77.4}{2} = 1259 \text{ psi} \quad \text{(Note 1)}$$

$$Tr = \frac{T}{Tc} = \frac{585}{370} = 1.58$$

$$Pr = \frac{Pavg}{Pc} = \frac{1259}{670} = 1.90 \quad \text{(Note 1)}$$

$Z \doteq 0.86$ $Tsc = 520°R$ $Psc = 13.3$ psi

$$Bg = Z \cdot \frac{T}{Tsc} \cdot \frac{Psc}{Pavg} = 0.86 \cdot \frac{585}{520} \cdot \frac{13.3}{1259} = 0.010 \quad \text{(Note 1)}$$

$q = 69.7$ mcfd $\cdot$ $178.1 = 12414$ b/d

$u = 1.20 \times 0.0114 = 0.0137$ cp (Note 2)

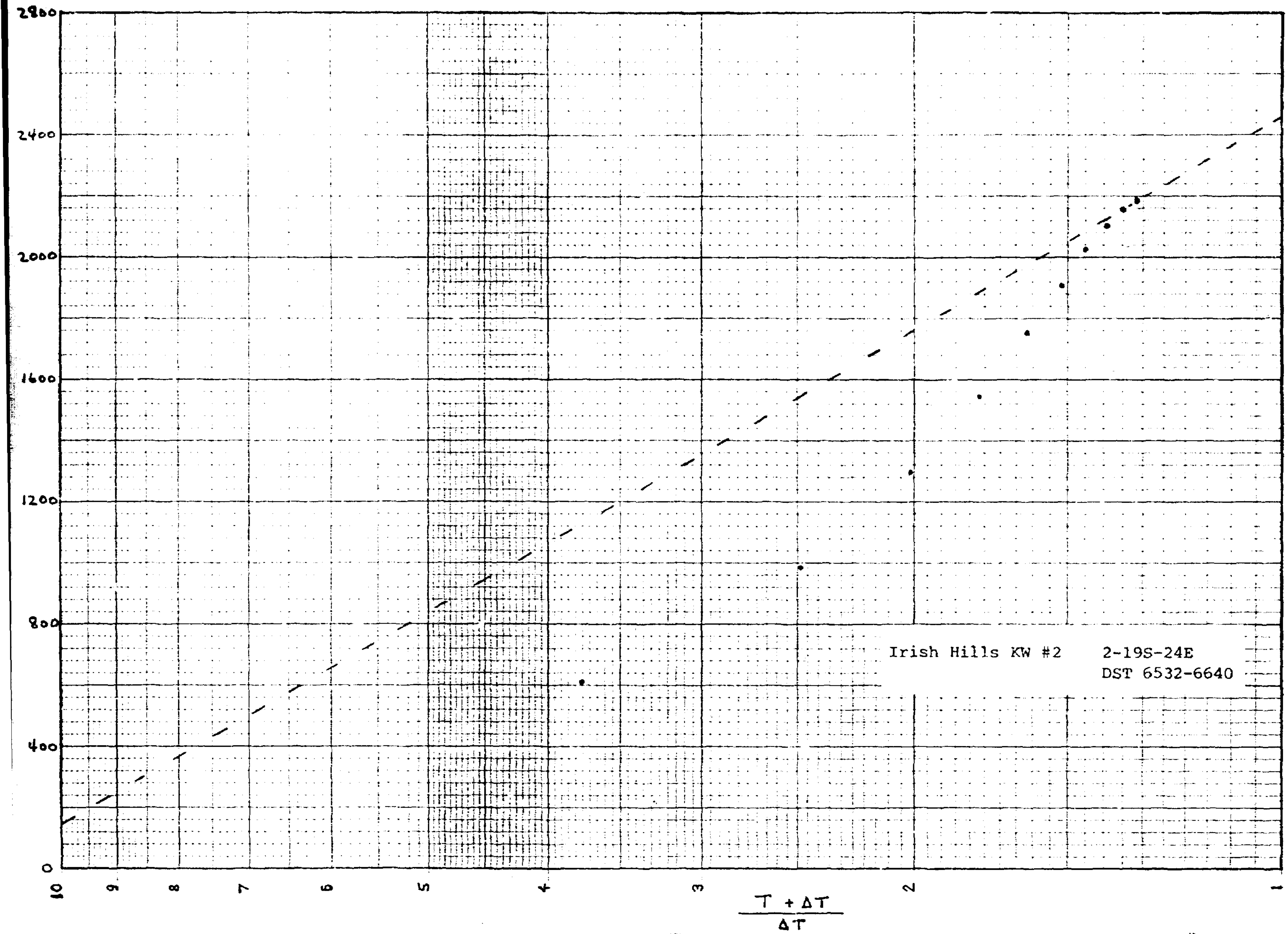
$$kh = \frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6\ (\ 12414\ )\ (\ 0.0137\ )\ (\ 0.010\ )}{2305}$$

$kh = 0.1200$ md $\cdot$ ft

$h = 58$ ft (Note 3)

$k = 0.0021$ md (Note 4)

1) C. S. Matthews - D.G. Russell eqn. 3.21a
2) C. S. Matthews D.G. Russell Fig. G.3A&B
3) h estimated from Log
4) k = 0.0026 md for T=192°F


2800
2400
2000
1600
1200
800
400
0
10
9
8
7
6
5
4
3
2
1
T + ΔT / ΔT
Irish Hills KW #2
2-19S-24E
DST 6532-6640

FLUID SAMPLE DATA	
Sampler Pressure	69 P.S.I.G. at Surface
Recovery: Cu. Ft. Gas	.284
cc. Oil	
cc. Water	
cc. Mud	500 drilling fluid
Tot. Liquid cc.	500
Gravity	° API @ °F
Gas/Oil Ratio	cu. ft./bbl.

	Resistivity	Chloride Content
Recovery Water	@ °F	ppm
Recovery Mud	@ °F	ppm
Recovery Mud Filtrate	@ °F	ppm
Mud Pit Sample	@ °F	ppm
Mud Pit Sample Filtrate	@ °F	ppm
Mud Weight	8.9	vis sec

Date	7-6-80	Ticket Number	879639
Kind of DST	OPEN HOLE OFF BOTTOM STRADDLE	Halliburton Location	ARTESIA
Tester	MR. LAMAR MR. MC KEE	Witness	MR. D. JACKSON
Drilling Contractor	CAPITAN DRILLING COMPANY RIG # 14		sm

EQUIPMENT & HOLE DATA

Formation Tested	Cisco
Elevation	3718' Ft.
Net Productive Interval	- Ft.
All Depths Measured From	Kelly bushing(AGL)
Total Depth	9190' Ft.
Main Hole Casing Size	7 7/8"
Drill Collar Length	660' I.D. 2.25"
Drill Pipe Length	5835' I.D. 3.340"
Packer Depth(s)	6526-6532-6640-6646' Ft.
Depth Tester Valve	6507' Ft.

Legal Location Sec. - Twp. - Rng.: 2 19 24

Cushion Type	Amount	Ft.	Depth Back Pres. Valve	Surface Choke	Bottom Choke
				3/8" Adj. choke	.75"

Meas. From Tester Valve

Recovered	180	Feet of	drilling fluid
Recovered		Feet of	
Recovered		Feet of	
Recovered		Feet of	
Recovered		Feet of	

Field Area: WILDCAT

Remarks SEE PRODUCTION TEST DATA SHEET

County: EDDY

State: NEW MEXICO

TEMPERATURE	Gauge No. 512		Gauge No. 113		Gauge No.		TIME (00:00-24:00 hrs.)	
	Depth: 6511 Ft.		Depth: 6583 Ft.		Depth: Ft.			
	24 Hour Clock		24 Hour Clock		Hour Clock		Tool	7-6-80
Est. 192 °F.	Blanked Off no		Blanked Off yes		Blanked Off		Opened	1900
							Opened	7-7-80
Actual °F.	Pressures		Pressures		Pressures		Bypass	0100
	Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic	3028	3067.2	2996	3104.5				
First Period Flow Initial	53	57.7	92	96.0			—	—
First Period Flow Final	66	80.0	92	100.0			30	29
First Period Closed in	1486	1496.0	1490	1509.2			90	89
Second Period Flow Initial	66	60.3	79	102.6			—	—
Second Period Flow Final	66	77.4	92	92.1			60	58
Second Period Closed in	2170	2191.5	2189	2197.9			180	183
Third Period Flow Initial							—	—
Third Period Flow Final								
Third Period Closed in								
Final Hydrostatic	3081	3067.2	3115	3103.1			—	—

FORMATION TEST DATA

16

Gauge No. 512 | Depth 6511' | Clock No. 13528 | 24 hour | Ticket No. 879639

	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
	Time Defl. .000"	PSIG Temp Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp Corr.	Time Defl. .000"	PSIG Temp Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp Corr.	Time Defl. .000"	PSIG Temp Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp Corr.
0	.0000	57.7	.0000		80.0	.0000	60.3	.0000		77.4					
1	.0139*	80.0	.0272**		274.2	.0268**	72.1	.0705***		628.9					
2	.0313	81.3	.0579		436.9	.0602	70.8	.1308		990.7					
3	.0488	81.3	.0885		602.6	.0936	74.8	.1912		1301.3					
4	.0662	80.0	.1192		764.4	.1271	76.1	.2516		1557.9					
5	.0836	80.0	.1498		910.5	.1606	76.1	.3120		1760.5					
6	.1010	30.0	.1804		1051.3	.1940	77.4	.3724		1911.8					
7			.2111		1184.2			.4328		2018.4					
8			.2417		1298.6			.4932		2094.7					
9			.2724		1413.1			.5536		2148.6					
10			.3030		1496.0			.6140		2181.5					
11															
12															
13															
14															
15															

Gauge No. 113 | Depth 6583' | Clock No. 6728 | 24 hour

	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
0	.0000	96.0	.0000		100.0	.0000	102.6	.0000		92.1					
1	.0135*	106.5	.0270**		242.1	.0270**	88.1	.0705***		609.5					
2	.0304	107.8	.0573		415.7	.0608	88.1	.1308		984.1					
3	.0473	107.8	.0876		575.2	.0946	89.4	.1912		1296.8					
4	.0642	103.9	.1180		733.5	.1284	92.1	.2516		1550.1					
5	.0811	100.0	.1483		881.2	.1622	92.1	.3120		1758.6					
6	.0980	100.0	.1787		1029.0	.1960	92.1	.3724		1915.6					
7			.2090		1163.6			.4328		2029.0					
8			.2393		1287.6			.4932		2106.9					
9			.2697		1402.4			.5536		2160.9					
10			.3000		1509.2			.6140		2197.9					
11															
12															
13															
14															
15															
Reading Interval	5		9			10		18							Minutes

REMARKS: *First interval is equal to 4 minutes. ** = 8 minutes. *** = 21 minutes.

Casing perfs ______ Bottom choke ______ Surf. temp ______ °F Ticket No. 879639
Gas gravity ______ Oil gravity ______ GOR ______
Spec. gravity ______ Chlorides ______ ppm Res. ______ @ ______ °F
INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED ______

Date Time a.m. p.m.	Choke Size	Surface Pressure psi	Gas Rate MCF	Liquid Rate BPD	Remarks
0700					Called out
1145					On location
1300					Picked up tools
1400					Started in hole with tools
1900					Opened with a weak blow
1905					Weak blow
1910					Blow increased to good
1915	3/8"	1½			Opened 3/8" choke
1930	"	0			Closed tool -no gas to the surface
2100	"	10			Opened tool on 3/8" choke
2105	"	12			
2106	"	11	88.4		Gas to the surface
2110	"	5½	69.7		Pressure dropped
2115	"	1/2	TSTR		"
2130	"		TSTR		"
2145	"		TSTR		"
2200	"		TSTR		Closed tool
7-7-80					
0100					Opened bypass and started out of hole.

TSTR = too small to record

PRODUCTION TEST DATA

FORMATION DENSITY

COMPANY Yates Petroleum Corporation

WELL Irish Hills "KW" State Com. #2

FIELD Wildcat

COUNTY Eddy STATE New Mexico

1980'FNL & 1980'FEL

19-? 24-E

Other Services: DLL-MSFL

Permanent Datum: GL Elev. 3709
Log Measured From KB 16.5 Ft. Above Perm. Datum
Drilling Measured From KB

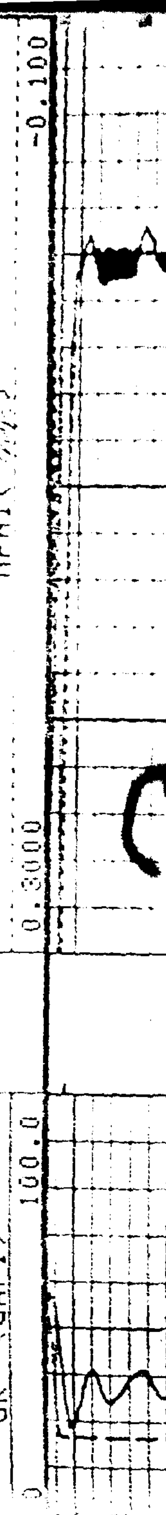
Elev.: K.B. 3725.5
D.F.
G.L. 3709

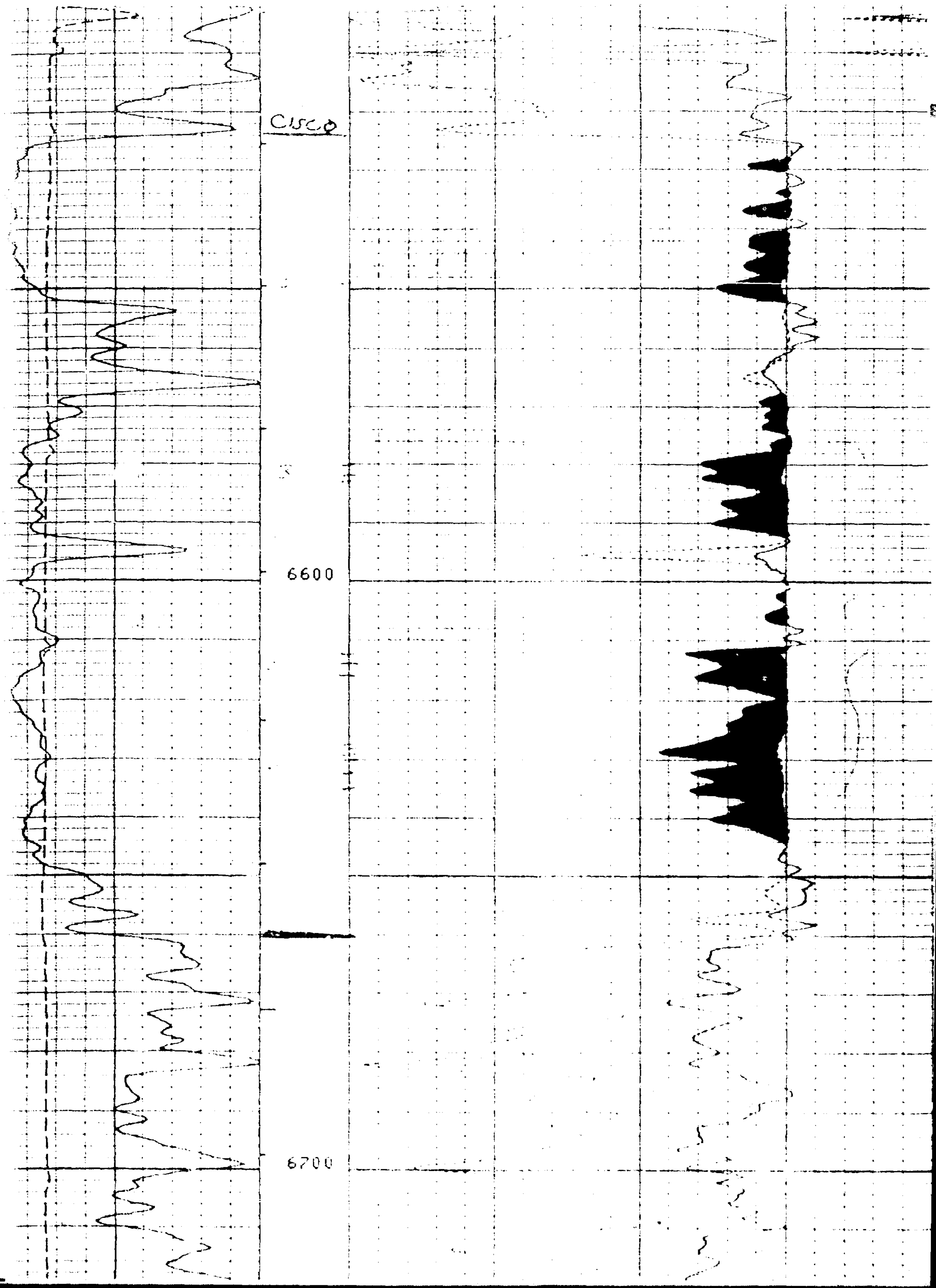
Date	7-5-80			
Run No.	ONE			
Depth-Driller	9190			
Depth-Logger	9189			
Btm. Log Interval	9188			
Top Log Interval	Surf			
Casing - Driller	8 5/8 @ 950	@	@	@
Casing Logger	948			
Bit Size	7 7/8			
Type Fluid in Hole	S.W. Gel, Starch			
Dens. / Visc.	9.0 / 38			
pH / Fluid Loss	10.0 / 9.4 ml	ml	ml	ml
Source of Sample	Circulated			
Rm @ Meas. Temp.	.17 @ 89 °F	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	.13 @ 89 °F	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	.25 @ 89 °F	@ °F	@ °F	@ °F
Source: Rmf / Rmc	M / M			
Rm @ BHT	.10 @ 149 °F	@ °F	@ °F	@ °F
Circulation Stopped	0700 7-5			
Logger on Bottom	1430 7-5			
Max. Rec. Temp.	149 °F	°F	°F	°F
Equip. / Location	8185 / Hobbs			
Recorded By				

PARAMETERS

NAME	UNIT	VALUE	NAME	UNIT	VALUE	NAME	UNIT	VALUE
HC		BS	PSNR		2.347	BS	INCH	7.875
MDEN	G/C3	2.710	FD	G/C3	1.100	MATR		LIME
BHF		WATE						
DO		0.0	BHS		CASE	FPHI		PHIX

GR (GAPI) 0.0 200.0
CALI(IN) 6.00 16.00
GR (GAPI) 100.0
DPHO(G/C3) -0.050 0.4500
RHOB(G/C3) 2.000 3.000
NPHI 0.3000 -0.100





Cisco
6600
6700

GAS QUALITY TEST REPORT

COMPANY SELLER Yates Pet. Co.

STA. NO. 1397-1

FIELD OR LOCATION

CONTRACT NO.

SOURCE OR RESERVOIR

TEST DATE 03 26 81

WELL OR STATION NAME Irish Hills "KW" #2

LAB 4

COMPOUND COMPONENTS	COMPONENT SPECIFIC GRAVITY	COMPONENT MOLE FRACTION
NITROGEN	.9672	.0124
CARBON DIOXIDE	1.5196	.0008
HELIUM	.1382	.
OXYGEN	1.1048	.
HYDROGEN SULFIDE	1.1766	.
WATER VAPOR	.6220	.
HYDROCARBON DILUENTS		(.0132)
METHANE	.5539	.8859
ETHANE	1.0382	.0613
PROPANE	1.5225	.0230
ISO-BUTANE	2.0068	.0035
N-BUTANE	2.0068	.0066
ISO-PENTANE	2.4910	.0020
N-PENTANE	2.4910	.0018
HEXANES	2.9753	.0017
HEPTANES +	3.7018	.0010
COMPOSITION		1.0000

LIQUEFIABLE HYDROCARBONS	COMPONENT G.P.M.	MOLE FRACTION	G.P.M. CONTENT
PROPANE	27.514	.	
ISO-BUTANE	32.698	.	
N-BUTANE	31.510	.	
LPG			
ISO-PENTANE	36.582	.	
N-PENTANE	36.213	.	
HEXANES	41.111	.	
HEPTANES +	46.126	.	
NATURAL GASOLINE			
TOTAL LIQUEFIABLE GPM			

WATER VAPOR CONTENT:

Gas Mixture Static Pressure PSIG 610# 65°

Hydrocarbon Dew Point °F

Water Vapor Dew Point °F

Lbs Water Vapor per MMCF 30#

Conversion Constant X 0.000021

Water Vapor Mole Fraction .

Moisture recorder reading

Make or type

MIXTURE SPECIFIC GRAVITY:

Calculated From Analysis REAL. .643

Determined by Test Instrument .645

Instrument Make or Type RNX.

SULFUR CONTENT:

H_2S – Hydrogen Sulfide, Gr./100 cf .00

RSH – Mercaptans "

RSR – Sulfides "

RSSR – Residuals "

Total Sulfur, Gr./100 cf .

H_2S Grains to fraction conversion X 0.0000157

H_2S Mole Fraction

MIXTURE HEATING VALUE:

Btu/cf at 14.73 Psia, 60°F, Sat.)

Calculated From Analysis 1109

Determined by Calorimeter

Calorimeter Verified ( )

Critical Pressure Critical Temperature

REMARKS INITIAL DELIVERY

MEASUREMENT AREA 1

GAS ANALYST GARRATT/ALSTON 27

232-A Rev. 10-75

YATES PETROLEUM CORPORATION
207 SOUTH FOURTH STREET
ARTESIA, NEW MEXICO 88210
TELEPHONE (505) 748-1331

OIL CONSERVATION DIVISION
OCT - 5 1981
RECEIVED

S. P. YATES
PRESIDENT
MARTIN YATES, III
VICE PRESIDENT
JOHN A. YATES
VICE PRESIDENT
B. W. HARPER
SEC.-TREAS

CASE NO. 7352

APPLICATION OF YATES PETROLEUM CORPORATION
FOR DESIGNATION OF A TIGHT FORMATION
EDDY COUNTY, NEW MEXICO

APPLICATION

Yates Petroleum Corporation seeks tight formation designation for a portion of the Permo-Penn underlying lands in western Eddy County, New Mexico, which are described in Exhibit No. 1 and shown in map form in Exhibits No.2 and 3.

DESCRIPTION OF FORMATION BY GEOLOGICAL PARAMETERS

The formation sought to be covered by this application is that stratigraphic interval between the top of a marker named the Third Sister Cycle (of the Wolfcamp Series of the Permian System) and the top of the Canyon Series (of the Pennsylvanian System).

Correlations of the Third Sister Cycle and The Canyon Series are shown on a network of 4 crossections spread over the subject area. (Exhibits 5 through 8). Positions of the Third Sister and Canyon in the geologic column are illustrated in Exhibit 4.

The Third Sister Cycle to Canyon Series varies from approximately 1000 to 1400 feet in thickness.

STATEMENT OF MEANING AND PURPOSE OF EACH EXHIBIT

EXHIBIT NO. 1

Exhibit No. 1 is a list which describes the lands which overlie the Permo-Penn interval for which tight formation designation is sought in this application.

EXHIBIT NO. 2

Exhibit No. 2 is a map of 1 inch equals 5000 feet scale which shows the lands described in Exhibit No. 1. The subject area stretches over a portion of western Eddy County, New Mexico, from the Pecos River east of the City of Artesia to the Huapache Monocline some 40 miles to the Southwest.

Also shown, by circled well spots, are all wells within the outline which have penetrated the above defined Permo-Penn formation and/or lower horizons. Red-colored well spots are wells which are currently producing gas from the above defined Permo-Penn interval.

The deposits of the subject Permo-Penn interval are a complex of 3 major environments of deposition or "facies": shelf, bank and basin facies.

The shelf facies, lying in bands to the West or Northwest, is comprised of interbedded limestones, shales, siltstones and sandstones. Terrigenous clastics (shales, siltstones and sandstones) increase and marine limestones and shales decrease traversing from East to West or Southeast to Northwest, that is, in a shelfward direction. Deposits of the Shelf facies are effectively non-porous and impermeable and constitute

An updip "mega-seal" to the bank facies.

The bank facies in composed mostly of marine limestones with a few intercalated marine shales. These marine limestones are made up of bioherms and their associated debris aprons interfingering with oolite bars. The porosity that is present is a result of preservation of primary porosity, principally of bryozoan material, and creation of secondary porosity by leaching of oolitic grainstones and former aragonitic shell material.

Most of the gas production that has been established in the subject Permo-Penn interval has been from the deposits of the bank facies.

The basin facies consists mainly of thin-bedded, fine-grained sandstones, siltstones and shales which were transported to the relatively deeper basin from the bank and shelf areas during periods of lowered sea level. Main conduits for transport to the basin were through passes between segments of the bank facies.

Scattered within the overall basin facies are isolated limestone or carbonate buildups termed "isolated mounds". In some of the isolated mounds porosity has been developed and/or preserved, but many are effectively non-porous and impermeable. Some of the isolated mounds have produced gas. Wells in the basin facies which have encountered mounds are indicated by the letter "M" close by the well spot.

About one-third of the subject Permo-Penn interval, in the upper part, has been termed the "Antelope Sink Zone", named for an interval in the Sun (Tom Brown) No. 1 Antelope Sink Unit in Section 18 of T19S-24E. This well is shown on 2 crossections, Exhibits 6 and 8. The geographical limits of shelf, bank and basin shown on Exhibit No. 2 are for the

Antelope Sink Zone alone. Lower zones of the subject Permo-Penn interval are not shown, but their facies trends are essentially parallel to those shown on Exhibit No. 2.

Exhibit No. 2 also Shows the traces of the crossections introduced in later exhibits.

EXHIBIT NO. 3

Exhibit No. 3 is identical to Exhibit No. 2 from the standpoint of scale, outline of lands, well spots and colored well spots.

The purpose of this exhibit is to illustrate the structural attitude of the Permo-Penn Formation in the subject area. Mapping was done on the top of the Antelope Sink Zone in the shelf and bank areas and on the top of the Canyon Series in the basinal areas. As the crossections will show, the Antelope Sink Zone is essentially parallel with the Third Sister Cycle above. Dashed contours are 100 feet contour intervals on the top of the Antelope Sink Zone. Solid contours are 100 foot contour intervals on the top of the Canyon Series.

These contours indicate that over most of the outlined area the Permo-Penn interval dips to the East or Southeast at approximately 100 feet per mile; however, in the southwestern part of the outlined area, near the Huapache Monocline, the Permo-Penn interval dips East to Northeasterly at 200 to 300 feet per mile and structure is complicated by faulting.

Structural relief on the top of the subject Permo-Penn is approximately 3300 feet in the outlined area. Ground level elevations rise approximately 1500 feet from wells near the Pecos River (in T17S-R26E) to wells near the Huapache Monocline (in T21S-R21E).

The drill depth to the top of the Third Sister Cycle in the highest well (Pennzoil No. 1 United Federal in Section 28 of T21S-R21E) is 4927 feet; and, the drill depth to the top of the Third Sister in the lowest well (Heyco No. 1 Big Boggy State in Section 36 of T17S-R26E) is 6717 feet. The average depth to the top of the subject Permo-Penn Formation is thus 5827 feet.

EXHIBIT NO. 4

Exhibit No. 4 illustrates the stratigraphic column present in western Eddy County, New Mexico. This geologic section was compiled from New Mexico Oil Conservation Division reference crossections and other industry-accepted correlations.

The main purpose of this exhibit is to show the Permo-Penn stratigraphic interval sought to be covered by this application in relation to geologic time and other major stratigraphic horizons.

EXHIBIT NO. 5

Exhibit No. 5 is a Northwest to Southeast stratigraphic crossection (A-A') hung on the Third Sister Cycle of the Wolfcamp Series. This crossection is tranverse to the three major facies trends of shelf, bank and basin.

Other pertinent correlations shown are the top of the Antelope Sink Zone of the shelf and bank facies, top of the Pennsylvanian (by correlating with the New Mexico Oil Conservation Division reference crossections) and the top of the Canyon Series.

Drill stem test, core and completion data are shown on the crossection. Well 6 was cored in the Permo-Penn and the core analysis report is given

in a later exhibt. Wells 2,3 and 5 are currently producing Permo-Penn gas and have been assigned to the Eagle Creek Permo-Penn (Gas) Field by the New Mexico Oil Conservation Division. Wells 4 and 6 should produce Permo-Penn gas, but they have not yet been completed in that interval. Note that well 8 produced gas from an isolated mound. This well was assigned to the Atoka Cisco, West (Gas) Field and produced 64,125 MCF of gas and 146 barrels of condensate before abandonment in 1980.

EXHIBIT NO. 6

Exhibit No. 6 is a Northwest to Southeast stratigraphic crossection (B-B') which is, again, hung on the Third Sister Cycle and is transverse to the 3 major facies of shelf, bank and basin.

A key correlation well, the Sun (Tom Brown) No. 1 Antelope Sink Unit, is well 3. Tops pertinent to this application are picked in this well as follows: Third Sister 5860', Antelope Sink Zone 6080', top of the bank facies 6140', top of the Pennsylvanian (by correlation with New Mexico Oil Conservation Division reference crossections) 6190', base of the bank facies 6420' and Canyon Series 7060'. Note that the perforated interval straddles the systemic boundary between the Permian and the Pennsylvanian. The Antelope Sink Unit No. 1 has been assigned to the Antelope Sink Upper Penn (Gas) Field. Well 4 should also produce Permo-Penn gas, but it has not yet been completed in the zone.

EXHIBIT NO. 7

Exhibit No. 7 is another Northwest to Southeast stratigraphic crossection (C-C') which is also hung on the Third Sister Cycle.

Wells 4 and 6 are producing gas from the Permo-Penn Formation and have been assigned to the Box Canyon Permo-Penn (Gas) Field.

EXHIBIT NO. 8

Exhibit No. 8 is a Southwest to Northeast stratigraphic crossection (D-D') which is hung on the Third Sister Cycle. This longitudinal or strike crossection is more or less parallel to the major facies of shelf, bank and basin.

The purpose of this crossection is to tie the three previous transverse crossections. It may be noted that the main gas-productive Antelope Sink Zone bank facies correlate very well from Box Canyon Permo-Penn (Gas) Field to Antelope Sink Upper Penn (Gas) Field to Penasco Draw Permo-Penn (Gas) Field to Eagle Creek Permo-Penn (Gas) Field.

YATES PETROLEUM CORPORATION
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The main purpose of this exhibit is to show the Permo-Penn stratigraphic interval sought to be covered by this application in relation to geologic time and other major stratigraphic horizons.

EXHIBIT NO. 5

Exhibit No. 5 is a Northwest to Southeast stratigraphic crossection (A-A') hung on the Third Sister Cycle of the Wolfcamp Series. This crossection is tranverse to the three major facies trends of shelf, bank and basin.

Other pertinent correlations shown are the top of the Antelope Sink Zone of the shelf and bank facies, top of the Pennsylvanian (by correlating with the New Mexico Oil Conservation Division reference crossections) and the top of the Canyon Series.

Drill stem test, core and completion data are shown on the crossection. Well 6 was cored in the Permo-Penn and the core analysis report is given

in a later exhibt. Wells 2,3 and 5 are currently producing Permo-Penn gas and have been assigned to the Eagle Creek Permo-Penn (Gas) Field by the New Mexico Oil Conservation Division. Wells 4 and 6 should produce Permo-Penn gas, but they have not yet been completed in that interval. Note that well 8 produced gas from an isolated mound. This well was assigned to the Atoka Cisco, West (Gas) Field and produced 64,125 MCF of gas and 146 barrels of condensate before abandonment in 1980.

EXHIBIT NO. 6

Exhibit No. 6 is a Northwest to Southeast stratigraphic crossection (B-B') which is, again, hung on the Third Sister Cycle and is transverse to the 3 major facies of shelf, bank and basin.

A key correlation well, the Sun (Tom Brown) No. 1 Antelope Sink Unit, is well 3. Tops pertinent to this application are picked in this well as follows: Third Sister 5860', Antelope Sink Zone 6080', top of the bank facies 6140', top of the Pennsylvanian (by correlation with New Mexico Oil Conservation Division reference crossections) 6190', base of the bank facies 6420' and Canyon Series 7060'. Note that the perforated interval straddles the systemic boundary between the Permian and the Pennsylvanian. The Antelope Sink Unit No. 1 has been assigned to the Antelope Sink Upper Penn (Gas) Field. Well 4 should also produce Permo-Penn gas, but it has not yet been completed in the zone.

EXHIBIT NO. 7

Exhibit No. 7 is another Northwest to Southeast stratigraphic crossection (C-C') which is also hung on the Third Sister Cycle.

Wells 4 and 6 are producing gas from the Permo-Penn Formation and have been assigned to the Box Canyon Permo-Penn (Gas) Field.

EXHIBIT NO. 8

Exhibit No. 8 is a Southwest to Northeast stratigraphic crossection (D-D') which is hung on the Third Sister Cycle. This longitudinal or strike crossection is more or less parallel to the major facies of shelf, bank and basin.

The purpose of this crossection is to tie the three previous transverse crossections. It may be noted that the main gas-productive Antelope Sink Zone bank facies correlate very well from Box Canyon Permo-Penn (Gas) Field to Antelope Sink Upper Penn (Gas) Field to Penasco Draw Permo-Penn (Gas) Field to Eagle Creek Permo-Penn (Gas) Field.

YATES PETROLEUM CORPORATION
207 SOUTH FOURTH STREET
ARTESIA, NEW MEXICO 88210
TELEPHONE (505) 748-1331

OIL CONSERVATION DIVISION
OCT - 5 1981
RECEIVED

S. P. YATES
PRESIDENT
MARTIN YATES, III
VICE PRESIDENT
JOHN A. YATES
VICE PRESIDENT
B. W. HARPER
SEC.-TREAS

CASE NO. 7352

APPLICATION OF YATES PETROLEUM CORPORATION

FOR DESIGNATION OF A TIGHT FORMATION

EDDY COUNTY, NEW MEXICO

APPLICATION

Yates Petroleum Corporation seeks tight formation designation for a portion of the Permo-Penn underlying lands in western Eddy County, New Mexico, which are described in Exhibit No. 1 and shown in map form in Exhibits No.2 and 3.

DESCRIPTION OF FORMATION BY GEOLOGICAL PARAMETERS

The formation sought to be covered by this application is that stratigraphic interval between the top of a marker named the Third Sister Cycle (of the Wolfcamp Series of the Permian System) and the top of the Canyon Series (of the Pennsylvanian System).

Correlations of the Third Sister Cycle and The Canyon Series are shown on a network of 4 crossections spread over the subject area. (Exhibits 5 through 8). Positions of the Third Sister and Canyon in the geologic column are illustrated in Exhibit 4.

The Third Sister Cycle to Canyon Series varies from approximately 1000 to 1400 feet in thickness.

STATEMENT OF MEANING AND PURPOSE OF EACH EXHIBIT

EXHIBIT NO. 1

Exhibit No. 1 is a list which describes the lands which overlie the Permo-Penn interval for which tight formation designation is sought in this application.

EXHIBIT NO. 2

Exhibit No. 2 is a map of 1 inch equals 5000 feet scale which shows the lands described in Exhibit No. 1. The subject area stretches over a portion of western Eddy County, New Mexico, from the Pecos River east of the City of Artesia to the Huapache Monocline some 40 miles to the Southwest.

Also shown, by circled well spots, are all wells within the outline which have penetrated the above defined Permo-Penn formation and/or lower horizons. Red-colored well spots are wells which are currently producing gas from the above defined Permo-Penn interval.

The deposits of the subject Permo-Penn interval are a complex of 3 major environments of deposition or "facies": shelf, bank and basin facies.

The shelf facies, lying in bands to the West or Northwest, is comprised of interbedded limestones, shales, siltstones and sandstones. Terrigenous clastics (shales, siltstones and sandstones) increase and marine limestones and shales decrease traversing from East to West or Southeast to Northwest, that is, in a shelfward direction. Deposits of the Shelf facies are effectively non-porous and impermeable and constitute

An updip "mega-seal" to the bank facies.

The bank facies in composed mostly of marine limestones with a few intercalated marine shales. These marine limestones are made up of bioherms and their associated debris aprons interfingering with oolite bars. The porosity that is present is a result of preservation of primary porosity, principally of bryozoan material, and creation of secondary porosity by leaching of oolitic grainstones and former aragonitic shell material.

Most of the gas production that has been established in the subject Permo-Penn interval has been from the deposits of the bank facies.

The basin facies consists mainly of thin-bedded, fine-grained sandstones, siltstones and shales which were transported to the relatively deeper basin from the bank and shelf areas during periods of lowered sea level. Main conduits for transport to the basin were through passes between segments of the bank facies.

Scattered within the overall basin facies are isolated limestone or carbonate buildups termed "isolated mounds". In some of the isolated mounds porosity has been developed and/or preserved, but many are effectively non-porous and impermeable. Some of the isolated mounds have produced gas. Wells in the basin facies which have encountered mounds are indicated by the letter "M" close by the well spot.

About one-third of the subject Permo-Penn interval, in the upper part, has been termed the "Antelope Sink Zone", named for an interval in the Sun (Tom Brown) No. 1 Antelope Sink Unit in Section 18 of T19S-24E. This well is shown on 2 crossections, Exhibits 6 and 8. The geographical limits of shelf, bank and basin shown on Exhibit No. 2 are for the

Antelope Sink Zone alone. Lower zones of the subject Permo-Penn interval are not shown, but their facies trends are essentially parallel to those shown on Exhibit No. 2.

Exhibit No. 2 also Shows the traces of the crossections introduced in later exhibits.

EXHIBIT NO. 3

Exhibit No. 3 is identical to Exhibit No. 2 from the standpoint of scale, outline of lands, well spots and colored well spots.

The purpose of this exhibit is to illustrate the structural attitude of the Permo-Penn Formation in the subject area. Mapping was done on the top of the Antelope Sink Zone in the shelf and bank areas and on the top of the Canyon Series in the basinal areas. As the crossections will show, the Antelope Sink Zone is essentially parallel with the Third Sister Cycle above. Dashed contours are 100 feet contour intervals on the top of the Antelope Sink Zone. Solid contours are 100 foot contour intervals on the top of the Canyon Series.

These contours indicate that over most of the outlined area the Permo-Penn interval dips to the East or Southeast at approximately 100 feet per mile; however, in the southwestern part of the outlined area, near the Huapache Monocline, the Permo-Penn interval dips East to Northeasterly at 200 to 300 feet per mile and structure is complicated by faulting.

Structural relief on the top of the subject Permo-Penn is approximately 3300 feet in the outlined area. Ground level elevations rise approximately 1500 feet from wells near the Pecos River (in T17S-R26E) to wells near the Huapache Monocline (in T21S-R21E).

The drill depth to the top of the Third Sister Cycle in the highest well (Pennzoil No. 1 United Federal in Section 28 of T21S-R21E) is 4927 feet; and, the drill depth to the top of the Third Sister in the lowest well (Heyco No. 1 Big Boggy State in Section 36 of T17S-R26E) is 6717 feet. The average depth to the top of the subject Permo-Penn Formation is thus 5827 feet.

EXHIBIT NO. 4

Exhibit No. 4 illustrates the stratigraphic column present in western Eddy County, New Mexico. This geologic section was compiled from New Mexico Oil Conservation Division reference crossections and other industry-accepted correlations.

The main purpose of this exhibit is to show the Permo-Penn stratigraphic interval sought to be covered by this application in relation to geologic time and other major stratigraphic horizons.

EXHIBIT NO. 5

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Wells 4 and 6 are producing gas from the Permo-Penn Formation and have been assigned to the Box Canyon Permo-Penn (Gas) Field.

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TIGHT FORMATION APPLICATION
CASE NO. 7352

EXHIBIT "1"

Township 17 South, Range 24 East, N.M.P.M.

All Sections

Township 17 South, Range 25 East, N.M.P.M.

All Sections

Township 17 South, Range 26 East, N.M.P.M.

All Sections

Township 18 South, Range 24 East, N.M.P.M.

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All Sections

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All Sections

Township 20-1/2 South, Range 22 East, N.M.P.M.

All Sections

Township 21 South, Range 21 East, N.M.P.M.

All Sections

Township 21 South, Range 22 East, N.M.P.M.

All Sections

Township 22 South, Range 21 East, N.M.P.M.

Sections 1 through 12

Township 22 South, Range 22 East, N.M.P.M.

Sections 1 through 12

containing 318,187.13 acres, more or less,

in Eddy County, New Mexico.

TIGHT FORMATION APPLICATION
CASE NO. 7352

EXHIBIT "1"

Township 17 South, Range 24 East, N.M.P.M.

All Sections

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TIGHT FORMATION APPLICATION
CASE NO. 7352

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All Sections

Township 22 South, Range 21 East, N.M.P.M.

Sections 1 through 12

Township 22 South, Range 22 East, N.M.P.M.

Sections 1 through 12

containing 318,187.13 acres, more or less,

in Eddy County, New Mexico.

LAW OFFICES
LOSEE, CARSON & DICKERSON, P.A.
300 AMERICAN HOME BUILDING
P. O. DRAWER 239
ARTESIA, NEW MEXICO 88211-0239
AREA CODE 505
746-3508

A. J. LOSEE
JOEL M. CARSON
CHAD DICKERSON
DAVID R. VANDIVER

January 29, 1982

Mr. Richard L. Stamets, Examiner
Energy and Minerals Department
Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501

Re: Case No. 7352
Yates Petroleum Corporation
Tight Formation Application

Dear Dick:

As requested, enclosed please find a proposed Order for entry by the Division in connection with the captioned case.

Please let me know if you have any questions in connection with this matter.

Thank you.

Sincerely yours,

LOSEE, CARSON & DICKERSON, P.A.

Chad Dickerson

Chad Dickerson

CD:pvm
Enclosure

cc w/enclosure: Mr. Dave Boneau

LAW OFFICES
LOSEE, CARSON & DICKERSON, P. A.
300 AMERICAN HOME BUILDING
P. O. DRAWER 239
ARTESIA, NEW MEXICO 88210
AREA CODE 505

A. J. LOSEE
JOEL M. CARSON
CHAD DICKERSON
DAVID R. VANDIVER

RECEIVED
JUL 28 1981
OIL CONSERVATION DIVISION
SANTA FE

July 27, 1981

Case 7352

Mr. Joe D. Ramey, Director
Energy and Minerals Department
Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501

Dear Mr. Ramey:

Enclosed for filing, please find three copies of the Application of Yates Petroleum Corporation for Tight Formation Designation in Eddy County, New Mexico.

We ask that this case be set for hearing before an examiner not earlier than September 9, 1981, and that you furnish us with a docket of said hearing. The Exhibits will be submitted at least 15 days prior to hearing.

Thank you.

Sincerely yours,

LOSEE, CARSON & DICKERSON, P.A.

Chad Dickerson

Chad Dickerson

CD:pvm
Enclosures

cc: Yates Petroleum Corporation

~~August~~ 26, 1981

CASE__________

NSP: SF
Artesia

Application of Yates Petroleum Corporation for designation of a tight formation, Eddy County, New Mexico.

Applicant, in the above-styled cause, pursuant to Section 107 of the Natural Gas Policy Act and 18 CFR Section 271.701-705, seeks the designation as a tight formation of the Perm Penn formation underlying all of the following townships: Township 17 South, Ranges 24 thru 26 East; 18 South, 24 and 25 East; 19 South, 23 thru 25 East; 20 South, 21, 23, and 24 East; 20½ South, 21 and 22 East; and 21 South, 21 and 22 East. Also Sections 1 thru 12 in 22 South, 21 and 22 East, all of the above containing 315,000 acres, more or less.

RECEIVED
JUL 28 1981
OIL CONSERVATION DIVISION
SANTA FE

BEFORE THE OIL CONSERVATION DIVISION

OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF YATES PETROLEUM CORPORATION FOR TIGHT FORMATION DESIGNATION, EDDY COUNTY, NEW MEXICO

CASE NO. 7352

APPLICATION

COMES NOW Yates Petroleum Corporation, by its attorneys, and states:

1. Applicant is the owner of interests in the Permo-Penn formation underlying portions of the lands described on Exhibit "A" attached hereto and incorporated by reference.

2. Said formation underlying the lands described in Exhibit "A" is expected to have an average in situ gas permeability throughout the pay section 0.1 millidarcy or less.

3. The average depth to the top of said formation is 6,460 feet. The stabilized production rate, either at atmospheric pressure or calculated against atmospheric pressure of wells completed for production in the formation without stimulation, is not expected to exceed 217 MCF of gas per day.

4. No well drilled into said formation underlying the lands described on Exhibit "A" is expected to produce more than five barrels of crude oil per day prior to application of stimulation techniques or processes.

WHEREFORE, Applicant prays that the Division enter its Order recommending to the Federal Energy Regulatory Commission that, pursuant to Section 107 of the Natural Gas Policy Act of 1978, and 18 C.F.R. §271.701, the Permo-Penn Reservoir underyling the lands described in Exhibit "A" be designated as a tight formation, together with such other and further relief as the Division deems proper.

YATES PETROLEUM CORPORATION

By: Chad Dickerson
Chad Dickerson

LOSEE, CARSON & DICKERSON, P.A.
P. O. Drawer 239
Artesia, New Mexico 88210

Attorneys for Applicant

EXHIBIT "A"

Township 17 South, Range 24 East, N.M.P.M.

All Sections

Township 17 South, Range 25 East, N.M.P.M.

All Sections

Township 17 South, Range 26 East, N.M.P.M.

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All Sections

Township 22 South, Range 21 East, N.M.P.M.

Sections 1 through 12

Township 22 South, Range 22 East, N.M.P.M.

Sections 1 through 12

in Eddy County, New Mexico.

RECEIVED
JUL 28 1981
OIL CONSERVATION DIVISION
SANTA FE

BEFORE THE OIL CONSERVATION DIVISION

OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION :
OF YATES PETROLEUM CORPORATION :
FOR TIGHT FORMATION DESIGNATION, :
EDDY COUNTY, NEW MEXICO :

CASE NO. 7352

APPLICATION

COMES now Yates Petroleum Corporation, by its attorneys, and states:

1. Applicant is the owner of interests in the Permo-Penn formation underlying portions of the lands described on Exhibit "A" attached hereto and incorporated by reference.

2. Said formation underlying the lands described in Exhibit "A" is expected to have an average in situ gas permeability throughout the pay section 0.1 millidarcy or less.

3. The average depth to the top of said formation is 6,400 feet. The stabilized production rate, either at atmospheric pressure or calculated against atmospheric pressure of wells completed for production in the formation without stimulation, is not expected to exceed 217 mcf of gas per day.

4. No well drilled into said formation underlying the lands described on Exhibit "A" is expected to produce more than five barrels of crude oil per day prior to application of stimulation treatment or [illegible].

[illegible], applicant prays that the Division enter its [illegible] pursuant to Section [illegible] 271.703, [illegible] reservoir underlying [illegible]

Chad Dickerson

[illegible]

EXHIBIT "A"

Township 17 South, Range 24 East, N.M.P.M.

All Sections

Township 17 South, Range 25 East, N.M.P.M.

All Sections

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All Sections

[illegible]

All Sections

[illegible]

All Sections

[illegible]

All Sections

[illegible]

[illegible]

[illegible]

RECEIVED
JUL 28 1981
OIL CONSERVATION DIVISION
SANTA FE

BEFORE THE OIL CONSERVATION DIVISION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF YATES PETROLEUM CORPORATION FOR TIGHT FORMATION DESIGNATION, EDDY COUNTY, NEW MEXICO	:	CASE NO. 7352

APPLICATION

COMES NOW Yates Petroleum Corporation, by its attorneys, and states:

1. Applicant is the owner of interests in the Permo-Penn formation underlying portions of the lands described on Exhibit "A" attached hereto and incorporated by reference.

2. Said formation underlying the lands described in Exhibit "A" is expected to have an average in situ gas permeability throughout the pay section 0.1 millidarcy or less.

3. The average depth to the top of said formation is 6,460 feet. The stabilized production rate, either at atmospheric pressure or calculated against atmospheric pressure of wells completed for production in the formation without stimulation, is not expected to exceed [illegible] cf of gas per day.

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[illegible] Section [illegible] or [illegible] underlying [illegible] Divi- [illegible]

Chad Dickerson

[illegible]

Township 17 South, Range 24 East, N.M.P.M.

All Sections

Township 17 South, Range 25 East, N.M.P.M.

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All Sections

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All Sections

Township [illegible] South, Range 21 East, N.M.P.M.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Township 21 South, [illegible]

[illegible]

[illegible]

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION DIVISION FOR THE PURPOSE OF CONSIDERING:

RLS other initials on cover letter

Case No. 7352
Order No. R-6904

APPLICATION OF YATES PETROLEUM CORPORATION FOR DESIGNATION OF A TIGHT FORMATION, EDDY COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9:00 A.M. on October 21, 1981, at Santa Fe, New Mexico, before Examiner Richard L. Stamets.

NOW, on this _____ day of February, 1982, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner, and being fully advised in the premises,

FINDS:

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

(2) That the applicant, Yates Petroleum Corporation, requests that the Division recommend to the Federal Energy Regulatory Commission that the Permo-Penn formation underlying the lands situated in Eddy County, New Mexico, described in Exhibit "A" attached hereto and incorporated by reference ("the Subject Area"), be designated as a tight formation in accordance with Section 107 of the Natural Gas Policy Act of 1978, and 18 C.F.R. §271.701, et seq.

(3) That the Permo-Penn formation underlying the Subject Area is that stratigraphic interval between the top of a marker

named the Third Sister Cycle of the Wolfcamp series of the Permian system and the top of the Canyon series of the Pennsylvanian system.

(4) That the type section for the Permo-Penn formation is found at a depth of from approximately 5860 feet to 7060 feet on the Sonic log dated July 22, 1963, from the Sun (Tom Brown) Antelope Sink Unit Well No. 1, located in Unit G of Section 18, Township 19 South, Range 24 East, Eddy County, New Mexico.

(5) That the Permo-Penn formation in the Subject Area is a complex of shelf, bank and basin facies reflecting three major environments of deposition, trending basinward from the west and northwest and dipping to the east and southeast at approximately 100 feet per mile in most of the Subject Area. The shelf facies to the northwest is composed of deposits of interbedded limestones, shales, siltstones and sandstones, and is effectively non-porous and impermeable and acts as an up-dip seal to the bank facies; that the bank facies is composed mostly of marine limestones made up in large part of bioherms and their associated debris aprons with a few intercalated marine shales; that the basin facies to the southeast consists mainly of thin-bedded, fine-grained sandstones, siltstones and shales, within which are scattered isolated mounds of built-up carbonates, in some of which porosity occurs but many of which are effectively non-porous and impermeable.

(6) That as of January 1, 1981, the Permo-Penn formation underlying the Subject Area has been penetrated by 333 wells, 50 of which were completed in the Permo-Penn formation as of January 1, 1981; that the average depth to the top of the pay zone in these 50 wells is 6490 feet, and the productive interval in said wells begins several hundred feet below the top of the marker named the Third Sister Cycle; and from all available data there appears to be no other productive zones within the Permo-Penn formation; that the large number of wells drilled through the Permo-Penn formation in the Subject Area gives reasonably effective control over both the vertical limits of said formation, and the areal extent of the Subject Area.

(7) That the depth to the top of the Permo-Penn formation in the Subject Area varies from 4927 feet in the highest well drilled ~~in the Subject Area~~ to 6717 feet in the ~~lowest well; the~~ with
an the average depth to the top of such formation ~~of~~ 5822 feet, ~~in the Subject Area~~.

(8) The thickness of the Permo-Penn formation in the Subject Area varies from 1000 to 1400 feet, much of which is non-productive; the markers picked to define the Permo-Penn formation

are the only ones which can be accurately picked throughout the Subject Area to most closely isolate the productive zones for which tight formation designation is sought; that recognition of said markers will facilitate industry and regulatory analysis of the formation in question.

(9) That the average insitu permeability calculated from all available drill stem test data is 0.031 millidarcy. The average insitu permeability from the only core data available is 0.035 millidarcy, thus confirming the drill stem test data.

(10) That the average production rate in the 10 available drill stem tests was 105 Mcf per day and the average production rate against atmospheric pressure for the 34 completed and stimulated wells that have approached stabilized conditions was 146 Mcf per day; that the drill stem test data should more closely represent average production rates inasmuch as the actual production figures are from wells in which production has been enhanced by stimulation.

(11) That maximum liquid production in any well at stabilized conditions is 4.1 barrels of oil per day and average production is 0.6 barrels of oil per day.

(12) That the data available indicate that the Permo-Penn formation in the Subject Area meets all the criteria set forth in 18 C.F.R. §271.701, et seq, viz:

(a) the estimated average insitu permeability throughout the pay section is expected to be less than 0.1 millidarcy;

(b) the stabilized production rate, against atmospheric pressure, of wells completed for production in the formation, without stimulation, is not expected to exceed 188 Mcf per day at the average depth to the top of the formation of 5822 feet;

(c) no well drilled into the formation is expected to produce without stimulation more than five barrels of oil per day; and

(d) the Division has not authorized the formation or any portion thereof to be developed by infill drilling.

(13) That the Artesian acquifer within the proposed area

has its base at depths from 1000 feet to 1400 feet or approximately 4500 feet above the Permo-Penn formation.

(14) That existing State of New Mexico and Federal Regulations relating to casing and cementing of wells will assure that development of the Permo-Penn formation will not adversely affect the Artesian acquifer or other shallower acquifers.

(15) That the Permo-Penn formation within the Subject Area should be designated as a tight formation.

IT IS THEREFORE ORDERED:

(1) That it be, and hereby is recommended to the Federal Energy Regulatory Commission pursuant to Section 107 of the Natural Gas Policy Act of 1978, and 18 C.F.R. §271.701, et seq, that the Permo-Penn formation underlying the Subject Area be designated as a tight formation.

(2) That jurisdiction of this cause be retained for the entry of such further orders as the Division may deem necessary.

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

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

JOE D. RAMEY
Director

CASE NO. 7352
ORDER NO. R-6904

EXHIBIT "A"

Township 17 South, Range 24 East, N.M.P.M.

All Sections

Township 17 South, Range 25 East, N.M.P.M.

All Sections

Township 17 South, Range 26 East, N.M.P.M.

All Sections

Township 18 South, Range 24 East, N.M.P.M.

All Sections

Township 18 South, Range 25 East, N.M.P.M.

All Sections

Township 19 South, Range 23 East, N.M.P.M.

All Sections

Township 19 South, Range 24 East, N.M.P.M.

All Sections

Township 19 South, Range 25 East, N.M.P.M.

All Sections

Township 20 South, Range 21 East, N.M.P.M.

All Sections

Township 20 South, Range 23 East, N.M.P.M.

All Sections

Township 20 South, Range 24 East, N.M.P.M.

All Sections

Township 20-1/2 South, Range 21 East, N.M.P.M.

All Sections

Township 20-1/2 South, Range 22 East, N.M.P.M.

All Sections

Township 21 South, Range 21 East, N.M.P.M.

All Sections

Township 21 South, Range 22 East, N.M.P.M.

All Sections

Township 22 South, Range 21 East, N.M.P.M.

Sections 1 through 12

Township 22 South, Range 22 East, N.M.P.M.

Sections 1 through 12

containing 318,187.13 acres, more or less, in Eddy County, New Mexico.

WELL NAME: Box Canyon #4A

LOCATION: 23-21S-21E

DST INTERVAL: 5876-6051

$p^* = 1904$ psi slope (M) = 92 psi/cycle

$T_c = 365\ ^\circ R$ $P_c = 670$ psi

$T = 130 + 460° = 590°R$ $P_{wf} = 1592$ psi

$$P_{avg} = \frac{P^* + P_{wf}}{2} = \frac{1904 + 1592}{2} = 1748 \text{ psi (Note 1)}$$

$$T_r = \frac{T}{T_c} = \frac{590}{365} = 1.62$$

$$P_r = \frac{P_{avg}}{P_c} = \frac{1748}{670} = 2.61$$

$Z = 0.84$ $T_{sc} = 520°R$ $P_{sc} = 13.3$ psi

$$B_g = Z \cdot \frac{T}{T_{sc}} \cdot \frac{P_{sc}}{P_{avg}} = 0.84 \cdot \frac{590}{520} \cdot \frac{13.3}{1748} = 0.0073 \text{ (Note 1)}$$

$q = 25$ mcfd $\cdot$ 178.1 = 4452.50 b/d

$u = (0.0114)(1.3) = 0.0148$ cp (Note 2)

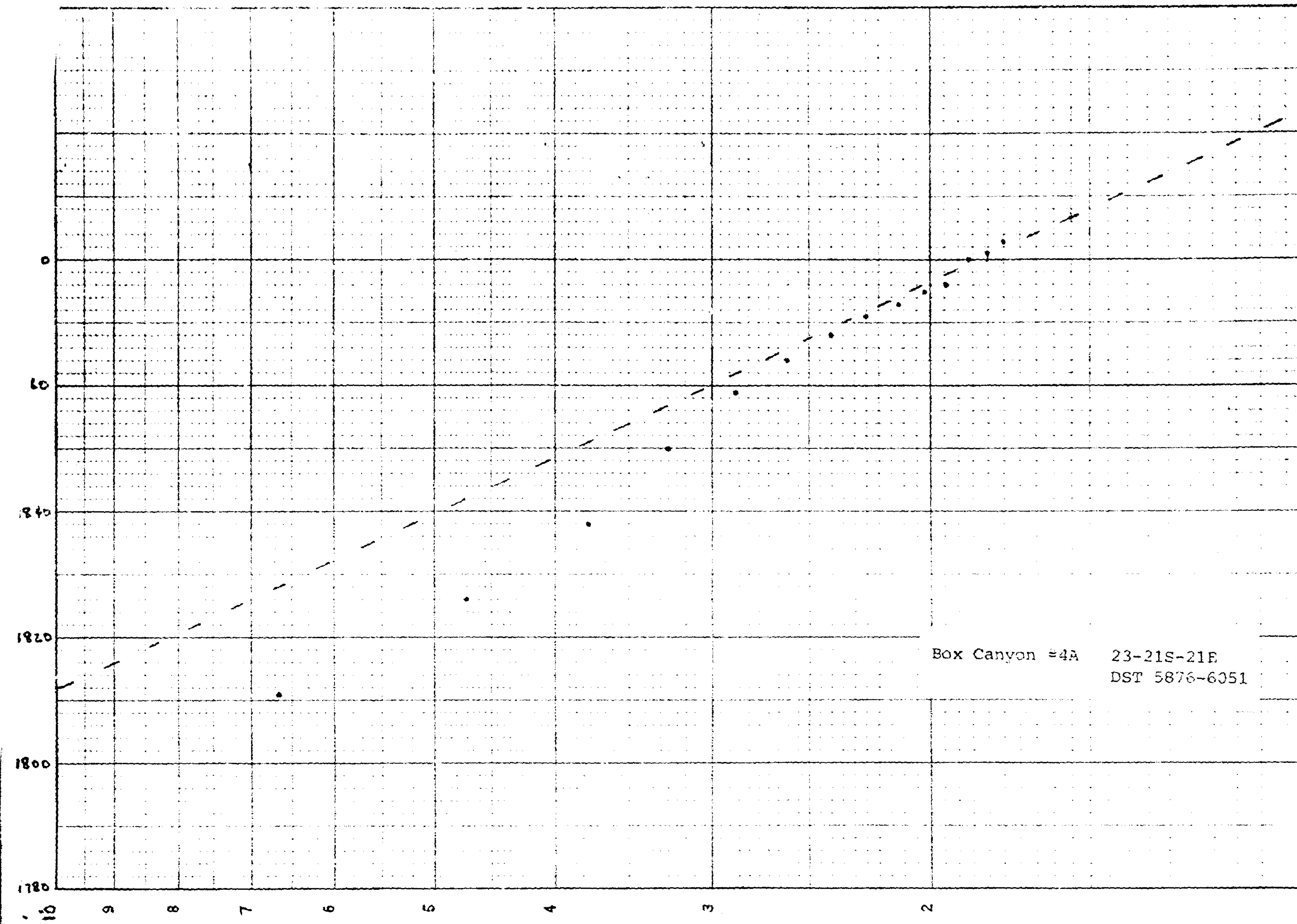
$$kh = \frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6\ (4452.5)\ (0.0148)\ (0.0073)}{92}$$

$kh = 0.8502$ md $\cdot$ ft

$h = 40$ ft (Note 3)

$k = 0.021$ md

1) C.S. Matthews - D.G. Russell eqn 3.21a
2) C.S. Matthews - D.G. Russell Fig. G.3A&B
3) h estimated from log



Box Canyon #4A
23-21S-21E
DST 5876-6051
0
60
1840
1820
1800
1780
10
9
8
7
6
5
4
3
2

EL PASO NATURAL GAS COMPANY

RPT-A[illegible] [illegible] CHROMATOGRAPHIC GAS ANALYSIS REPORT

RPT DATE 07 27 79 METER STA 61929

ANAL DATE 07 [illegible] METER STATION NAME OPER 9641

[illegible] 4A #1

TYPE CODE	SAMPLE DATE	EFF. DATE	USE ADJ.	SCALE	H2S GRAINS	LOCATION
00	07 10 79	07 27 79	0[illegible]		0000*	1 J 13

	NORMAL MOLS	GPM
C O 2	00.00	0.000
H 2 S	00.00*	0.000
N2	01.09	0.000
METHANE	90.35	0.000
ETHANE	05.34	1.427
PROPANE	01.83	0.503
ISO-BUTANE	00.33	0.106
NORM-BUTANE	00.51	0.161
ISO-PENTANE	00.17	0.062
NORM-PENTANE	00.14	0.051
HEXANE PLUS	00.24	0.105
TOTALS	100.00	2.41[illegible]

SPECIFIC GRAVITY 0.62[illegible]

MIXTURE HEATING VALUE
(BTU/CF @ 14.7[illegible] PSIA,[illegible] DEGREES,DRY) 1111

RATIO OF SPECIFIC HEAT [illegible]99

* NO TEST [illegible] FOR DETERMINATION H2S CONTENT.

FLUID SAMPLE DATA

Sampler Pressure	1850 P.S.I.G. at Surface
Recovery: Cu. Ft. Gas	3.2
cc. Oil	
cc. Water	1800
cc. Mud	
Tot. Liquid cc.	1800
Gravity	° API @ °F.
Gas/Oil Ratio	cu. ft./bbl.

	RESISTIVITY		CHLORIDE CONTENT
Recovery Water	@	°F.	ppm
Recovery Mud	@	°F.	ppm
Recovery Mud Filtrate	@	°F.	ppm
Mud Pit Sample	@	°F.	25,000 ppm
Mud Pit Sample Filtrate	@	°F.	ppm

Mud Weight 9 vis 42 sec

Date	2-4-78	Ticket Number	253334
Kind of Job	STRADDLE OPEN HOLE	Halliburton District	ARTESIA
Tester	PITTMAN LAMAR	Witness	JONAS
Drilling Contractor	MORANCO RIG # 5		DR

EQUIPMENT & HOLE DATA

Formation Tested	Upper Canyon
Elevation	4592' Ft.
Net Productive Interval	32 Ft.
All Depths Measured From	Kelly Drive Bushing (13')
Total Depth	8400' Ft.
Main Hole/Casing Size	7 7/8"
Drill Collar Length	430' I.D. 2.25"
Drill Pipe Length	5404' I.D. 3.826"
Packer Depth(s)	5870-5876-6051-6057' Ft.
Depth Tester Valve	5863' Ft.

Cushion TYPE	AMOUNT	Depth Back Pres. Valve	Surface Choke	Bottom Choke
	Ft.		1" Adj.	.75"

Recovered	Approximately 200	Feet of	drilling mud
Recovered	Approximately 2000	Feet of	formation fluid
Recovered		Feet of	
Recovered		Feet of	
Recovered		Feet of	

Meas. From Tester Valve

Remarks SEE PRODUCTION TEST DATA SHEET

TEMPERATURE	Gauge No. 512		Gauge No. 113		Gauge No.		TIME	
	Depth: 5964 Ft.		Depth: 5905 Ft.		Depth: Ft.			
Calc.	24 Hour Clock		24 Hour Clock		Hour Clock		Tool	A.M.
Est. 130 °F.	Blanked Off No		Blanked Off Yes		Blanked Off		Opened 1000	P.M.
							Opened 1530	A.M.
Actual °F.	Pressures		Pressures		Pressures		Bypass	P.M.
	Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic	2836	2817	2857	2846				
First Period Flow Initial	355	446	398	575			—	—
First Period Flow Final	801	781	519	811			30	30
First Period Closed in	1895	1896	1904	1909			90	90
Second Period Flow Initial	749	733	767	759			—	—
Second Period Flow Final	1591	1592	1626	1622			90	90
Second Period Closed in	1895	1883	1904	1893			120	120
Third Period Flow Initial							—	—
Third Period Flow Final								
Third Period Closed in								
Final Hydrostatic	2809	2800	2830	2829			—	—

Legal Location Sec. - Twp. - Rng. 23-21-21

Field Area WILDCAT

County EDDY

State NEW MEXICO

FORMATION TEST DATA

Gauge No. 512	Depth 5864'	Clock No. 13736	24 hour	Ticket No. 253334

	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$\log \frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$\log \frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$\log \frac{t+\theta}{\theta}$	PSIG Temp. Corr.
0	.000	446	.000		781	.000	733	.000		1592					
1	.0167	396	.0201		1745	.0503	797	.0269		1788					
2	.0333	485	.0403		1805	.1007	1158	.0537		1811					
3	.0500	526	.0604		1832	.1510	1318	.0806		1826					
4	.0667	628	.0805		1850	.2013	1435	.1075		1838					
5	.0834	720	.1007		1860	.2517	1525	.1344		1850					
6	.1000	781	.1208		1864	.3020	1592	.1612		1859					
7			.1409		1868			.1881		1864					
8			.1610		1868			.2150		1868					
9			.1812		1869			.2418		1871					
10			.2013		1873			.2687		1873					
11			.2214		1877			.2956		1875					
12			.2416		1884			.3224		1876					
13			.2617		1888			.3493		1880					
14			.2818		1892			.3762		1881					
15			.3020		1896			.4030		1883					

Gauge No. 113	Depth 5905'	Clock No. 13528	hour 24

	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
0	.000	575	.000		811	.000	759	.000		1622					
1	.0172	422	.0203		1765	.050	996	.0272		1804					
2	.0343	519	.0405		1816	.100	1180	.0544		1827					
3	.0515	549	.0608		1848	.150	1334	.0816		1841					
4	.0687	656	.0811		1865	.200	1455	.1088		1855					
5	.0859	739	.1014		1874	.250	1549	.1360		1862					
6	.1030	811	.1216		1880	.300	1622	.1632		1872					
7			.1419		1882			.1904		1878					
8			.1622		1884			.2176		1881					
9			.1824		1885			.2448		1884					
10			.2027		1889			.2720		1885					
11			.2230		1893			.2992		1886					
12			.2432		1898			.3264		1889					
13			.2635		1902			.3536		1890					
14			.2838		1906			.3808		1892					
15			.3040		1909			.4080		1893					
Reading Interval	5		6			15		8							Minutes

REMARKS:

Casing perfs. ______ Bottom choke .75" ______ Surf. temp ______ °F Ticket No. 253334
Gas gravity ______ Oil gravity ______ GOR ______
Spec. gravity ______ Chlorides ______ ppm Res. ______ @ ______ °F
INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED 1/4 x 60 PSI gauge

Date Time a.m. p.m.	Choke Size	Surface Pressure psi	Gas Rate MCF	Liquid Rate BPD	Remarks
1000		1 1/2#			Opened tool with a good blow
1005	1/4"	35	73.50		Opened on 1/4" choke
1010	"	53	99.96		Gas to surface
1015	"	55	102.90		
1020	"	57	105.84		Started losing pressure
1025	"	52	98.49		-
1030	"	43	85.26		Closed tool
1200	"	0	-		Opened tool
1205	"	0	-		
1210	"	0	-		
1215	"	0	-		
1230	"	2	24.99		Pressure climbing
1245	"	5	29.40		
1200	"	2	24.99		
1215	"	2	24.99		
1330	"	2	24.99		Closed tool
1530					Pulled loose and started out of hole.
1600					Pulled 7 stands and reversed out.
					NOTE: Attemped to straddle section at
					6304'-6490', could not hook, came up
					and straddled section at 5876'-6051'.
					Got hook to set and went on with test.

PRODUCTION TEST DATA

FORMATION DENSITY

COMPANY

WELL

FIELD Box Canyon

COUNTY Eddy STATE New Mexico

LOCATION

Other Services:

Permanent Datum:	GL Elev. 4592
Log Measured From	KB 13 Ft. Above Perm. Datum
Drilling Measured From	KB

Elev.: K.B. 4605
D.F.
G.L. 4592

Date	2-2-78			
Run No.	ONE			
Depth—Driller	8400			
Depth—Logger	8401			
Btm. Log Interval	8400			
Top Log Interval	Surface			
Casing—Driller	8 5/8 @ ~~1486~~/1498	@	@	@
Casing—Logger	1492			
Bit Size	7 7/8			
Type Fluid in Hole	S.W. Mud			
Dens. / Visc.	8.8 / 42			
pH / Fluid Loss	8.5 / 8.0 ml	ml	ml	ml
Source of Sample	Pit			
Rm @ Meas. Temp.	.232 @ 62 °F	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	.186 @ 62 °F	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	- @ - °F	@ °F	@ °F	@ °F
Source: Rmf / Rmc	M / -			
Rm @ BHT	.114 @ 126 °F	@ °F	@ °F	@ °F
TIME Circulation Stopped	1745 (2-2)			
TIME Logger on Bottom	5:50 (2-3)			
Max. Rec. Temp.	126 °F	°F	°F	°F
Equip. Location				

COUNTY, FIELD, LOCATION, WELL, COMPANY

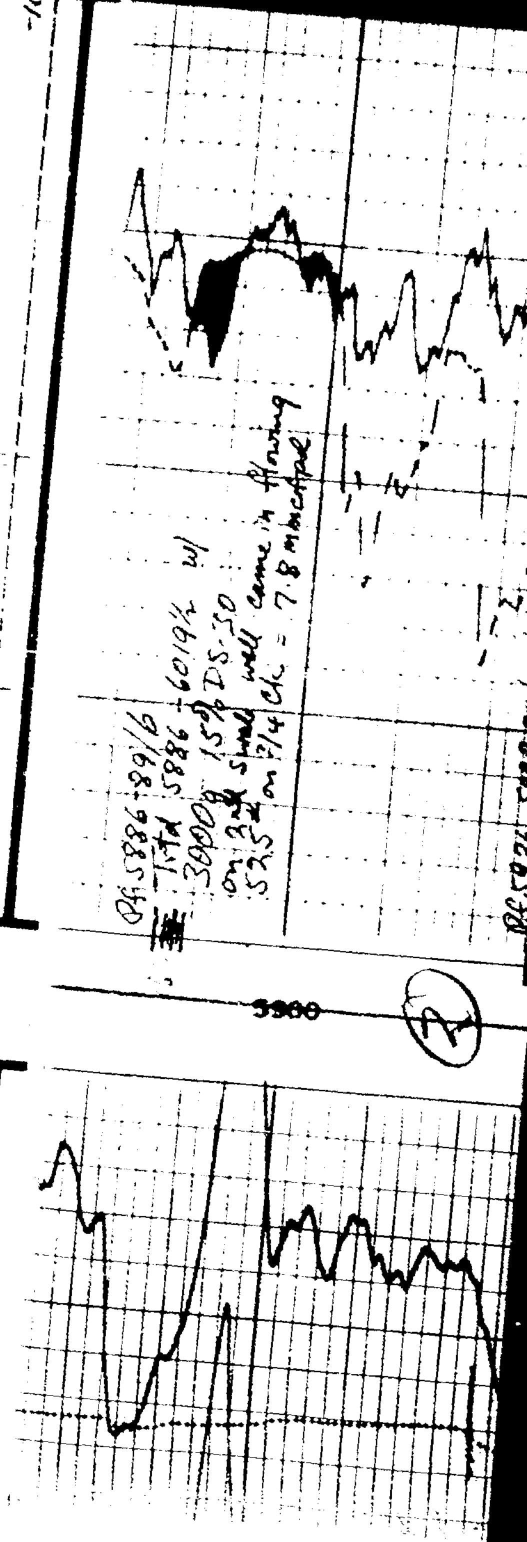
The well name, location and borehole reference data were furnished by the customer.

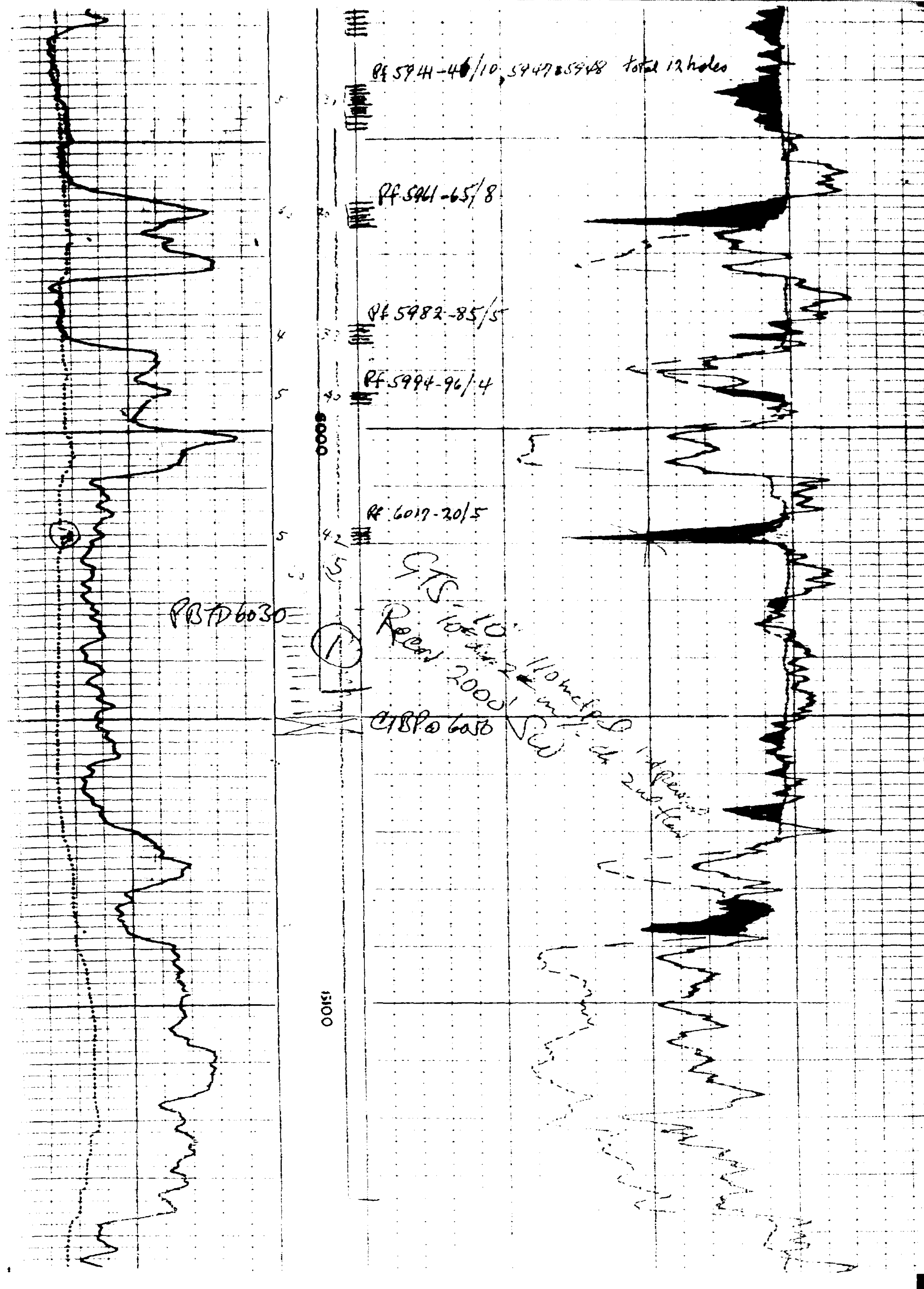
POROSITY INDEX % Limestone MATRIX
COMPENSATED FORMATION DENSITY POROSITY
COMPENSATED NEUTRON POROSITY

DEPTH

CALIPER DIAM. IN INCHES

GAMMA RAY API UNITS 100 200





Pf 5944-46/10, 5947 & 5948 total 12 holes
Pf 5961-65/8
Pf 5982-85/5
Pf 5994-96/4
6000
Pf 6017-20/5
PBTD 6030
CIBP @ 6050
6100

WELL NAME: La Cama #1

LOCATION: 20-18S-25E

DST INTERVAL: 6812-7000

$p^* = 2418$ psi slope (M) = 392 psi/cycle

$T_c = 374^\circ R$ $P_c = 677$ psi

measured

$T = 128 + 460^\circ = 588^\circ R$ $P_{wf} = 551$ psi

$$P_{avg} = \frac{P^* + P_{wf}}{2} = \frac{2418 + 551}{2} = 1484.5 \text{ psi (Note 1)}$$

$$T_r = \frac{T}{T_c} = \frac{588}{374} = 1.57$$

$$P_r = \frac{P_{avg}}{P_c} = \frac{1484.5}{667} = 2.23$$

$Z = 0.84$ $T_{sc} = 520^\circ R$ $P_{sc} = 13.3$ psi

$$B_g = Z \cdot \frac{T}{T_{sc}} \cdot \frac{P_{sc}}{P_{avg}} = 0.84 \cdot \frac{588}{520} \cdot \frac{13.3}{1484.5} = 0.0085 \text{ (Note 1)}$$

$q = 390$ mcfd $\cdot$ 178.1 = 69459 b/d (Note 2)

$u = (1.26)(0.0112) = 0.0141$ cp (Note 3)

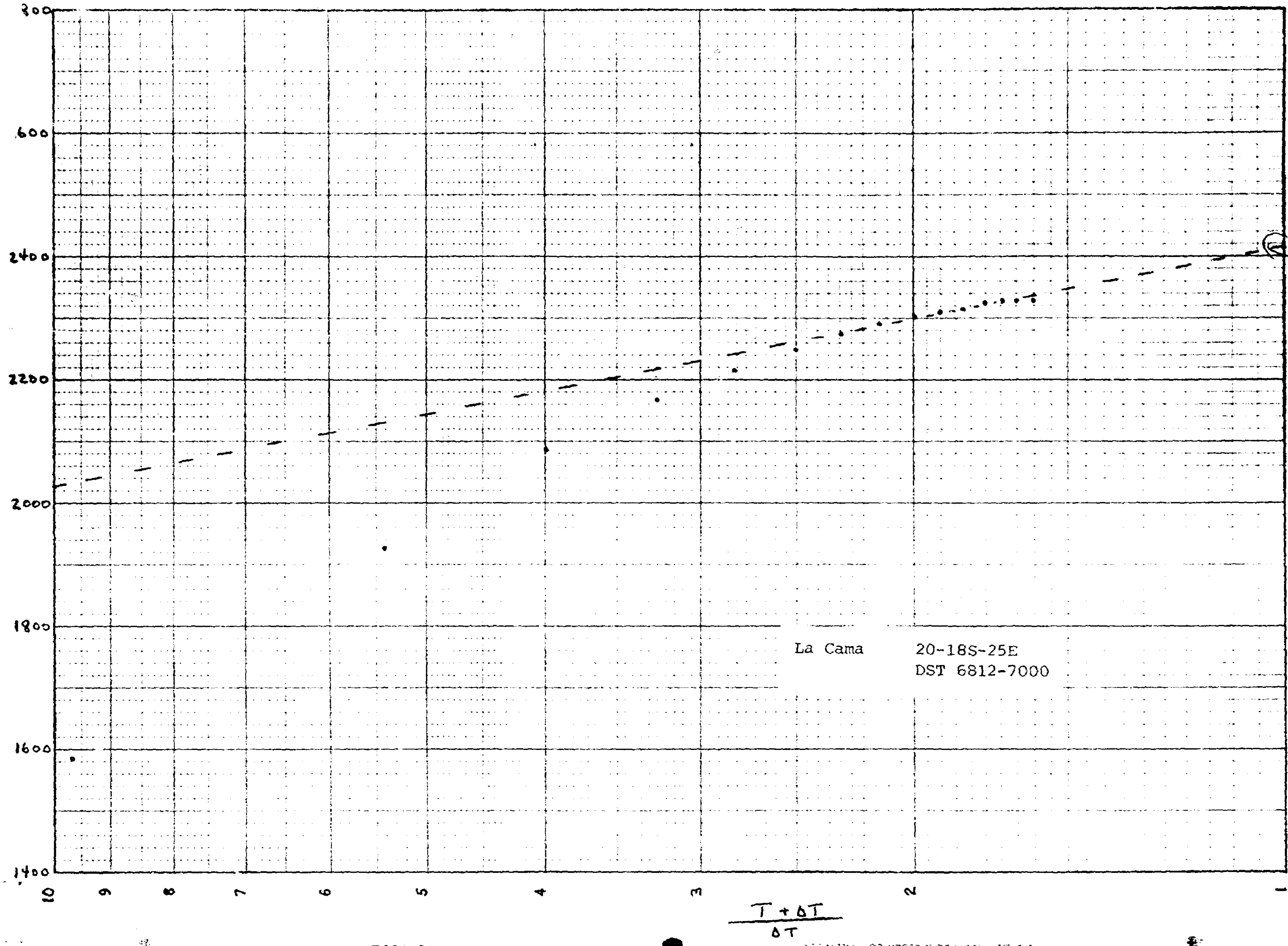
$$kh = \frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6\,(69459)\,(0.0141)\,(0.0085)}{392}$$

$kh = 345$ md $\cdot$ ft

$h = 38$ ft (Note 4)

$k = 0.091$ md

1) C.S. Matthews - D.G. Russell eqn. 3.21a
2) Flow rate is natural flow rate as reported on Drilling Report. Flow during DST was actually less.
3) C.S. Matthews - D.G. Russell Fig. G.3A&B
4) h estimated from Log



46 4652

K&E SEMI-LOGARITHMIC 3 CYCLES X 70 DIVISIONS KEUFFEL & ESSER CO.

FLUID SAMPLE DATA

Sampler Pressure ________ P.S.I.G. at Surface

Recovery: Cu. Ft. Gas ________

cc. Oil ________

cc. Water ________

cc. Mud ________

Tot. Liquid cc. ________

Gravity ________ ° API @ ________ °F.

Gas/Oil Ratio ________ cu. ft./bbl.

	RESISTIVITY		CHLORIDE CONTENT
Recovery Water	@	°F.	ppm
Recovery Mud	@	°F.	ppm
Recovery Mud Filtrate	@	°F.	ppm
Mud Pit Sample	@	°F.	ppm
Mud Pit Sample Filtrate	@	°F.	ppm

Mud Weight 9.3 vis sec

Date 10-9-77 Ticket Number 139167

Kind of Job OPEN HOLE TEST Halliburton District ARTESIA

Tester RAINES Witness J. MC DONALD

Drilling Contractor MORAN BROTHERS DRILLING COMPANY PW

EQUIPMENT & HOLE DATA

Formation Tested Cisco

Elevation 3578' Ft.

Net Productive Interval 16' Ft.

All Depths Measured From Kelly Bushing- AGL 3593'

Total Depth 7000' Ft.

Main Hole/Casing Size 7 7/8"

Drill Collar Length 379' ? I.D. 2.250"

Drill Pipe Length 6448' I.D. 3.340"

Packer Depth(s) 6800'- 6806' - 6812' Ft.

Depth Tester Valve 6775' Ft.

Cushion TYPE AMOUNT Ft. Depth Back Pres. Valve Surface Choke 3/8" Botton Choke .75"

Recovered 1383 Feet of drilling mud - 500' of water.

Recovered Feet of

Recovered Feet of

Recovered Feet of

Recovered Feet of

Meas. From Tester Valve

Remarks

SEE PRODUCTION TEST DATA SHEET.....

TEMPERATURE	Gauge No. 1114 Depth: 6784 Ft.		Gauge No. 1113 Depth: 6844 Ft.		Gauge No. Depth: Ft.		TIME	
	24 Hour Clock		24 Hour Clock		Hour Clock		Tool Opened	1315 A.M. P.M.
Est. °F.	Blanked Off No		Blanked Off no		Blanked Off		Opened Bypass	2330 A.M. P.M.
Actual 127 °F.	Pressures		Pressures		Pressures			
	Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic	3461	3286	3320	3299				
First Period Flow Initial	249	269	282	366			—	—
First Period Flow Final	392	400	405	405			45	45
First Period Closed in	2178	2157	2149	2149			90	90
Second Period Flow Initial	392	555	370	594			—	—
Second Period Flow Final	551	551	563	549			180	179
Second Period Closed in	2320	2327	2324	2327			300	301
Third Period Flow Initial							—	—
Third Period Flow Final								
Third Period Closed in								
Final Hydrostatic	3264	3273	3285	3288			—	—

Legal Location Sec. - Twp. - Rng. 20 - 18 - 25

Well No.

Test No.

Field Area DINKUS RANCH

Tested Interval 6812' - 6828'

County EDDY

Lease Owner/Company Name

State NEW MEXICO

FORM 181-R2—PRINTED IN U.S.A.

FORMATION TEST DATA

LITTLE'S 102548 5M 3/76

11

Gauge No.	1114	Depth	6784'	Clock No.	4365	24 hour	Ticket No.	139167

	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$Log \frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$Log \frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$Log \frac{t+\theta}{\theta}$	PSIG Temp. Corr.
0	.000	269	.000		400	.000	555	.000		551					
1	.0164*	254	.0298		1048	.0969**	415	.0692***		1585					
2	.0428	295	.0596		1433	.1971	448	.1351		1926					
3	.0691	317	.0894		1658	.2973	488	.2010		2086					
4	.0954	349	.1192		1809	.3975	514	.2669		2164					
5	.1217	377	.1490		1913	.4978	535	.3329		2217					
6	.1480	400	.1788		1989	.5980	551	.3988		2251					
7			.2086		2046			.4646		2276					
8			.2384		2091			.5306		2292					
9			.2682		2128			.5965		2304					
10			.2980		2157			.6624		2313					
11								.7283		2318					
12								.7942		2324					
13								.8601		2326					
14								.9260		2327					
15								.9920		2327					

Gauge No.	1113	Depth	6844'	Clock No.	13433	24 hour

0	.000	366	.000		405	.000	594	.000		549					
1	.0167*	271	.0300		1044	.0964**	415	.0698***		1552					
2	.0433	305	.0600		1422	.1961	449	.1362		1908					
3	.0700	322	.0900		1646	.2958	484	.2027		2066					
4	.0967	352	.1200		1796	.3956	512	.2691		2156					
5	.1234	379	.1500		1901	.4953	533	.3356		2210					
6	.1500	405	.1800		1977	.5950	549	.4020		2247					
7			.2100		2038			.4685		2271					
8			.2400		2084			.5349		2288					
9			.2700		2121			.6014		2301					
10			.3000		2149			.6678		2311					
11								.7343		2316					
12								.8007		2320					
13								.8672		2323					
14								.9336		2325					
15								1.0000		2327					
Reading Interval	8		9			30		20							Minutes

REMARKS: * = 5 minute interval. ** = 29 minute interval. *** = 21 minute interval.

SPECIAL PRESSURE DATA

Casing perfs	Bottom choke .75"	Surf. temp °F	Ticket No. 139167
Gas gravity	Oil gravity	GOR	
Spec. gravity	Chlorides ppm	Res. @ °F	

INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED

Date Time a.m. p.m.	Choke Size	Surface Pressure psi	Gas Rate MCF	Liquid Rate BPD	Remarks
1315	3/8"	1#			Opened tool with a good blow.
1320	"	5			Good blow.
1325	"	15			Good blow - no gas.
1330	"	20			"
1335	"	23	129.20		Gas to the surface in 20 minutes.
1340	"	24	132.60		Flared gas.
1345	"	24	132.60		"
1350	"	"	"		"
1355	"	23	129.20		"
1400	"	"	"		" Closed tool.
1530	"	2			Reopened tool with a good blow.
1535	"	28	146		Gas to flare in 3 minutes.
1545	"	43	197		Gas flare.
1600	"	34	166		"
1615	"	25	136		"
1630	"	20	119		"
1645	"	17	108		"
1700	"	18	112		"
1730	"	23	129		"
1800	"	24	132		Slight increase.
1830	"	25	136		Closed tool.
2330					Opened bypass - pulled loose.

PRODUCTION TEST DATA

DENSITY

COMPANY MORRIS R. ANTWELL

WELL LA CAMA # 1

FIELD DINKUS RANCH

COUNTY EDDY STATE NEW MEXICO

LOCATION 1980' FNL & 1980' FWL

COUNTY EDDY
FIELD DINKUS RANCH
LOCATION
WELL LA CAMA # 1
COMPANY MORRIS R. ANTWELL

API SERIAL NO	SEC	TWP	RANGE
	20	18-S	25-E

Other Services: DLL

Permanent Datum: G.L. ; Elev.: 3578
Log Measured From K.B. 15 Ft. Above Perm. Datum
Drilling Measured From K.B.

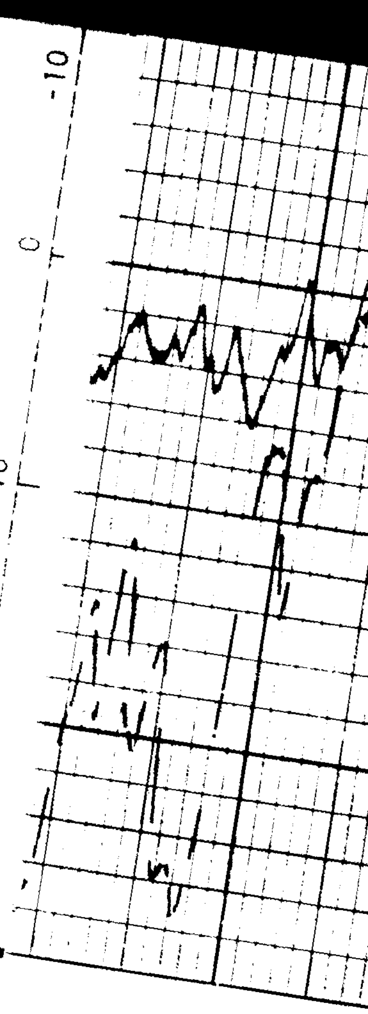
Elev.: K.B. 3593
D.F. 3592
G.L. 3578

Date	10-5-77			
Run No.	ONE			
Depth—Driller	8750			
Depth—Logger	8742			
Btm. Log Interval	8741			
Top Log Interval	SURFACE			
Casing—Driller	8 5/8 @ 1200	@	@	@
Casing—Logger	1203			
Bit Size	7 7/8			
Type Fluid in Hole	BRINE-GEL			
Dens. | Visc.	9.3 | 60	|	|	|
pH | Fluid Loss	10 | 6 ml	| ml	| ml	| ml
Source of Sample	PIT			
Rm @ Meas. Temp.	.11 @ 86 °F	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	.082 @ 86 °F	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	.16 @ 86 °F	@ °F	@ °F	@ °F
Source: Rmf | Rmc	M | C	|	|	|
Rm @ BHT	.066 @ 148 °F	@ °F	@ °F	@ °F
TIME Circulation Stopped	0630			
TIME Logger on Bottom	1230			
Max. Rec. Temp.	148 °F	°F	°F	°F
Equip. | Location	7732 | HOBBS	|	|	|
Recorded By	RAFF			

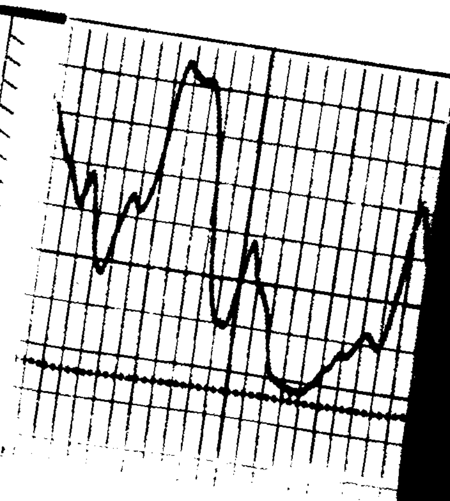
FOLD HERE

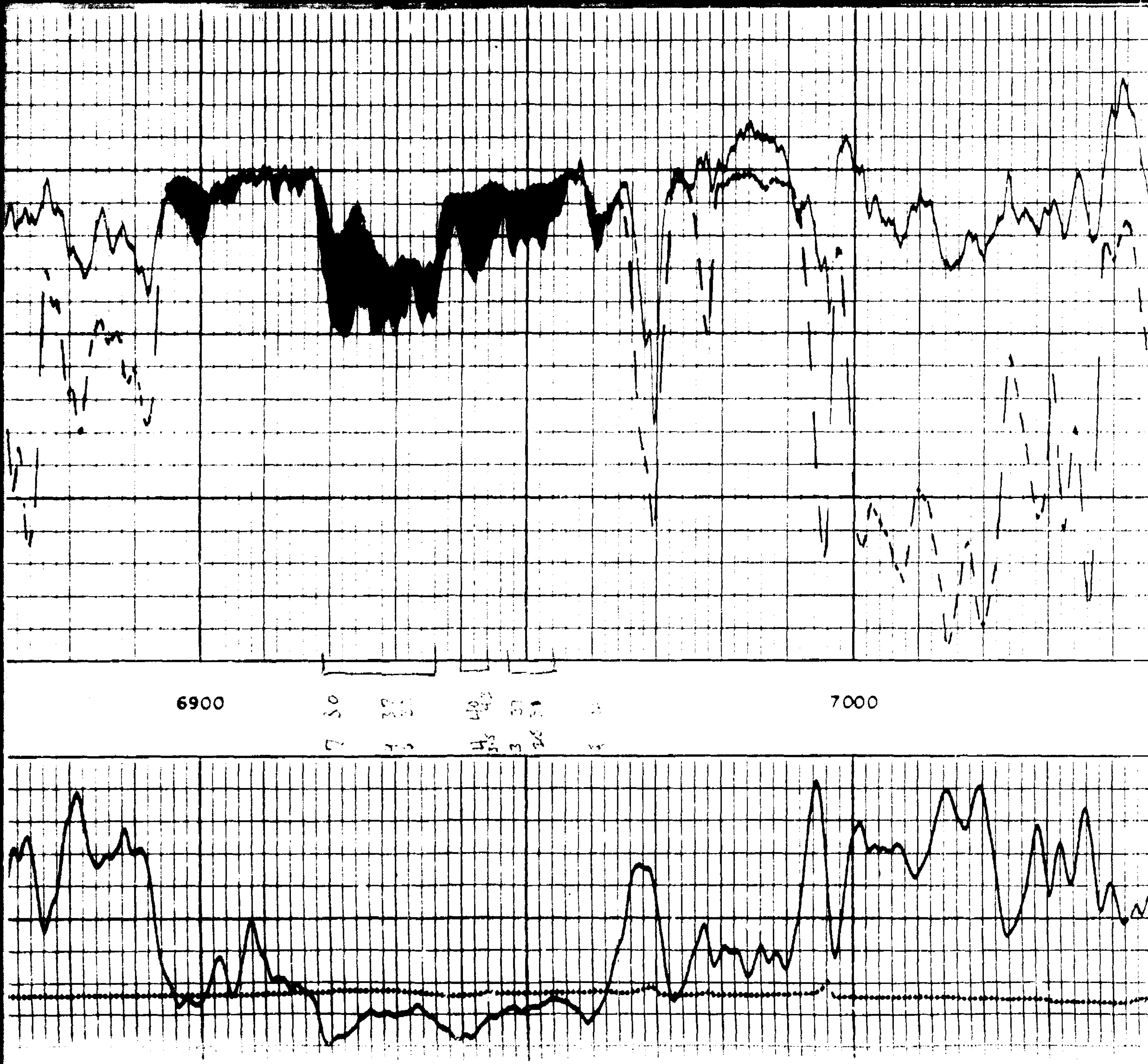
The well name, location and borehole reference data were furnished by the customer.

POROSITY INDEX (%) LIME MATRIX
COMPENSATED FORMATION DENSITY POROSITY -10 0 10 20 30
COMPENSATED NEUTRON POROSITY -10 0 10 20 30



CALIPER DIAM. IN INCHES 16
GAMMA RAY API UNITS 0 100 200

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7000

EL PASO NATURAL GAS COMPANY

RPT-ASL 314 CHROMATOGRAPHIC GAS ANALYSIS REPORT

RPT DATE 02 03 81 METER STA 61894
ANAL DATE 01 29 81 METER STATION NAME OPER 9841
LA CAMA COM #1

TYPE CODE	SAMPLE DATE	EFF. DATE	USE MOS.	SCALE	H2S GRAINS	LOCATION
00	01 21 81	02 03 81	06		0000*	1 J 1

	NORMAL MOL%	GPM
C O 2	00.00	0.000
H 2 S	00.00*	0.000
N2	01.74	0.000
METHANE	83.51	0.000
ETHANE	08.93	2.387
PROPANE	03.21	0.883
ISO-BUTANE	00.36	0.118
NORM-BUTANE	01.14	0.359
ISO-PENTANE	00.34	0.124
NORM-PENTANE	00.35	0.127
HEXANE PLUS	00.42	0.183
TOTALS	100.00	4.181

SPECIFIC GRAVITY 0.684

MIXTURE HEATING VALUE
(BTU/CF @ 14.73 PSIA,60 DEGREES,DRY) 1187

RATIO OF SPECIFIC HEATS 1.287
* NO TEST SECURED FOR DETERMINATION H2S CONTENT.

WELL NAME: Cities JG State #1

LOCATION: 13-18S-24E

DST INTERVAL: 6544-6865

$P^* = 2312$ psi slope (M) = 260 psi/cycle

$T_c = 377$ °R $P_c = 669$ psi

$T = 122 + 460° = 582$ °R $P_{wf} = 116$ psi

$$P_{avg} = \frac{P^* + P_{wf}}{2} = \frac{2312 + 116}{2} = 1214 \text{ psi} \quad \text{(Note 1)}$$

$$T_r = \frac{T}{T_c} = \frac{582}{377} = 1.54$$

$$P_r = \frac{P_{avg}}{P_c} = \frac{1214}{669} = 1.81$$

$Z \doteq 0.885$ $T_{sc} = 520$°R $P_{sc} = 13.3$ psi

$$B_g = Z \cdot \frac{T}{T_{sc}} \cdot \frac{P_{sc}}{P_{avg}} = 0.885 \cdot \frac{582}{520} \cdot \frac{13.3}{1214} = 0.0109 \quad \text{(Note 1)}$$

$q = 189$ mcfd $\cdot$ 178.1 = 33660.9 b/d

$u = (1.2)\ (0.0114) = 0.0137$ cp (Note 2)

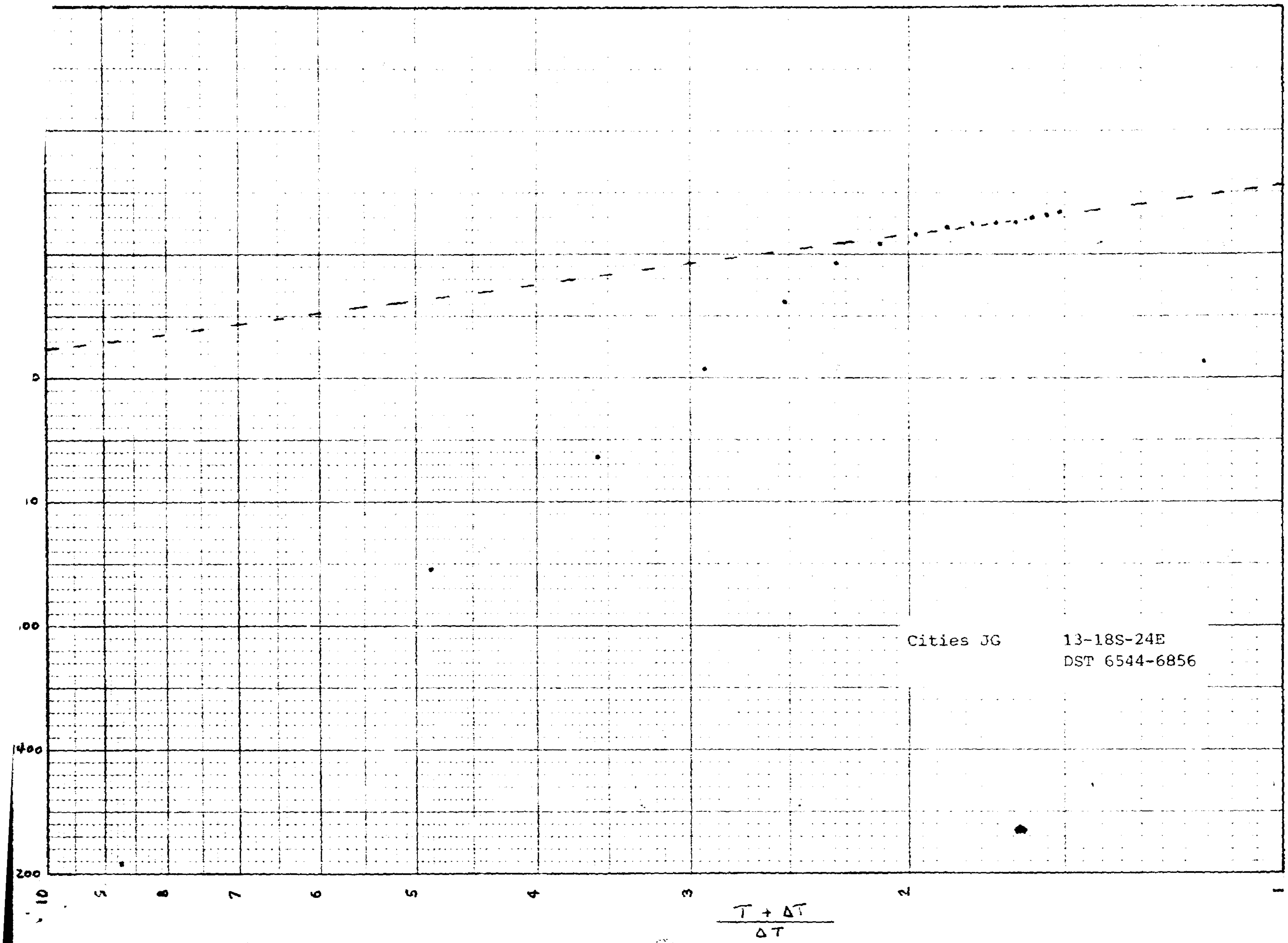
$$kh = \frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6\ (33660.9)\ (0.0137)\ (0.0109)}{260}$$

$kh = 3.144$ md $\cdot$ ft

$h = 45$ ft (Note 3)

$k = 0.69$ md

1) C.S. Matthews - D.G. Russell eqn. 3.21a
2) C.S. Matthews - D.G Russell Fig. G.3A&B
3) h estimated from Log


Cities JG
13-18S-24E
DST 6544-6856
T + ΔT / ΔT

FLUID SAMPLE DATA

Sampler Pressure	85 P.S.I.G. at Surface
Recovery: Cu. Ft. Gas	.107
cc. Oil	
cc. Water	
cc. Mud	500
Tot. Liquid cc	
Gravity	° API @ °F.
Gas/Oil Ratio	cu. ft./bbl.

	RESISTIVITY		CHLORIDE CONTENT
Recovery Water	@	°F.	ppm
Recovery Mud	@	°F.	ppm
Recovery Mud Filtrate	@	°F.	ppm
Mud Pit Sample	@	°F.	ppm
Mud Pit Sample Filtrate	@	°F.	ppm

Mud Weight 8.6 vis 28 sec

Date	11-14-76	Ticket Number	520451
Kind of Job	OPEN HOLE	Halliburton District	ARTESIA
Tester	RICHARD PEPPERS	Witness	J. JONAS
Drilling Contractor	LANDIS DRILLING # 4 DR		

EQUIPMENT & HOLE DATA

Formation Tested	Lower Cisco		
Elevation	3651' Ft.		
Net Productive Interval	20' Ft.		
All Depths Measured From	Kelly Bushing		
Total Depth	6856' Ft.		
Main Hole/Casing Size	7 7/8"		
Drill Collar Length	352'	I.D.	1.25"
Drill Pipe Length	6156'	I.D.	3.826"
Packer Depth(s)	6538-6544' Ft.		
Depth Tester Valve	6518' Ft.		

Cushion TYPE	AMOUNT	Depth Back Pres. Valve Ft.	Surface Choke	Bottom Choke
			5/8"	.75"

Recovered	442	Feet of	drilling mud
Recovered		Feet of	
Recovered		Feet of	
Recovered		Feet of	
Recovered		Feet of	

Mea. From Tester Valve

Remarks SEE PRODUCTION TEST DATA SHEET

TEMPERATURE	Gauge No. 1114		Gauge No. 1113		Gauge No.		TIME	
	Depth: 6522 Ft.		Depth: 6852 Ft.		Depth: Ft.			
	24 Hour Clock		24 Hour Clock		Hour Clock		Tool Opened 0800	A.M. P.M.
Est. °F.	Blanked Off No		Blanked Off Yes		Blanked Off		Opened Bypass 1300	A.M. P.M.
Actual 122 °F.	Pressures		Pressures		Pressures		Reported	Computed
	Field	Office	Field	Office	Field	Office	Minutes	Minutes
Initial Hydrostatic	2993	2964	3153	3106				
First Period Flow Initial	125	226	214	416			—	—
First Period Flow Final	178	178	285	312			30	31
First Period Closed in	2300	2297	2477	2429			90	89
Second Period Flow Initial	178	395	267	382			—	—
Second Period Flow Final	125	116	231	246			60	60
Second Period Closed in	2265	2265	2406	2394			120	120
Third Period Flow Initial							—	—
Third Period Flow Final								
Third Period Closed in								
Final Hydrostatic	2975	2952	3135	3099			—	—

Legal Location Sec. - Twp. - Rng.	13-18S-24E
Lease Name	CITY "JG" STATE COMM.
Well No.	1
Test No.	1
Field Area	
Tested Interval	6544-6856'
County	EDDY
Lease Owner/Company Name	YATES PETROLEUM CORPORATION
State	NEW MEXICO

FORMATION TEST DATA

Casing perfs_______ Bottom choke_______ Surf. temp_______ °F Ticket No. 520451

Gas gravity_______ Oil gravity_______ GOR_______

Spec. gravity_______ Chlorides_______ ppm Res_______ @_______ °F

INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED_______

Date Time a.m. p.m.	Choke Size	Surface Pressure psi	Gas Rate MCF	Liquid Rate BPD	Remarks
0800	1/8"				Opened tool with a good blow
0805	"	18			Good blow, no gas
0810	"	28			"
0815	"	38			"
0820	"	49			"
0825	"	60			"
0830	"	70			Closed tool
0834					Gas to surface
1000	5/8"				Opened tool, gas flare
1005	"	15	299		
1010	"	10	249		Gas depleating
1015	"	6	209		Gas Stabilized
1020	"	6	209		"
1025	"	6	209		"
1030	"	6	209		"
1035	"	6	209		"
1040	"	6	209		"
1045	"	6	209		"
1050	"	5	199		Gas depleating
1055	"	4	189		"
1100	"	4	189		Closed tool
1300					Pulled tool loose

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PRODUCTION TEST DATA

6

Gauge No. 1114 | Depth 6522' | Clock No. 13428 | 24 hour | Ticket No. 520451

	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.
0	.000	336	.000		178	.000	395 Q	.000		116					
1	.0197	89*	.0165		848**	.0342	121	.0265		1219					
2	.0362	110	.0363		1502	.0683	107	.0531		1693					
3	.0526	132	.0562		1850	.1025	112	.0796		1876					
4	.0691	148	.0760		1970	.1367	114	.1061		2018					
5	.0855	164	.0958		2057	.1709	116	.1327		2124					
6	.1020	178	.1156		2125	.2050	116	.1592		2186					
7			.1354		2180			.1857		2219					
8			.1553		2217			.2122		2235					
9			.1751		2246			.2388		2246					
10			.1949		2263			.2653		2251					
11			.2147		2276			.2918		2253					
12			.2345		2284			.3184		2256					
13			.2544		2290			.3449		2260					
14			.2742		2293			.3714		2263					
15			.2940		2297			.3980		2265					

Gauge No. 1113 | Depth 6852' | Clock No. 4365 | hour 24

0	.000	416	.000		312	.000	382	.000		246					
1	.0199	218*	.0167		1033**	.0332	237	.0267		1371					
2	.0366	244	.0367		1643	.0663	232	.0533		1807					
3	.0532	263	.0567		1957	.0995	239	.0800		2005					
4	.0698	279	.0768		2086	.1327	244	.1067		2145					
5	.0864	296	.0968		2178	.1659	246	.1334		2244					
6	.1030	312	.1168		2253	.1990	246	.1600		2310					
7			.1368		2314			.1867		2348					
8			.1568		2355			.2134		2368					
9			.1769		2383			.2400		2376					
10			.1969		2402			.2667		2383					
11			.2169		2411			.2934		2385					
12			.2369		2420			.3200		2389					
13			.2569		2427			.3467		2392					
14			.2769		2429			.3734		2394					
15			.2970		2429			.4000		2394					
Reading Interval	5		6			10		8							Minutes

REMARKS: *-6 minutes **-5 minutes Q-Questionable

SPECIAL PRESSURE DATA

FORMATION DENSITY

COUNTY
FIELD
LOCATION
WELL
COMPANY

COMPANY Yates [illegible]

WELL [illegible] State Com #1

FIELD Wildcat

COUNTY Eddy STATE New Mexico

LOCATION 660' F [illegible]

Other Services: [illegible]

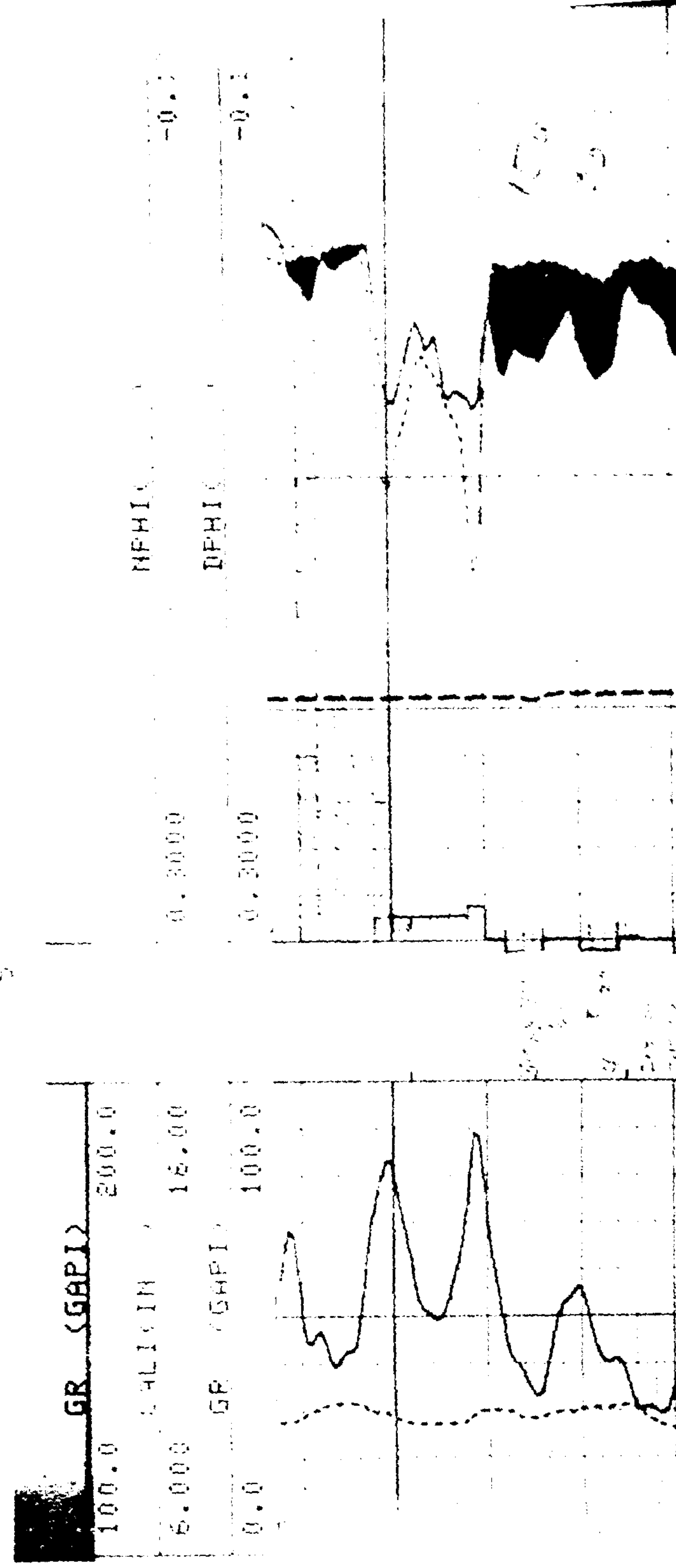
Permanent Datum: [illegible] Elev.: [illegible]
Log Measured From KB [illegible] Ft. Above Perm. Datum
Drilling Measured From KB

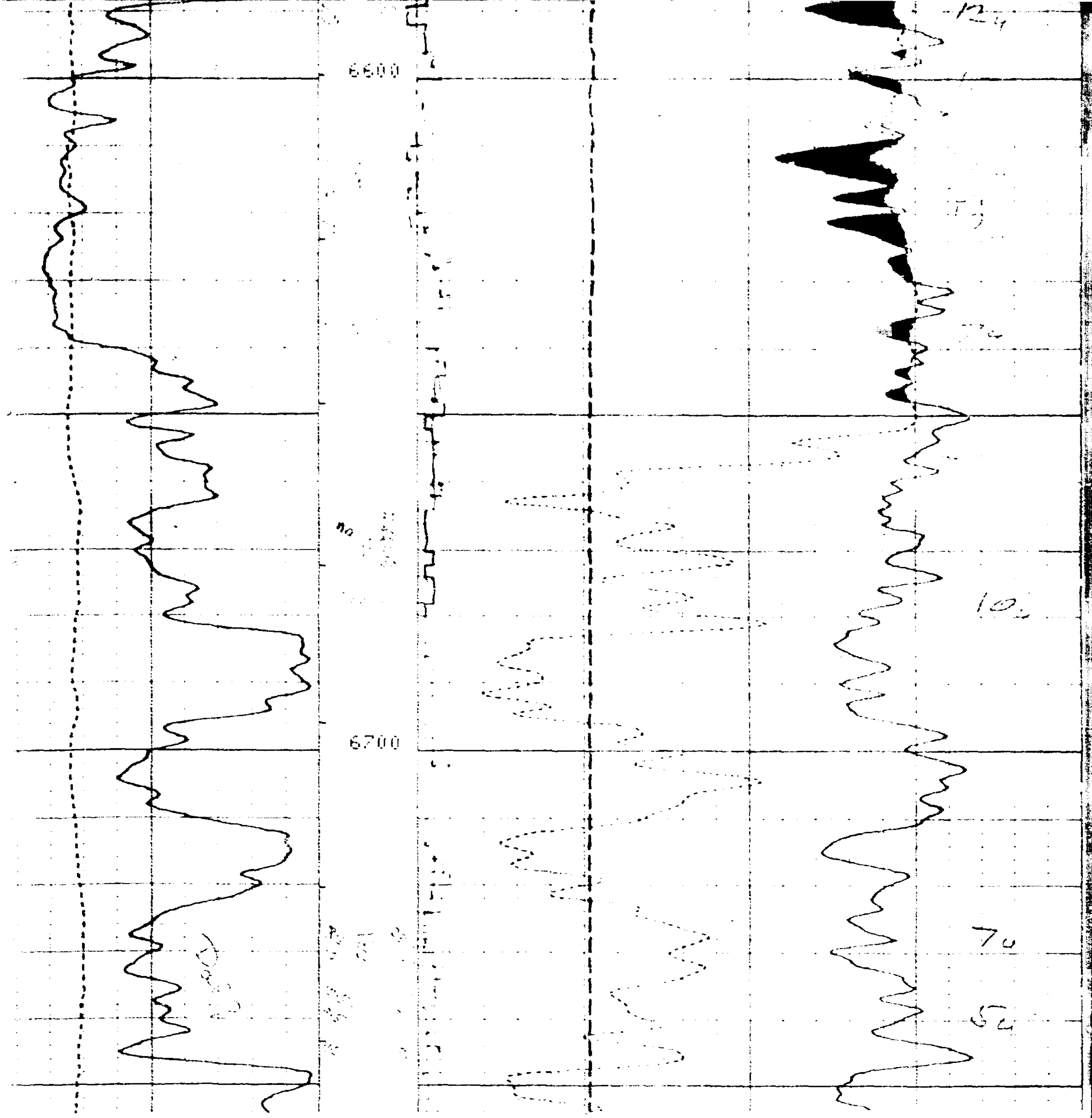
Elev.: K.B. [illegible]
D.F.
G.L. 3651

Date	[illegible]			
Run No.	[illegible]			
Depth—Driller	[illegible]			
Depth—Logger	[illegible]			
Btm. Log Interval	[illegible]			
Top Log Interval	0			
Casing—Driller	8 5/8 @ [illegible]	@	@	@
Casing—Logger	[illegible]			
Bit Size	[illegible]			
Type Fluid in Hole	[illegible]			
Dens. | Visc.	[illegible]			
pH | Fluid Loss	[illegible] ml	ml	ml	ml
Source of Sample	[illegible]			
Rm @ Meas. Temp.	[illegible] °F	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	[illegible] °F	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	[illegible] °F	@ °F	@ °F	@ °F
Source: Rmf | Rmc	[illegible]			
Rm @ BHT	.040 @ [illegible] °F	@ °F	@ °F	@ °F
TIME Circulation Stopped	[illegible]			
TIME Logger on Bottom	[illegible]			
Max. Rec. Temp.	[illegible] °F	°F	°F	°F
Equip. | Location	3063 | Hobbs			
Recorded By	[illegible]			

FIELD PRINT

The well name, location and borehole reference data were furnished by the customer.

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GAS QUALITY TEST REPORT

COMPANY SELLER: Yates Pet. Co.
STA. NO. 1232-2
FIELD OR LOCATION:
CONTRACT NO.:
SURFACE OR RESERVOIR:
TEST DATE: 04 01 80
WELL OR STATION NAME: Cities "JG"
LAB: 4

COMPOUND COMPONENTS	COMPONENT SPECIFIC GRAVITY	COMPONENT MOLE FRACTION
NITROGEN	.9672	.0126
CARBON DIOXIDE	1.5195	.0019
HELIUM	.1382	.
OXYGEN	1.1048	.0002
HYDROGEN SULFIDE	1.1766	.
WATER VAPOR	.6220	.
HYDROCARBON DILUENTS		(.0147)
METHANE	.5539	.8632
ETHANE	1.0382	.0710
PROPANE	1.5225	.0290
ISO-BUTANE	2.0068	.0039
N-BUTANE	2.0068	.0085
ISO-PENTANE	2.4910	.0024
N-PENTANE	2.4910	.0021
HEXANES	2.9753	.0028
HEPTANES +	3.7018	.0020
COMPOSITION		1.0000

LIQUEFIABLE HYDROCARBONS	COMPONENT G.P.M.	MOLE FRACTION	G.P.M. CONTENT
PROPANE	27.514	.	
ISO-BUTANE	32.698	.	
N-BUTANE	31.510	.	
LPG			
ISO-PENTANE	36.582	.	
N-PENTANE	36.213	.	
HEXANES	41.111	.	
HEPTANES +	46.126	.	
NATURAL GASOLINE			
TOTAL LIQUEFIABLE GPM			

WATER VAPOR CONTENT:

Gas Mixture Static Pressure PSI ______
Hydrocarbon Dew Point °F ______
Water Vapor Dew Point °F ______
Lbs Water Vapor per MMCF ______
Conversion Constant X 0.000021
Water Vapor Mole Fraction ___.___

Moisture recorder reading ______
Make or type ______

MIXTURE SPECIFIC GRAVITY:

Calculated From Analysis .664
Determined by Test Instrument .663
Instrument Make or Type RNX

SULFUR CONTENT:

H_2S – Hydrogen Sulfide, Gr./100 cf .00
RSH – Mercaptans " .02
RSR – Sulfides " .24
RSSR – Residuals " .
Total Sulfur, Gr./100 cf .26
H_2S Grains to fraction conversion X 0.0000157
H_2S Mole Fraction ______

MIXTURE HEATING VALUE:
(Btu/cf at 14.73 Psia, 60°F, Sat.)

Calculated From Analysis 1140
Determined by Calorimeter ______
Calorimeter Verified (______)

Critical Pressure 668.7 Critical Temperature 376.5

REMARKS ______

MEASUREMENT AREA Roswell
GAS ANALYST Frazer

WELL NAME: Irish Hills KW #2

LOCATION: 2-19S-24E

DST INTERVAL: 6532-6640

$P^* = 2440$ psi slope (M) = 2305 psi/cycle

$T_c = 370^\circ R$ $P_c = 670$ psi

$T = 125 + 460^\circ = 585^\circ R$ $P_{wf} = 77.4$ psi

$$P_{avg} = \frac{P^* + P_{wf}}{2} = \frac{2440 + 77.4}{2} = 1259 \text{ psi} \quad \text{(Note 1)}$$

$$T_r = \frac{T}{T_c} = \frac{585}{370} = 1.58$$

$$P_r = \frac{P_{avg}}{P_c} = \frac{1259}{670} = 1.90 \quad \text{(Note 1)}$$

$z \doteq 0.86$ $T_{sc} = 520^\circ R$ $P_{sc} = 13.3$ psi

$$B_g = z \cdot \frac{T}{T_{sc}} \cdot \frac{P_{sc}}{P_{avg}} = 0.86 \cdot \frac{585}{520} \cdot \frac{13.3}{1259} = 0.010 \quad \text{(Note 1)}$$

$q = 69.7$ mcfd $\cdot$ 178.1 = 12414 b/d

$u = 1.20 \times 0.0114 = 0.0137$ cp (Note 2)

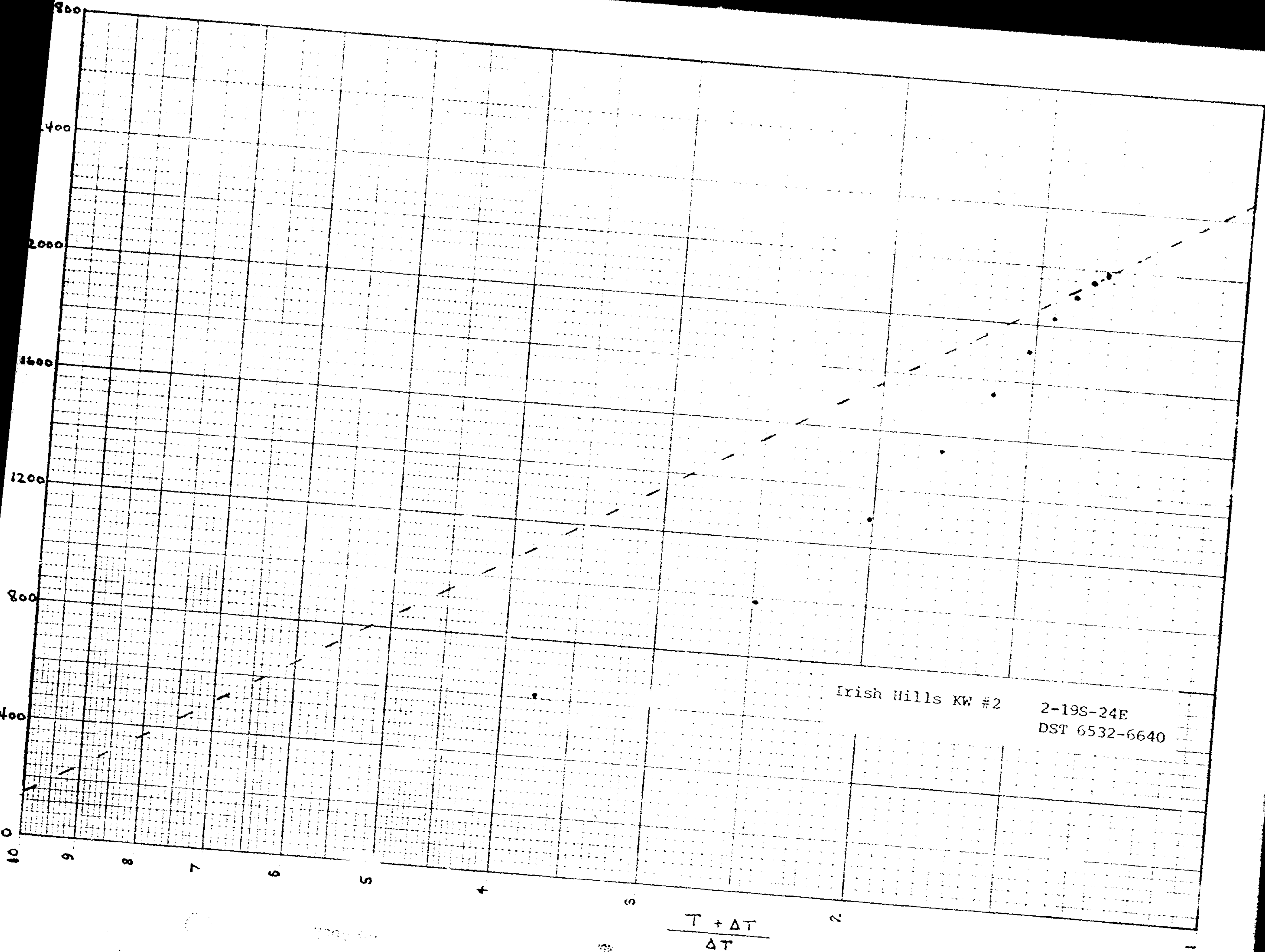
$$kh = \frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6\,(12414)\,(0.0137)\,(0.010)}{2305}$$

$kh = 0.1200$ md $\cdot$ ft

$h = 58$ ft (Note 3)

$k = 0.0021$ md (Note 4)

1) C. S. Matthews - D.G. Russell eqn. 3.21a
2) C. S. Matthews - D.G. Russell Fig. G.3A&B
3) h estimated from Log
4) k = 0.0026 md for T=192°F


Irish Hills KW #2
2-19S-24E
DST 6532-6640
2800
2400
2000
1600
1200
800
400
0
10
9
8
7
6
5
4
3
2
1
T + ΔT / ΔT

FLUID SAMPLE DATA

Sampler Pressure 69 P.S.I.G. at Surface
Recovery: Cu. Ft. Gas .284
cc Oil
cc Water
cc Mud 500 drilling fluid
Tot. Liquid cc. 500
Gravity ° API @ °F.
Gas/Oil Ratio cu. ft./bbl.

	Resistivity	Chloride Content
Recovery Water	@ °F.	ppm
Recovery Mud	@ °F.	ppm
Recovery Mud Filtrate	@ °F.	ppm
Mud Pit Sample	@ °F.	ppm
Mud Pit Sample Filtrate	@ °F.	ppm

Mud Weight 8.9 vis sec

Date 7-6-80
Ticket Number 879639
Kind of DST OPEN HOLE OFF BOTTOM STRADDLE
Halliburton Location ARTESIA
Tester MR. LAMAR / MR. MC KEE
Witness MR. D. JACKSON
Drilling Contractor CAPITAN DRILLING COMPANY RIG # 14 sm

EQUIPMENT & HOLE DATA

Formation Tested Cisco
Elevation 3718' Ft.
Net Productive Interval - Ft.
All Depths Measured From Kelly bushing(AGL)
Total Depth 9190' Ft.
Main Hole Casing Size 7 7/8"
Drill Collar Length 660' I.D. 2.25"
Drill Pipe Length 5835' I.D. 3.340"
Packer Depth(s) 6526-6532-6640-6646' Ft.
Depth Tester Valve 6507' Ft.

Cushion TYPE AMOUNT Ft. Depth Back Pres. Valve
Surface Choke 3/8" Adj. choke
Bottom Choke .75"

Recovered 180 Feet of drilling fluid
Recovered Feet of
Recovered Feet of
Recovered Feet of
Recovered Feet of

Meas. From Tester Valve

Remarks SEE PRODUCTION TEST DATA SHEET

TEMPERATURE	Gauge No. 512		Gauge No. 113		Gauge No.		TIME (00.00-24:00 hrs.)	
	Depth: 6511 Ft.		Depth: 6583 Ft.		Depth: Ft.			
	24 Hour Clock		24 Hour Clock		Hour Clock		Tool	7-6-80
Est. 192 °F.	Blanked Off no		Blanked Off yes		Blanked Off		Opened	1900
							Opened	7-7-80
Actual °F.	Pressures		Pressures		Pressures		Bypass	0100
	Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic	3028	3067.2	2996	3104.5				
First Period Flow Initial	53	57.7	92	96.0			—	—
First Period Flow Final	66	80.0	92	100.0			30	29
First Period Closed in	1486	1496.0	1490	1509.2			90	89
Second Period Flow Initial	66	60.3	79	102.6			—	—
Second Period Flow Final	66	77.4	92	92.1			60	58
Second Period Closed in	2170	2161.5	2189	2197.9			180	183
Third Period Flow Initial							—	—
Third Period Flow Final								
Third Period Closed in								
Final Hydrostatic	3081	3067.2	3115	3103.1			—	—

Legal Location Sec. - Twp. - Rng. 2 19 24
Field Area WILDCAT
County EDDY
State NEW MEXICO

FORM 18-R2 — PRINTED IN U.S.A.

FORMATION TEST DATA

/c

Gauge No. 512			Depth 6511'					Clock No. 13528			24 hour	Ticket No. 879639			
	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log (t + θ)/θ	PSIG Temp Corr.	Time Defl .000"	PSIG Temp Corr.	Time Defl. .000"	Log (t + θ)/θ	PSIG Temp Corr.	Time Defl .000"	PSIG Temp Corr.	Time Defl .000"	Log (t + θ)/θ	PSIG Temp Corr.
0	.0000	57.7	.0000		80.0	.0000	60.3	.0000		77.4					
1	.0139*	80.0	.0272**		274.2	.0263**	72.1	.0705***		628.9					
2	.0313	81.3	.0579		436.9	.0602	70.8	.1308		990.7					
3	.0488	81.3	.0885		602.6	.0936	74.8	.1912		1301.3					
4	.0662	80.0	.1192		764.4	.1271	76.1	.2516		1557.9					
5	.0836	80.0	.1498		910.5	.1606	76.1	.3120		1760.5					
6	.1010	80.0	.1804		1051.3	.1940	77.4	.3724		1911.8					
7			.2111		1184.2			.4328		2018.4					
8			.2417		1298.6			.4932		2094.7					
9			.2724		1413.1			.5536		2148.5					
10			.3030		1496.0			.6140		2181.5					
11															
12															
13															
14															
15															
Gauge No. 113			Depth 6583'					Clock No. 6728		24 hour					
0	.0000	96.0	.0000		100.0	.0000	102.6	.0000		92.1					
1	.0135*	106.5	.0270**		242.1	.0270**	88.1	.0705***		609.5					
2	.0304	107.8	.0573		415.7	.0608	88.1	.1308		984.1					
3	.0473	107.8	.0876		575.2	.0946	89.4	.1912		1296.8					
4	.0642	103.9	.1180		733.5	.1284	92.1	.2516		1550.1					
5	.0811	100.0	.1483		881.2	.1622	92.1	.3120		1758.6					
6	.0980	100.0	.1787		1029.0	.1960	92.1	.3724		1915.6					
7			.2090		1163.6			.4328		2029.0					
8			.2393		1287.6			.4932		2106.9					
9			.2697		1402.4			.5536		2160.9					
10			.3000		1509.2			.6140		2197.9					
11															
12															
13															
14															
15															
Reading Interval	5		9			10		18							Minutes

REMARKS: *First interval is equal to 4 minutes. ** = 8 minutes. *** = 21 minutes.

Casing perfs ________ Bottom choke ________ Surf. temp ________ °F Ticket No. 879639
Gas gravity ________ Oil gravity ________ GOR ________
Spec. gravity ________ Chlorides ________ ppm Res. ________ @ ________ °F
INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED ________

Date Time a.m. p.m.	Choke Size	Surface Pressure psi	Gas Rate MCF	Liquid Rate BPD	Remarks
0700					Called out
1145					On location
1300					Picked up tools
1400					Started in hole with tools
1900					Opened with a weak blow
1905					Weak blow
1910					Blow increased to good
1915	3/8"	1½			Opened 3/8" choke
1930	"	0			Closed tool -no gas to the surface
2100	"	10			Opened tool on 3/8" choke
2105	"	12			
2106	"	11	88.4		Gas to the surface
2110	"	5½	69.7		Pressure dropped
2115	"	1/2	TSTR		"
2130	"		TSTR		"
2145	"		TSTR		"
2200	"		TSTR		Closed tool
7-7-80					
0100					Opened bypass and started out of hole.

TSTR = too small to record

PRODUCTION TEST DATA

COMPANY Yates Petroleum Corporation

WELL Irish Hills "KW" State Com. #1

FIELD Wildcat

COUNTY Eddy STATE New Mexico

1980' FNL & 1980' FEL

19-S 24-E

Other Services: DLL-MSFL

Permanent Datum: GL

Log Measured From KB Elev. 3709

Drilling Measured From KB 16.5 Ft. Above Perm. Datum

Elev.: K.B 3730.5

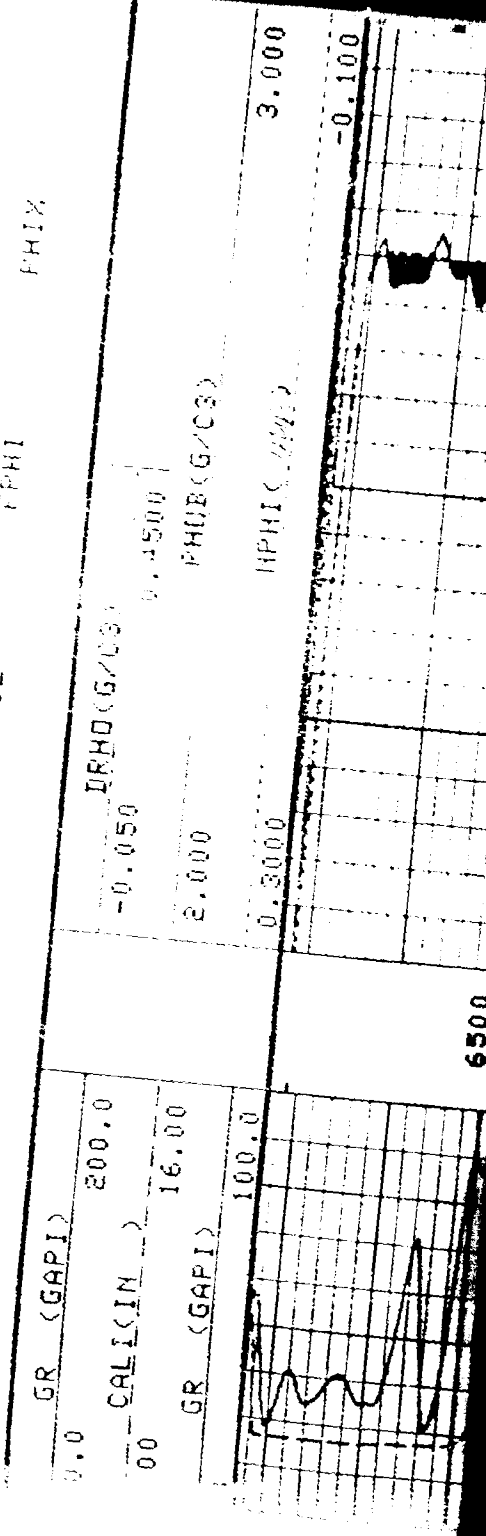
D.F.

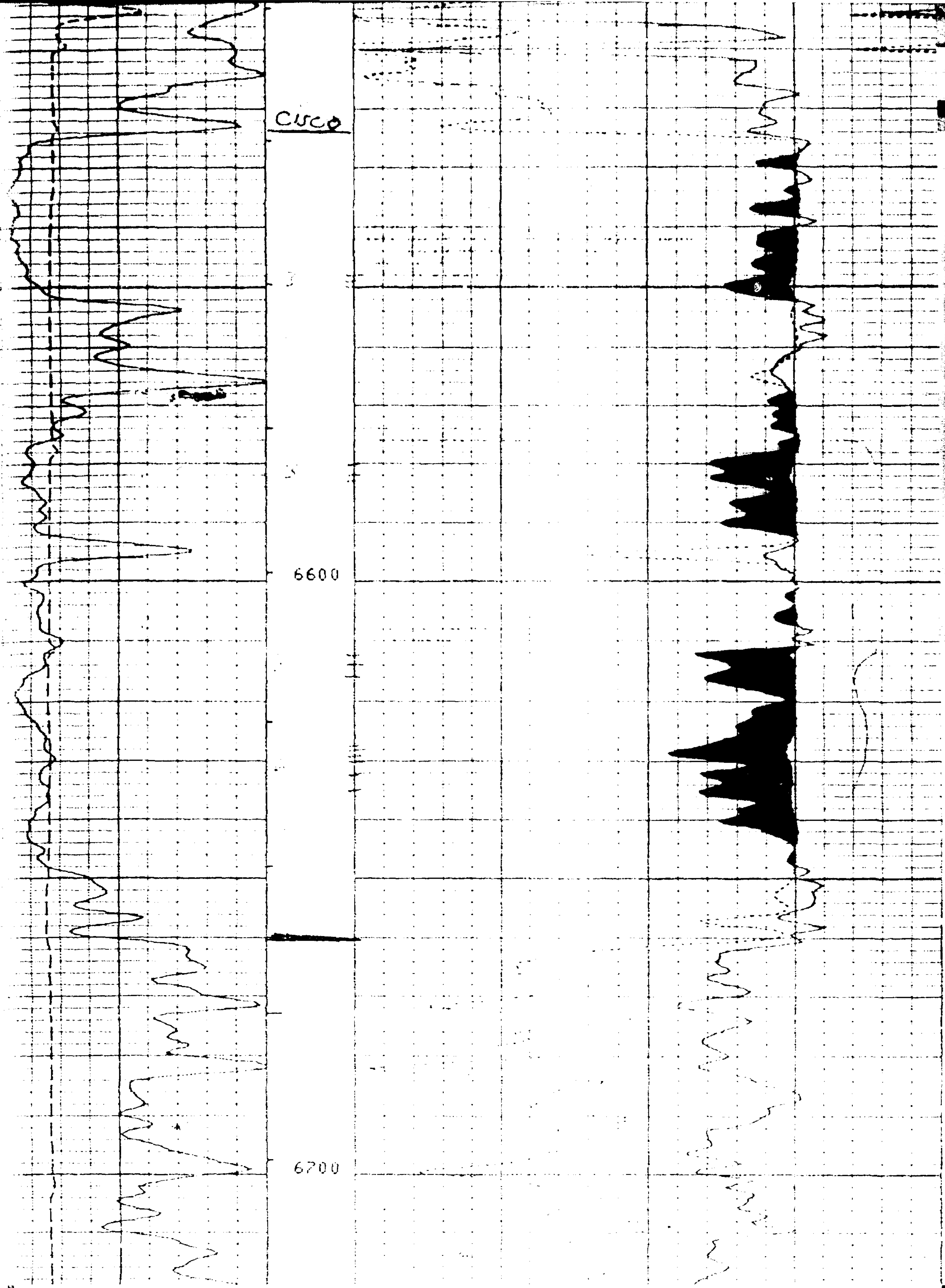
G.L. 3709

Date	7-5-80		
Run No.	ONE		
Depth-Driller	9190		
Depth-Logger	9189		
Btm. Log Interval	9188		
Top Log Interval	Surf		
Casing-Driller	8 5/8 @ 950	@	@
Casing-Logger	948		
Bit Size	7 7/8		
Type Fluid in Hole	S.W. Gel, Starch		
Dens. | Visc.	9.0 | 38		
pH | Fluid Loss	10.0 | 9.4 ml	ml	ml
Source of Sample	Circulated		
Rm @ Meas. Temp.	.17 @ 89 °F	@ °F	@ °F
Rmf @ Meas. Temp.	.13 @ 89 °F	@ °F	@ °F
Rmc @ Meas. Temp.	.25 @ 89 °F	@ °F	@ °F
Source: Rmf | Rmc	M | M		
Rm @ BHT	.10 @ 149 °F	@ °F	@ °F
TIME Circulation Stopped	0700 7-5		
TIME Logger on Bottom	1430 7-5		
Max. Rec. Temp.	149 °F	°F	°F
Equip. | Location	8185 | Hobbs		
Recorded By	[illegible]		

PARAMETERS

NAME	UNIT	VALUE	NAME	UNIT	VALUE	NAME	UNIT	VALUE
HC		BS	FSHF			BS	INCH	7.875
MDEN	G/C3	2.710	FD	G/C3	2.347	MATR		LIME
BHF		WATE			1.100	FPHI		
DO		0.0	BHS		CASE	FPHIX		




Cisco
6600
6700

TW

GAS QUALITY TEST REPORT

COMPANY ... LER Yates Pet. Co.

STA. NO. 1397-1

FIELD OR LOCATION

CONTRACT NO.

SOURCE OR RESERVOIR

TEST DATE 03 26 81

WELL OR STATION NAME IRISH HILLS "KW" #2

LAB 4

COMPOUND COMPONENTS	COMPONENT SPECIFIC GRAVITY	COMPONENT MOLE FRACTION
NITROGEN	.9672	.0124
CARBON DIOXIDE	1.5195	.0008
HELIUM	.1382	.
OXYGEN	1.1048	.
HYDROGEN SULFIDE	1.1766	.
WATER VAPOR	.6220	.
HYDROCARBON DILUENTS		(.0132)
METHANE	.5539	.8859
ETHANE	1.0382	.0613
PROPANE	1.5225	.0230
ISO-BUTANE	2.0068	.0035
N-BUTANE	2.0068	.0066
ISO-PENTANE	2.4910	.0020
N-PENTANE	2.4910	.0018
HEXANES	2.9753	.0017
HEPTANES +	3.7018	.0010
COMPOSITION		1.0000

LIQUEFIABLE HYDROCARBONS	COMPONENT G.P.M.	MOLE FRACTION	G.P.M. CONTENT
PROPANE	27.514	.	
ISO-BUTANE	32.698	.	
N-BUTANE	31.510	.	
LPG			
ISO-PENTANE	36.582	.	
N-PENTANE	36.213	.	
HEXANES	41.111	.	
HEPTANES +	46.126	.	
NATURAL GASOLINE			
TOTAL LIQUEFIABLE GPM			

WATER VAPOR CONTENT:

Gas Mixture Static Pressure PSIG 610# 65°

Hydrocarbon Dew Point °F

Water Vapor Dew Point °F

Lbs Water Vapor per MMCF 30#

Conversion Constant X 0.000021

Water Vapor Mole Fraction .

Moisture recorder reading

Make or type

MIXTURE SPECIFIC GRAVITY:

Calculated From Analysis REAL. .643

Determined by Test Instrument .645

Instrument Make or Type RNX.

SULFUR CONTENT:

H_2S – Hydrogen Sulfide, Gr./100 cf .00

RSH – Mercaptans "

RSR – Sulfides "

RSSR – Residuals "

Total Sulfur, Gr./100 cf

H_2S Grains to fraction conversion X 0.0000157

H_2S Mole Fraction

MIXTURE HEATING VALUE:

(Btu/cf at 14.73 Psia, 60°F, Sat.)

Calculated From Analysis 1109

Determined by Calorimeter

Calorimeter Verified ( )

Critical Pressure Critical Temperature

REMARKS INITIAL DELIVERY

MEASUREMENT AREA 1

GAS ANALYST GARRATT / ALSTON 27

232-A Rev. 10-75

YATES PETROLEUM CORPORATION
207 SOUTH FOURTH STREET
ARTESIA, NEW MEXICO 88210
TELEPHONE (505) 748-1331

S. P. YATES
PRESIDENT
MARTIN YATES, III
VICE PRESIDENT
JOHN A. YATES
VICE PRESIDENT
B. W. HARPER
SEC.-TREAS

OIL CONSERVATION DIVISION
1981
RECEIVED

CASE NO. 7352

APPLICATION OF YATES PETROLEUM CORPORATION

FOR DESIGNATION OF A TIGHT FORMATION

EDDY COUNTY, NEW MEXICO

APPLICATION

Yates Petroleum Corporation seeks tight formation designation for a portion of the Permo-Penn underlying lands in western Eddy County, New Mexico, which are described in Exhibit No. 1 and shown in map form in Exhibits No.2 and 3.

DESCRIPTION OF FORMATION BY GEOLOGICAL PARAMETERS

The formation sought to be covered by this application is that stratigraphic interval between the top of a marker named the Third Sister Cycle (of the Wolfcamp Series of the Permian System) and the top of the Canyon Series (of the Pennsylvanian System).

Correlations of the Third Sister Cycle and The Canyon Series are shown on a network of 4 crossections spread over the subject area. (Exhibits 5 through 8). Positions of the Third Sister and Canyon in the geologic column are illustrated in Exhibit 4.

The Third Sister Cycle to Canyon Series varies from approximately 1000 to 1400 feet in thickness.

STATEMENT OF MEANING AND PURPOSE OF EACH EXHIBIT

EXHIBIT NO. 1

Exhibit No. 1 is a list which describes the lands which overlie the Permo-Penn interval for which tight formation designation is sought in this application.

EXHIBIT NO. 2

Exhibit No. 2 is a map of 1 inch equals 5000 feet scale which shows the lands described in Exhibit No. 1. The subject area stretches over a portion of western Eddy County, New Mexico, from the Pecos River east of the City of Artesia to the Huapache Monocline some 40 miles to the Southwest.

Also shown, by circled well spots, are all wells within the outline which have penetrated the above defined Permo-Penn formation and/or lower horizons. Red-colored well spots are wells which are currently producing gas from the above defined Permo-Penn interval.

The deposits of the subject Permo-Penn interval are a complex of 3 major environments of deposition or "facies": shelf, bank and basin facies.

The shelf facies, lying in bands to the West or Northwest, is comprised of interbedded limestones, shales, siltstones and sandstones. Terrigenous clastics (shales, siltstones and sandstones) increase and marine limestones and shales decrease traversing from East to West or Southeast to Northwest, that is, in a shelfward direction. Deposits of the Shelf facies are effectively non-porous and impermeable and constitute

An updip "mega-seal" to the bank facies.

The bank facies in composed mostly of marine limestones with a few intercalated marine shales. These marine limestones are made up of bioherms and their associated debris aprons interfingering with oolite bars. The porosity that is present is a result of preservation of primary porosity, principally of bryozoan material, and creation of secondary porosity by leaching of oolitic grainstones and former aragonitic shell material.

Most of the gas production that has been established in the subject Permo-Penn interval has been from the deposits of the bank facies.

The basin facies consists mainly of thin-bedded, fine-grained sandstones, siltstones and shales which were transported to the relatively deeper basin from the bank and shelf areas during periods of lowered sea level. Main conduits for transport to the basin were through passes between segments of the bank facies.

Scattered within the overall basin facies are isolated limestone or carbonate buildups termed "isolated mounds". In some of the isolated mounds porosity has been developed and/or preserved, but many are effectively non-porous and impermeable. Some of the isolated mounds have produced gas. Wells in the basin facies which have encountered mounds are indicated by the letter "M" close by the well spot.

About one-third of the subject Permo-Penn interval, in the upper part, has been termed the "Antelope Sink Zone", named for an interval in the Sun (Tom Brown) No. 1 Antelope Sink Unit in Section 18 of T19S-24E. This well is shown on 2 crossections, Exhibits 6 and 8. The geographical limits of shelf, bank and basin shown on Exhibit No. 2 are for the

Antelope Sink Zone alone. Lower zones of the subject Permo-Penn interval are not shown, but their facies trends are essentially parallel to those shown on Exhibit No. 2.

Exhibit No. 2 also Shows the traces of the crossections introduced in later exhibits.

EXHIBIT NO. 3

Exhibit No. 3 is identical to Exhibit No. 2 from the standpoint of scale, outline of lands, well spots and colored well spots.

The purpose of this exhibit is to illustrate the structural attitude of the Permo-Penn Formation in the subject area. Mapping was done on the top of the Antelope Sink Zone in the shelf and bank areas and on the top of the Canyon Series in the basinal areas. As the crossections will show, the Antelope Sink Zone is essentially parallel with the Third Sister Cycle above. Dashed contours are 100 feet contour intervals on the top of the Antelope Sink Zone. Solid contours are 100 foot contour intervals on the top of the Canyon Series.

These contours indicate that over most of the outlined area the Permo-Penn interval dips to the East or Southeast at approximately 100 feet per mile; however, in the southwestern part of the outlined area, near the Huapache Monocline, the Permo-Penn interval dips East to Northeasterly at 200 to 300 feet per mile and structure is complicated by faulting.

Structural relief on the top of the subject Permo-Penn is approximately 3300 feet in the outlined area. Ground level elevations rise approximately 1500 feet from wells near the Pecos River (in T17S-R26E) to wells near the Huapache Monocline (in T21S-R21E).

The drill depth to the top of the Third Sister Cycle in the highest well (Pennzoil No. 1 United Federal in Section 28 of T21S-R21E) is 4927 feet; and, the drill depth to the top of the Third Sister in the lowest well (Heyco No. 1 Big Boggy State in Section 36 of T17S-R26E) is 6717 feet. The average depth to the top of the subject Permo-Penn Formation is thus 5822 feet.

EXHIBIT NO. 4

Exhibit No. 4 illustrates the stratigraphic column present in western Eddy County, New Mexico. This geologic section was compiled from New Mexico Oil Conservation Division reference crossections and other industry-accepted correlations.

The main purpose of this exhibit is to show the Permo-Penn stratigraphic interval sought to be covered by this application in relation to geologic time and other major stratigraphic horizons.

EXHIBIT NO. 5

Exhibit No. 5 is a Northwest to Southeast stratigraphic crossection (A-A') hung on the Third Sister Cycle of the Wolfcamp Series. This crossection is tranverse to the three major facies trends of shelf, bank and basin.

Other pertinent correlations shown are the top of the Antelope Sink Zone of the shelf and bank facies, top of the Pennsylvanian (by correlating with the New Mexico Oil Conservation Division reference crossections) and the top of the Canyon Series.

Drill stem test, core and completion data are shown on the crossection Well 6 was cored in the Permo-Penn and the core analysis report is given

in a later exhibt. Wells 2,3 and 5 are currently producing Permo-Penn gas and have been assigned to the Eagle Creek Permo-Penn (Gas) Field by the New Mexico Oil Conservation Division. Wells 4 and 6 should produce Permo-Penn gas, but they have not yet been completed in that interval. Note that well 8 produced gas from an isolated mound. This well was assigned to the Atoka Cisco, West (Gas) Field and produced 64,125 MCF of gas and 146 barrels of condensate before abandonment in 1980.

EXHIBIT NO. 6

Exhibit No. 6 is a Northwest to Southeast stratigraphic crossection (B-B') which is, again, hung on the Third Sister Cycle and is transverse to the 3 major facies of shelf, bank and basin.

A key correlation well, the Sun (Tom Brown) No. 1 Antelope Sink Unit, is well 3. Tops pertinent to this application are picked in this well as follows: Third Sister 5860', Antelope Sink Zone 6080', top of the bank facies 6140', top of the Pennsylvanian (by correlation with New Mexico Oil Conservation Division reference crossections) 6190', base of the bank facies 6477' and Canyon Series 7060'. Note that the perforated interval straddles the systemic boundary between the Permian and the Pennsylvanian. The Antelope Sink Unit No. 1 has been assigned to the Antelope Sink Upper Penn (Gas) Field. Well 4 should also produce Permo-Penn gas, but it has not yet been completed in the zone.

EXHIBIT NO. 7

Exhibit No. 7 is another Northwest to Southeast stratigraphic crossection (C-C') which is also hung on the Third Sister Cycle.

Wells 4 and 6 are producing gas from the Permo-Penn Formation and have been assigned to the Box Canyon Permo-Penn (Gas) Field.

EXHIBIT NO. 8

Exhibit No. 8 is a Southwest to Northeast stratigraphic crossection (D-D') which is hung on the Third Sister Cycle. This longitudinal or strike crossection is more or less parallel to the major facies of shelf, bank and basin.

The purpose of this crossection is to tie the three previous transverse crossections. It may be noted that the main gas-productive Antelope Sink Zone bank facies correlate very well from Box Canyon Permo-Penn (Gas) Field to Antelope Sink Upper Penn (Gas) Field to Penasco Draw Permo-Penn (Gas) Field to Eagle Creek Permo-Penn (Gas) Field.

LAW OFFICES
LOSEE, CARSON & DICKERSON, P. A.
300 AMERICAN HOME BUILDING
P. O. DRAWER 239
ARTESIA, NEW MEXICO 88210

A. J. LOSEE
JOEL M. CARSON
CHAD DICKERSON
DAVID R. VANDIVER

AREA CODE 505
746-3508

October 2, 1981

OIL CONSERVATION DIVISION
, 1981
RECEIVED

VIA PUROLATOR

Energy and Minerals Department
Oil Conservation Division
P. O. Box 2088
State Land Office
Santa Fe, New Mexico 87501

Re: Case No. 7352
Application for Tight Formation
October 21, 1981 Examiner Hearing

Gentlemen:

Enclosed, please find four copies of a complete set of Exhibits 1 through 17, which Yates Petroleum Corporation proposes to offer or introduce at the hearing set for the captioned case, together with two separate statements of the meaning and purpose of each exhibit, one as to engineering (Exhibits 9 - 17) and one as to geological testimony (Exhibits 1 - 8).

Sincerely yours,

LOSEE, CARSON & DICKERSON, P.A.

Chad Dickerson

Chad Dickerson

CD:pvm
Enclosures

OIL CONSERVATION DIVISION
OCT - 5 1981
RECEIVED

LAW OFFICES
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300 AMERICAN HOME BUILDING
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A. J. LOSEE
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DAVID R. VANDIVER

AREA CODE 505
746-3508

November 16, 1981

NOV 18 1981
OIL CONSERVATION DIVISION
SANTA FE

Energy and Minerals Department
Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501

Attention: Mr. Dick Stamets

Re: Tight Formation Application
Case No. 7352
10/14/81 Examiner Hearing

Gentlemen:

As requested at the hearing on the subject application, enclosed please find four copies of Supplement to Exhibit 12 furnished to further explain the information shown by Applicant's Exhibit 12. This information is composed of raw drillstem test data, and calculations based thereon.

Thank you.

Sincerely yours,

LOSEE, CARSON & DICKERSON, P.A.

Chad Dickerson

Chad Dickerson

CD:pvm
Enclosures

cc: Mr. Dave Boneau

cc w/enclosure: United States Geological Survey
505 Marquette, N.W.
Albuquerque, New Mexico 87102

WELL NAME: Fox Canyon #4A

LOCATION: 23-21S-21E

DST INTERVAL: 5876-6051

$p^* = 1904$ psi   slope (M) = 92 psi/cycle

$T_c = 365\ ^\circ R$ $P_c = 670$ psi

$T = 130 + 460^\circ = 590^\circ R$ $P_{wf} = 1592$ psi

$$P_{avg} = \frac{p^* + P_{wf}}{2} = \frac{1904 + 1592}{2} = 1748 \text{ psi} \quad \text{(Note 1)}$$

$$T_r = \frac{T}{T_c} = \frac{590}{365} = 1.62$$

$$P_r = \frac{P_{avg}}{P_c} = \frac{1748}{670} = 2.61$$

$Z = 0.84$ $T_{sc} = 520^\circ R$ $P_{sc} = 13.3$ psi

$$B_g = Z \cdot \frac{T}{T_{sc}} \cdot \frac{P_{sc}}{P_{avg}} = 0.84 \cdot \frac{590}{520} \cdot \frac{13.3}{1748} = 0.0073 \quad \text{(Note 1)}$$

$q = 25$ mcfd $\cdot$ 178.1 = 4452.50 b/d

$u = (0.0114)\ (1.3) = 0.0148$ cp (Note 2)

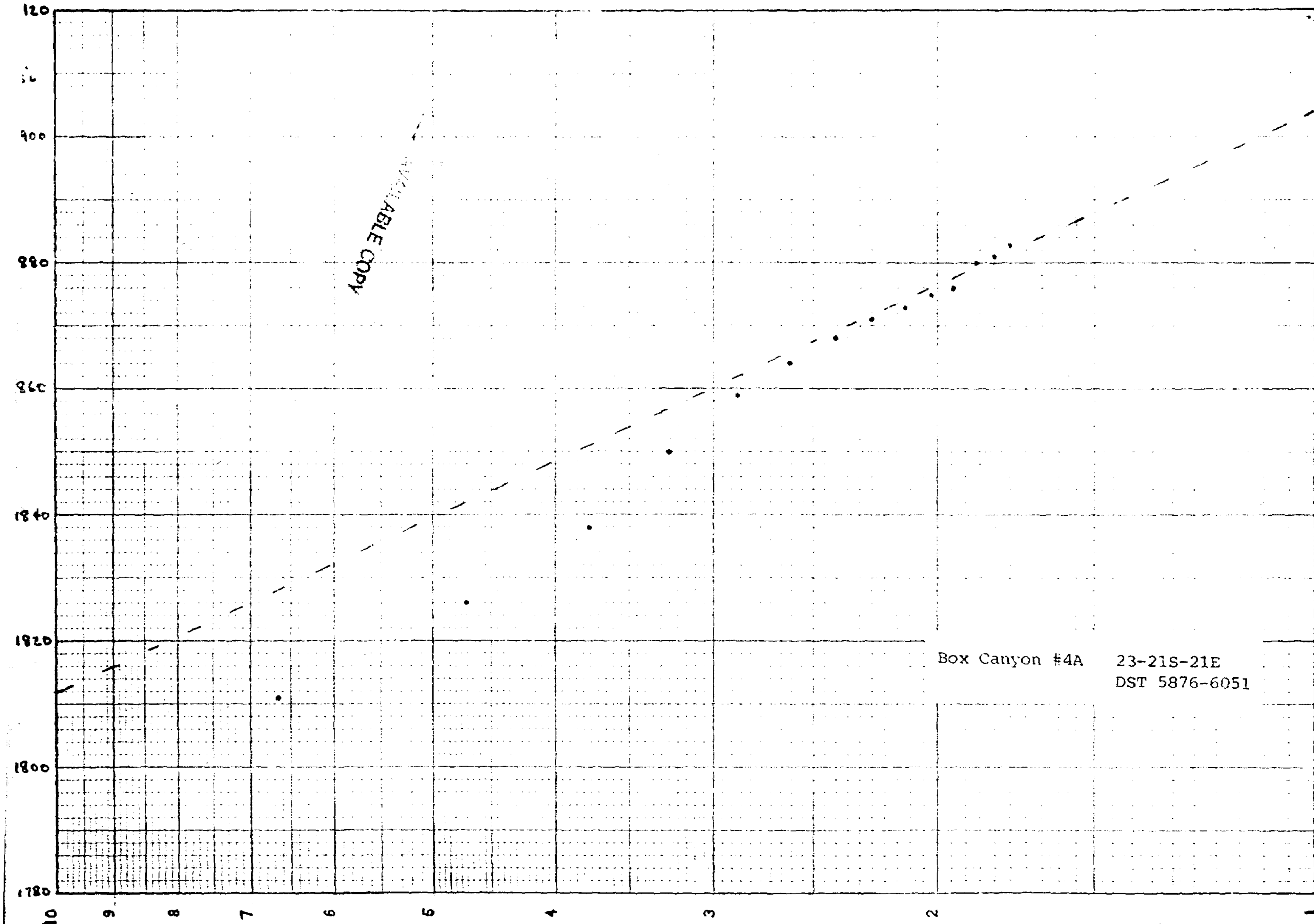
$$kh = \frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6\ (4452.5)\ (0.0148)\ (0.0073)}{92}$$

$kh = 0.8502$ md $\cdot$ ft

$h = 40$ ft (Note 3)

$k = 0.021$ md

1) [illegible]
2) [illegible]
3) [illegible]



Supplement to Exhibit 12
Page 1 - 2

[illegible] NATURAL [illegible] COMPANY

RPT-ASL [illegible]

RPT DAT[illegible] 07 27 79 [illegible] STA 61929
ANAL DAT[illegible] [illegible] [illegible] STATE [illegible] 9691
[illegible] CANYON [illegible]

TYPE CODE	SAMPLE DATE	[illegible]	[illegible]	LOCATION
00	07 10 79	07 [illegible] 79	C0304	1 3 [illegible]

	NORMAL [illegible]	GPM
C O 2	00.[illegible]	0.000
H 2 S	00.[illegible]	0.000
N2	01.[illegible]	0.000
METHANE	[illegible]	0.000
ETHANE	[illegible]	1.4[illegible]
PROPANE	01.[illegible]	0.50[illegible]
ISO-BUTANE	00.33	0.106
NORM-BUTANE	00.[illegible]1	0.161
ISO-PENTANE	00.[illegible]	0.0[illegible]
NORM-PENTANE	00.1[illegible]	0.051
HEXANE PLUS	00.[illegible]	0.1[illegible]
TOTAL	100.00	[illegible]

SPECIFIC GRAVITY [illegible]

[illegible]

BEST AVAILABLE COPY

[illegible] SAMPLE DATA

Sampler Pressure	[illegible]
Recovery: Cu. Ft.	[illegible]
cc Oil	
cc Water	1000
cc Mud	
Tot. Liquid cc	1800
Gravity	°API @ °F
Gas/Oil Ratio	
RESISTIVITY	
Recovery Water	@ °F ppm
Recovery Mud	@ °F ppm
Recovery Mud Filtrate	@ °F ppm
Mud Pit Sample	@ °F 25,000 ppm
Mud Pit Sample Filtrate	@ °F ppm
Mud Weight	9 vis 42

Date	[illegible]-78
Ticket Number	253334
Kind of Job	STRADDLE OPEN HOLE
Halliburton District	ARTESIA
Tester	PITTMAN LAMAR
Witness	JONAS
Drilling Contractor	MORANCO RIG # 5 DR

EQUIPMENT & HOLE DATA

Formation Tested	Upper Canyon
Elevation	4592' Ft.
Net Productive Interval	32 Ft.
All Depths Measured From	Kelly Drive Bushing (13')
Total Depth	8400' Ft.
Main Hole/Casing Size	7 7/8"
Drill Collar Length	430' I.D. 2.25"
Drill Pipe Length	5404' I.D. 3.826"
Packer Depth(s)	5870-5876-6051-6057' Ft.
Depth Tester Valve	5863' Ft.

Legal Location Sec. - Twp. - Rng.: 23-21-21

Cushion	TYPE	AMOUNT	Ft.	Depth Back Pres. Valve	Surface Choke	1" Adj.	Bottom Choke	.75"

Recovered Approximately 200 Feet of drilling mud

Recovered Approximately 2000 Feet of formation fluid

Recovered Feet of

Recovered Feet of

Recovered Feet of

Remarks SEE PRODUCTION TEST DATA SHEET

Field Area: WILDCAT

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County: EDDY

State: NEW MEXICO

TEMPERATURE	Gauge No. 512	Gauge No. [illegible]	Gauge No.	TIME	
	Depth 5964 Ft.	Depth 5905 Ft.	Depth Ft.		
Calc. Est. 130 °F	24 Hour Clock	24 Hour Clock	Hour Clock	Tool Opened 1000	A.M. / P.M.
	Blanked Off No	Blanked Off YES	Blanked Off	Opened 1530	A.M. / P.M.
Actual °F	Pressures	Pressures	Pressures	Bypass	

		Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic		[illegible]	[illegible]	[illegible]	2846				
First Period	Flow Initial	[illegible]	[illegible]		[illegible]			———	———
	Flow Final	[illegible]	[illegible]		811			30	30
	Closed in	[illegible]	[illegible]		1909			90	90
Second Period	Flow Initial	[illegible]	[illegible]		759			———	———
	Flow Final	[illegible]	[illegible]		[illegible]			90	90
	Closed in	[illegible]	[illegible]		[illegible]			120	120
Third Period	Flow Initial							———	———
	Flow Final								
	Closed in								
Final Hydrostatic		[illegible]	[illegible]		[illegible]			———	———

FORMATION TEST DATA

/ 3

Casing perfs. ______ Bottom choke. .75" ______ Surf. temp ______ °F Ticket No. 253334
Gas gravity ______ Oil gravity ______ GOR ______
Spec. gravity ______ Chlorides ______ ppm Res ______ @ ______ °F
INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED 1/4 x 60 PSI gauge

Date Time a.m. p.m.	Choke Size	Surface Pressure psi	Gas Rate MCF	Liquid Rate BPD	Remarks
1000		1 1/2#			Opened tool with a good blow
1005	1/4"	35	73.50		Opened on 1/4" choke
1010	"	53	99.96		Gas to surface
1015	"	55	102.90		
1020	"	57	105.84		Started losing pressure
1025	"	52	98.49		-
1030	"	43	85.26		Closed tool
1200	"	0	-		Opened tool
1205	"	0	-		
1210	"	0	-		
1215	"	0	-		
1230	"	2	24.99		Pressure climbing
1245	"	5	29.40		
1200	"	2	24.99		
1215	"	2	24.99		
1330	"	2	24.99		Closed tool
1530					Pulled loose and started out of hole.
1600					Pulled 7 stands and reversed out.
					NOTE: Attemped to straddle section at
					6304'-6490', could not hook, came up
					and straddled section at 5876'-6051'.
					Got hook to set and went on with test.

PRODUCTION TEST DATA

Gauge No.	512				Depth	5864'		Clock No.	13736		24 hour		Ticket No.	253334	
	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
	Time Defl. .000"	PSIG Temp Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp Corr.	Time Defl. .000"	PSIG Temp Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp Corr.	Time Defl. .000"	PSIG Temp Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp Corr.
0	.000	446	.000		781	.000	735	.000		1592					
1	.0167	396	.0201		1745	.0503	797	[illegible]		1788					
2	.0333	485	.0403		1805	.1007	1158	.0537		1811					
3	.0500	525	.0604		1832	.1510	1318	.0806		1826					
4	.0667	628	.0805		1850	.2013	1435	.1075		1838					
5	.0834	720	.1007		1860	.2517	1525	.1344		1850					
6	.1000	781	.1208		1864	.3020	1592	.1612		1859					
7			.1409		1868			.1881		1864					
8			.1610		1868			.2150		1868					
9			.1812		1869			.2418		1871					
10			.2013		1873			.2687		1873					
11			.2214		1877			.2956		1875					
12			.2416		1884			.3224		1876					
13			.2617		1888			.3493		1880					
14			.2818		1892			.3762		1881					
15			.3020		1896			.4030		1883					

Gauge No.	113				Depth	5905'		Clock No.	13528		hour	24			
0	.000	575	.000		811	.000	759	.000		1622					
1	.0172	422	.0203		1765	.050	996	.0272		1804					
2	.0343	519	.0405		1816	.100	1180	.0544		1827					
3	.0515	549	.0608		1848	.150	1334	.0816		1841					
4	.0687	656	.0811		1865	.200	1455	.1088		1855					
5	.0859	739	.1014		1874	.250	1549	.1360		1862					
6	.1030	811	.1216		1880	.300	1622	.1632		1872					
7			.1419		1832			.1904		1878					
8			.1622		1884			.2176		1881					
9			.1824		1885			.2448		1884					
10			.2027		1889			.2720		1885					
11			.2230		1895			.2992		1886					
12			.2432		1898			.3264		1889					
13			.2635		1902			.3536		1890					
14			.2838		1906			.3808		1892					
15			.3040		1909			.4080		1893					
Reading Interval	5			6			15		8						Minutes

REMARKS:

Supplement to Exhibit 12
Page 1 - 6

Box Canyon 4A

DST 5876-6051

Log footage contributing to height h:

Interval	Feet
5885-5889	4
5924-5925	1
5926-5927	1
5928-5934	6
5935-5937	2
5938-5939	1
5940-5949	9
5960-5966	6
5982-5983	1
5984-5985	1
5994-5996	2
6016-6020	4
6030-6032	2
	40 ft.

Box Canyon #4A

DST 5876-6051

Time to Reach Pseudosteady State

A) Average Porosity = 0.024 (Note 1)

Interval	Porosity
5885-5889	0.025
5924-5925	0.024
5926-5927	0.015
5928-5934	0.013
5935-5937	0.011
5938-5939	0.012
5940-5949	0.018
5960-5966	0.043
5982-5983	0.008
5984-5985	0.017
5994-5996	0.026
6016-6020	0.052
6030-6032	0.011

B) Total Compressibility = $S_g C_g$

$$C_t = (0.7)\ (0.00065) = 0.00046 \text{ psi}^{-1}$$ (Note 2)

c) Time $t = \dfrac{1136 \phi u C_t r_e^2}{k}$

$$t = \frac{1136\ (0.024)\ (0.0148)\ (0.00046)\ (2106)^2}{0.021}$$

t = 39,200 hr

t = 4.5 yr

1) Porosity averaged over 40 ft of pay
2) C.S. Matthews - D.G. Russell Fig. G7.A

Schlumberger

SIMULTANEOUS

COMPENSATED NEUTRON FORMATION DENSITY

COMPANY

WELL

FIELD

COUNTY STATE

COUNTY FIELD LOCATION WELL COMPANY

Permanent Datum: GL Elev. [illegible]
Log Measured From KB 12 Ft. Above Perm. Datum
Drilling Measured From KB

Elev.: KB [illegible] DF GL 4022

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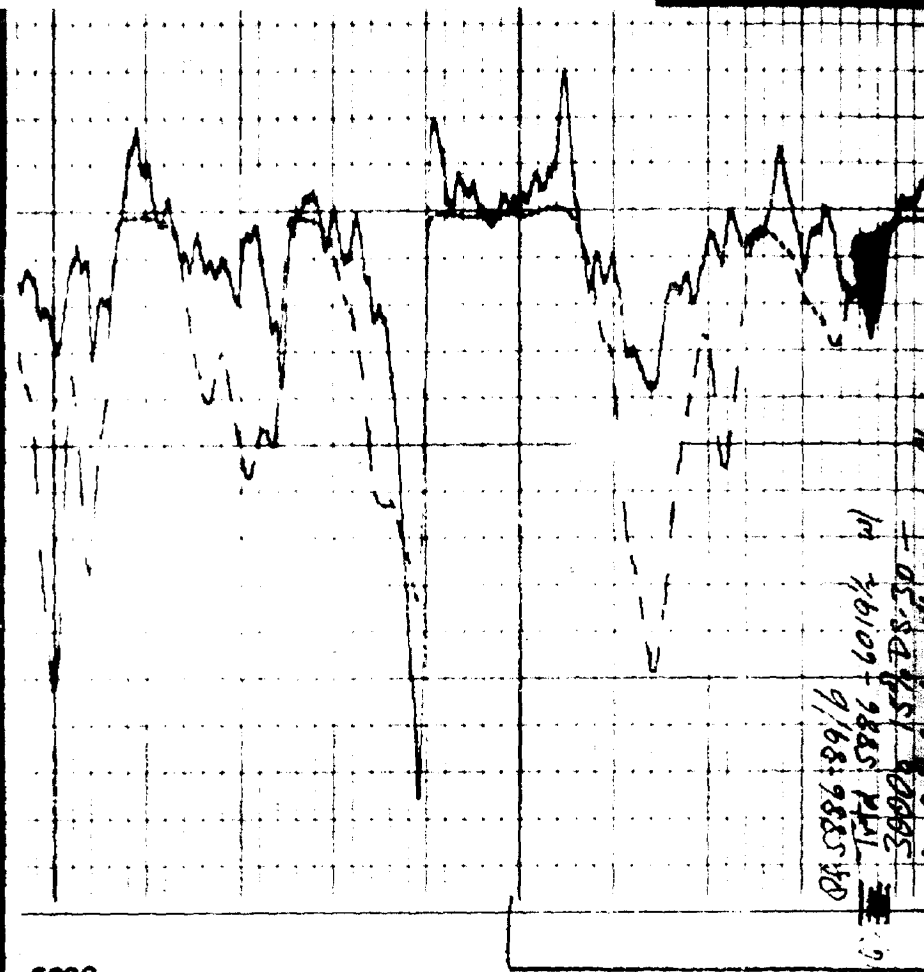
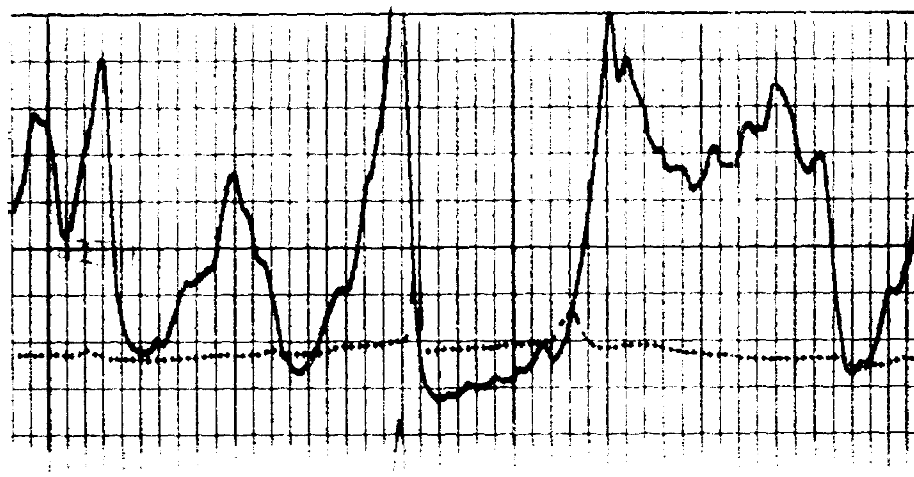
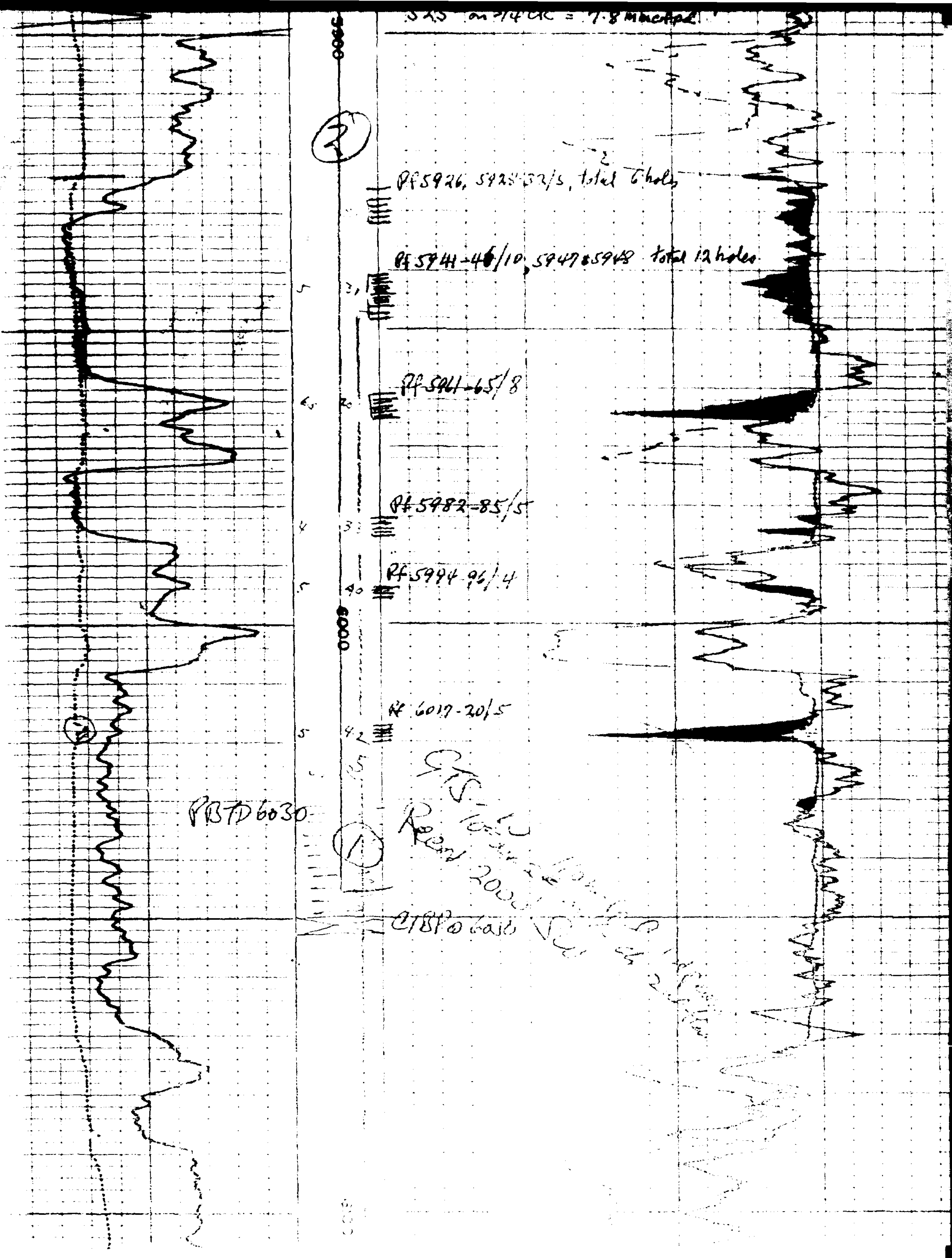
Date	2-2-78			
Run No.	ONE			
Depth–Driller	8400			
Depth–Logger	8401			
Btm. Log Interval	8400			
Top Log Interval	Surface			
Casing–Driller	8 5/8 @ ~~1486~~/1498	@	@	
Casing–Logger	1492			
Bit Size	7 7/8			
Type Fluid in Hole	Salt Mud			
Dens. / Visc.	8.9 / 42			
pH / Fluid Loss	8.5 / 8.0 ml	ml	ml	ml
Source of Sample	Pit			
Rm @ Meas. Temp.	.232 @ 62 °F	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	.186 @ 62 °F	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	– @ – °F	@ °F	@ °F	@ °F
Source: Rmf / Rmc	M / –			
Rm @ BHT	.114 @ 126 °F	@ °F	@ °F	@ °F
TIME Circulation Stopped	1745 (2-2)			
TIME Logger on Bottom	5:50 (2-3)			
Max. Rec. Temp.	°F			°F



5800





Pf 5926, 5928-32/5, total 6 holes
Pf 5941-46/10, 5947 & 5948 total 12 holes
Pf 5961-65/8
Pf 5982-85/5
Pf 5994-96/4
6000
Pf 6017-20/5
PBTD 6030
CIBP @ 6030

WELL NAME: Cities JG State #1

LOCATION: 13-18S-24E

DST INTERVAL: 6544-6865

$P^* = 2312$ psi   slope (M) = 260 psi/cycle

$T_c = 377\ ^{\circ}R$ $P_c = 669$ psi

$T = 122 + 460^{\circ} = 582\ ^{\circ}R$ $P_{wf} = 116$ psi

$$P_{avg} = \frac{P^* + P_{wf}}{2} = \frac{2312 + 116}{2} = 1214 \text{ psi} \quad \text{(Note 1)}$$

$$T_r = \frac{T}{T_c} = \frac{582}{377} = 1.54$$

$$P_r = \frac{P_{avg}}{P_c} = \frac{1214}{669} = 1.81$$

$Z = 0.885$ $T_{sc} = 520^{\circ}R$ $P_{sc} = 13.3$ psi

$$B_g = Z \cdot \frac{T}{T_{sc}} \cdot \frac{P_{sc}}{P_{avg}} = 0.885 \cdot \frac{582}{520} \cdot \frac{13.3}{1214} = 0.0109 \quad \text{(Note 1)}$$

$q = 189$ Mcfd $\cdot$ 178.1 = 33660.9 b/d

$u = (1.2)(0.0114) = 0.0137$ cp (Note 2)

$$kh = \frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6\,(33660.9)\,(0.0137)\,(0.0109)}{260}$$

$kh = 3.144$ md·ft

$h = 45$ ft (Note 3)

$k = 0.069$ md

1) C.S. Matthews - D. G. Russell eqn. 3.21a
2) C.S. Matthews - D. G. Russell Fig. G.3A&B
3) h estimated from log

Supplement to Exhibit 12
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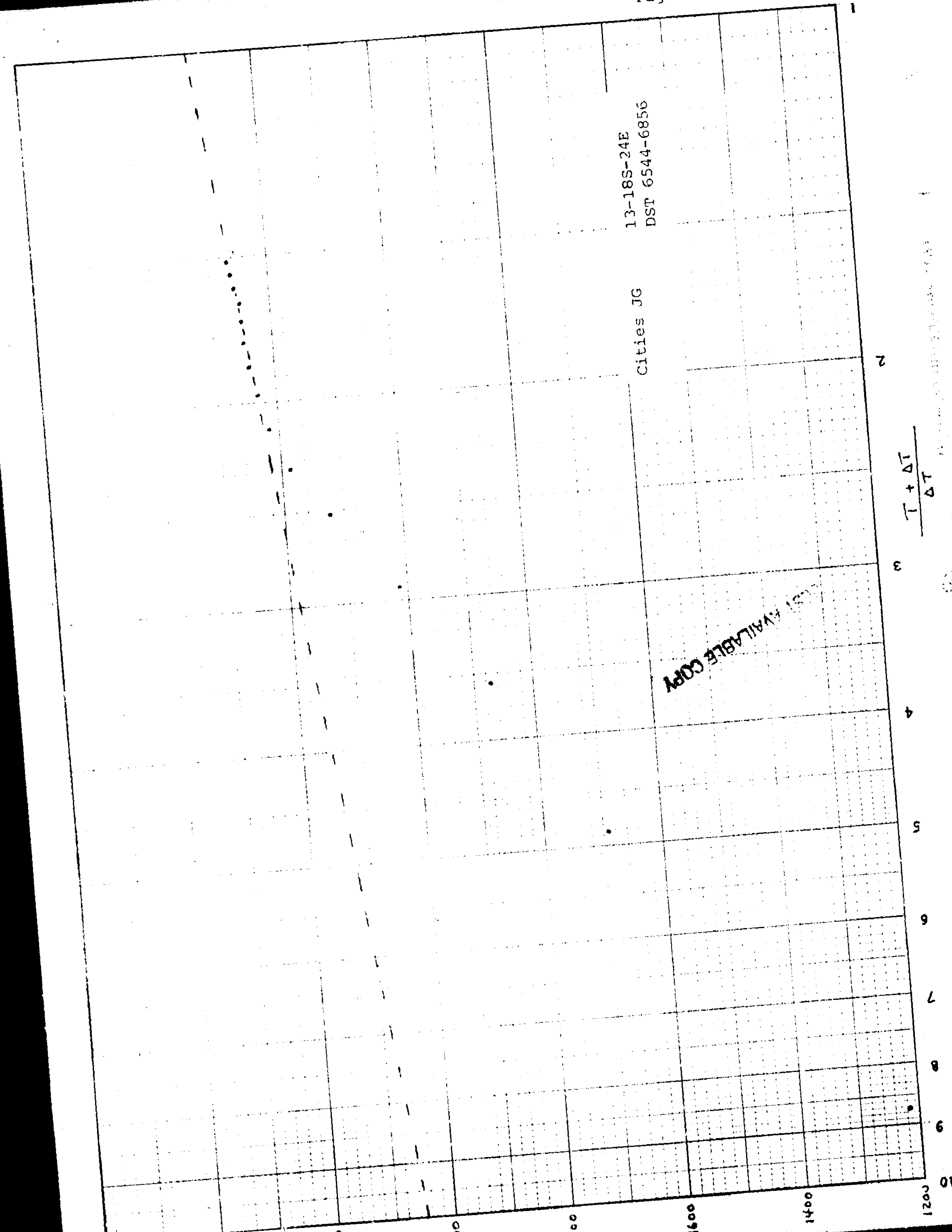

GAS QUALITY TEST REPORT

Vans Pet. Co.

Cities "JG"

STA. NO. 1232-2

CONTRACT NO.

TEST DATE 04.01.80

LAB 4

COMPOUND COMPONENTS	COMPONENT SPECIFIC GRAVITY	MOLE FRACTION
NITROGEN	.9672	.0126
CARBON DIOXIDE	1.5195	.0019
HELIUM	.1382	
OXYGEN	1.1048	.0002
HYDROGEN SULFIDE	1.1766	
WATER VAPOR	.6220	
NON-HYDROCARBON		.0147
METHANE	.5539	.8632
ETHANE	1.0382	.0110
PROPANE	1.5225	.0790
ISO-BUTANE	2.0068	.0099
N-BUTANE	2.0068	.0085
ISO-PENTANE	2.4910	.0026
N-PENTANE	2.4910	.0021
HEXANES	2.9753	.0028
HEPTANES +	3.7018	.0020

COMPOSITION

LIQUEFIABLE HYDROCARBONS	COMPONENT G.P.M.	MOLE FRACTION	G.P.M. CONTENT
PROPANE	27.514	.	
ISO-BUTANE	32.698	.	
N-BUTANE	31.510	.	
LPG			
ISO-PENTANE	36.582	.	
N-PENTANE	36.213	.	
HEXANES	41.111	.	
HEPTANES +	46.126	.	
NATURAL GASOLINE			
TOTAL LIQUEFIABLE GPM			

WATER VAPOR CONTENT:

Gas Mixture Static Pressure PSI

Hydrocarbon Dew Point °F

Water Vapor Dew Point °F

Lbs. Water Vapor per MMCF

Conversion Constant X 0.000021

Water Vapor Mole Fraction .

Moisture recorder reading

Make or type

MIXTURE SPECIFIC GRAVITY:

Calculated From Analysis .664

Determined by Test Instrument .663

Instrument & Serial Type

SULFUR CONTENT:

H_2S - Hydrogen Sulfide, Gr. 100 cf .00

RSH - Mercaptans " .02

RSR - Sulfides " .24

RSSR - Residuals " .

Total Sulfur, Gr. 100 cf .26

H_2S Mole Fraction Constant X 0.0000157

MIXTURE HEATING VALUE:
(Btu/cf at 14.73 psia, 60°F, Dry)

Calculated From Analysis

Determined

Calorimeter

Pressure 568.7 Temperature 376.5

REMARKS

MEASUREMENT AREA

FLUID SAMPLE DATA

Sampler Pressure	[illegible] P.S.I.G. at Surface
Recovery: Cu. Ft. Gas	.107
cc Oil	
cc Water	
cc Mud	[illegible]
Tot. Liquid cc	
Gravity	°API @ °F
Gas/Oil Ratio	cu. ft. per bbl.

	RESISTIVITY	CHLORIDE CONTENT
Recovery Water	@ °F	ppm
Recovery Mud	@ °F	ppm
Recovery Mud Filtrate	@ °F	ppm
Mud Pit Sample	@ °F	ppm
Mud Pit Sample Filtrate	@ °F	ppm
Mud Weight	8.6	vis 28 sec

Date	[illegible]
Ticket Number	529481
Kind of Job	OPEN HOLE
Hall Number / District	ARTESIA
Tester	RICHARD PEPPERS
Witness	J. JONAS
Drilling Contractor	[illegible] DRILLING # 4

Legal Location Sec. - Twp. - Rng: 13-18S-24E

EQUIPMENT & HOLE DATA

Formation Tested	Lower Cisco
Elevation	3651' Ft.
Net Productive Interval	20' Ft.
All Depths Measured From	Kelly Bushing
Total Depth	6856' Ft.
Main Hole/Casing Size	7 7/8"
Drill Collar Length	352' I.D. 1.25"
Drill Pipe Length	6156' I.D. 3.826"
Packer Depth(s)	6538-6544' Ft.
Depth Tester Valve	6518' Ft.

Cushion — TYPE: AMOUNT: Ft. Depth Back Pres. Valve: Surface Choke: 5/8" Bottom Choke: .75"

Recovered 442 Feet of drilling mud

Recovered Feet of

Recovered Feet of

Recovered Feet of

Recovered Feet of

Remarks: SEE PRODUCTION TEST DATA SHEET

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Field Area · Meas. From Tester Valve · Well No. · Test No. · Tested Interval · County: EDDY · State: NEW MEXICO

TEMPERATURE	Gauge No. 1114	Gauge No. 1113	Gauge No.	TIME
	Depth 6522 Ft.	Depth 6852 Ft.	Depth Ft.	
	24 Hour Clock	24 Hour Clock	Hour Clock	Tool Opened 0800 A.M./P.M.
Est. °F.	Blanked Off No	Blanked Off Yes	Blanked Off	Opened Bypass 1300 A.M./P.M.
Actual 122 °F.	Pressures	Pressures	Pressures	

		Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic		[illegible]	2964	[illegible]	3106				
First Period	Flow Initial	[illegible]	[illegible]	[illegible]	[illegible]			—	—
	Flow Final	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	31
	Closed in	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	99
Second Period	Flow Initial	[illegible]	[illegible]	[illegible]	[illegible]			—	—
	Flow Final	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	60
	Closed in	[illegible]	[illegible]	[illegible]	2394			[illegible]	120
Third Period	Flow Initial							—	—
	Flow Final								
	Closed in								
Final Hydrostatic		[illegible]	[illegible]		[illegible]			—	—

FORMATION TEST DATA

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...sing perfs .... bottom choke .... Surf. temp. .... °F Ticket No. 520451
...s gravity .... Oil gravity .... GOR ....
...ec. gravity .... Chlorides .... ppm Res. .... @ .... °F
...DICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED ....

...te ...me a.m. p.m.	Choke Size	Surface Pressure psi	Gas Rate MCF	Liquid Rate BPD	Remarks
0800	1/8"				Opened tool with a good blow
0805	"	18			Good blow, no gas
0810	"	28			"
0815	"	38			"
0820	"	49			"
0825	"	60			"
0830	"	70			Closed tool
0834					Gas to surface
1000	5/8"				Opened tool, gas flare
1005	"	15	299		
1010	"	10	249		Gas depleating
1015	"	6	209		Gas Stabilized
1020	"	6	209		"
1025	"	6	209		"
1030	"	6	209		"
1035	"	6	209		"
1040	"	6	209		"
1045	"	6	209		"
1050	"	5	199		Gas depleating
1055	"	4	189		"
1100	"	4	[illegible]		Closed tool
1300					Pulled tool loose

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PRODUCTION TEST DATA

Gauge No. 1114 | Depth 6522' | Clock No. 13428 | 24 hour | Ticket No. 520451

	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.
0	.000	336	.000		178	.000	395 Q	.000		116					
1	.0197	[illegible]	.0165		848**	.0342	[illegible]	.0265		1219					
2	.0362	110	.0363		1502	.0683	107	.0531		1693					
3	.0526	132	.0562		1850	.1025	112	.0796		1876					
4	.0691	142	.0759		1970	.1367	114	.1061		2018					
5	.0855	164	.0958		2057	.1709	116	.1327		2124					
6	.1020	178	.1156		2125	.2050	116	.1592		2186					
7			.1354		2180			.1857		2219					
8			.1553		2217			.2122		2235					
9			.1751		2246			.2388		2246					
10			.1949		2263			.2653		2251					
11			.2147		2276			.2918		2253					
12			.2345		2284			.3184		2256					
13			.2544		2290			.3449		2260					
14			.2742		2293			.3714		2263					
15			.2940		2297			.3980		2265					

Gauge No. 1113 | Depth 6852' | Clock No. 4365 | hour 24

	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
0	.000	416	.000		312	.000	382	.000		246					
1	.0199	218*	.0167		1033**	.0332	237	.0267		1371					
2	.0366	244	.0367		1643	.0663	232	.0533		1807					
3	.0532	263	.0567		1957	.0995	239	.0800		2005					
4	.0698	279	.0768		2086	.1327	244	.1067		2145					
5	.0864	296	.0968		2178	.1659	246	.1334		2244					
6	.1030	312	.1168		2253	.1990	246	.1600		2310					
7			.1368		2314			.1867		2348					
8			.1568		2355			.2134		2368					
9			.1769		2383			.2400		2376					
10			.1969		2402			.2667		2383					
11			.2169		2411			.2934		2385					
12			.2369		2420			.3200		2389					
13			.2569		2427			.3467		2392					
14			.2769		2429			.3734		2394					
15			.2970		2429			.4000		2394					
Reading Interval		5			6		10			8					Minutes

REMARKS: *-6 minutes **-5 minutes Q-Questionable

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6

SPECIAL PRESSURE DATA

Supplement to Exhibit 12
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Cities JG State #1

DST 6544-6865

Log footage contributing to height h:

Interval	Feet
6561-6583	22
6588-6593	5
6599-6601	2
6609-6615	6
6616-6618	2
6620-6625	5
6636-6639	3
	45 ft.

Cities JC State #1

DST 6544-6865

<u>Time to Reach Pseudosteady State</u>

A) Average Porosity = 0.025 (Note 1)

Interval	Porosity
6561-6583	0.026
6588-6593	0.028
6599-6601	0.021
6609-6615	0.035
6616-6618	0.026
6620-6625	0.020
6636-6639	0.010

B) Total Compressibility = $S_g C_g$

$$C_t = (0.7)\ (0.00090) = 0.00063\ \text{psi}^{-1}$$ (Note 2)

C) Time $t = \dfrac{1136 \phi u C_t r_e^2}{k}$

$$t = \frac{1136\ (0.025)\ (0.0137)\ (0.00063)\ (2106)^2}{0.069}$$

$t =$ 15,800 hr

$t =$ 1.8 yr

1) Porosity averaged over 45 ft of pay
2) C.S. Matthews - D.G. Russell Fig. G7.A

FORMATION DENSITY

COMPANY

WELL

FIELD

COUNTY

STATE

COUNTY
FIELD
LOCATION
WELL
COMPANY

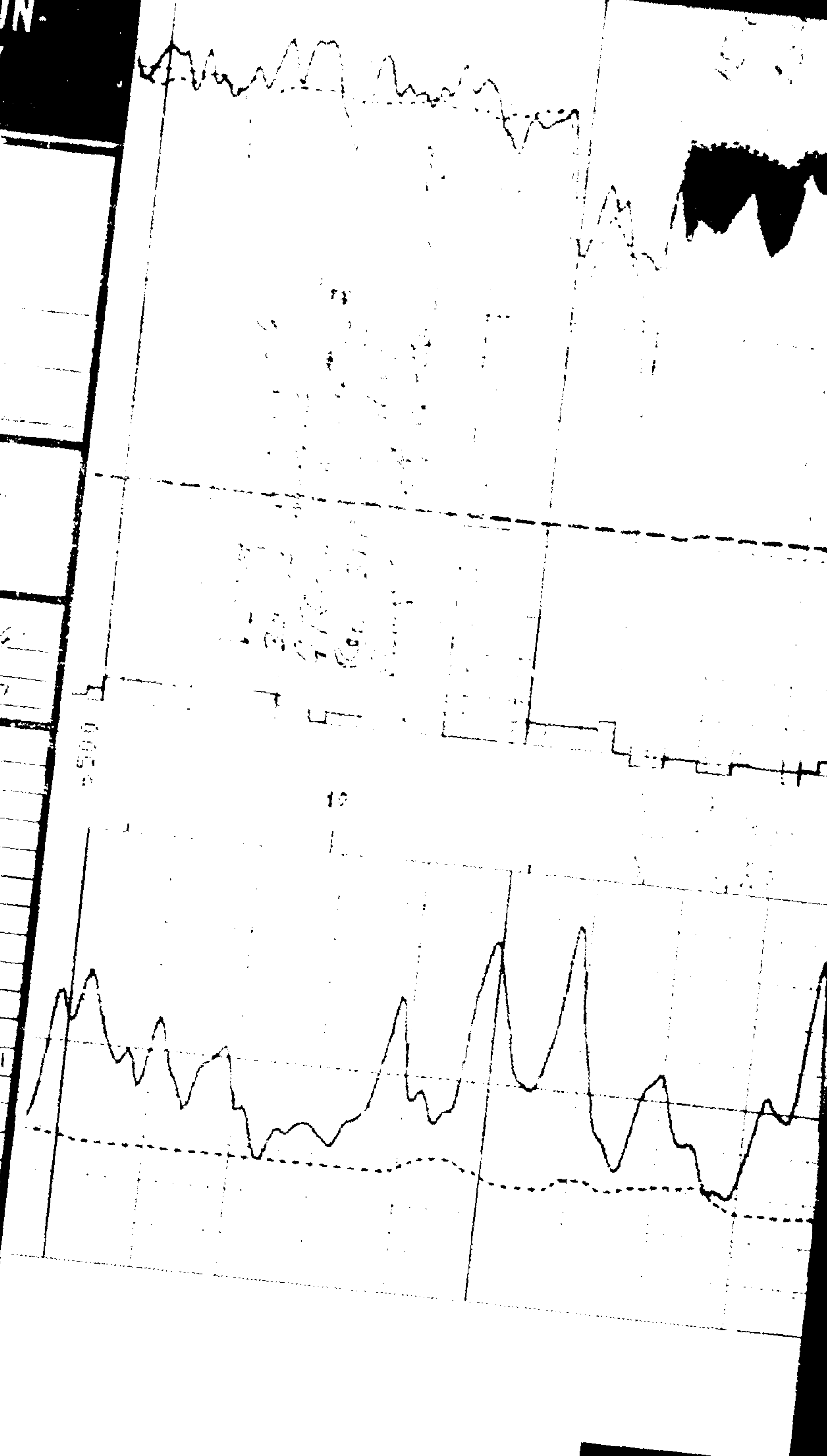
Permanent Datum: G.L.
Log Measured From K.B. Elev.:
Drilling Measured From K.B. Ft. Above Perm. Datum

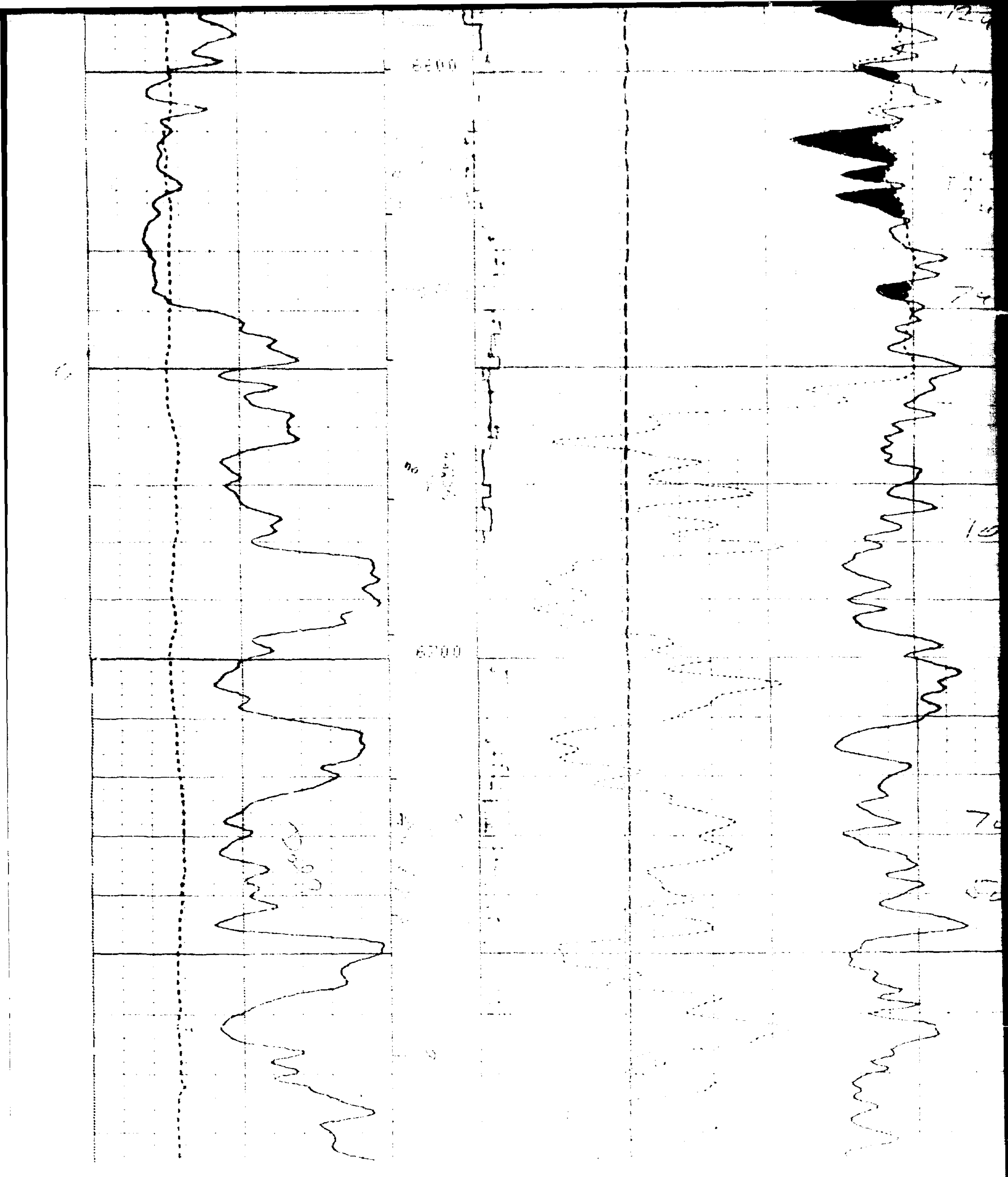
Elev.: K.B.
D.F.
G.L. 365

Date			
Run No.			
Depth – Driller			
Depth – Logger	2160		
Btm. Log Interval			
Top Log Interval			
Casing – Driller	0		
Casing – Logger	8 5/8 @	@	@
Bit Size			
Type Fluid in Hole			
Dens. | Visc.			
pH | Fluid Loss	ml	ml	ml
Source of Sample			
Rm @ Meas. Temp.	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	@ 60 °F	@ °F	@ °F
Rmc @ Meas. Temp.	@ 60 °F	@ °F	@ °F
Source: Rmf | Rmc			
Rm @ BHT	@ °F	@ °F	@ °F
Circulation Stopped			
Logger on Bottom			

BEST AVAILABLE COPY

FIELD PRINT




6200

WELL NAME: Cities JH State #1

LOCATION: 36-21S-21E

DST INTERVAL: 5900-6100

$P^* = 2175$ psi Slope (M) 2243 psi/cycle

$Tc = 386$ °R $Pc = 688$ psi

$T = 99 + 460° = 559$ °R $Pwf = 321$ psi

$$P_{avg} = \frac{P^* + P_{wf}}{2} = \frac{2175 + 321}{2} = 1248 \text{ psi (Note 1)}$$

$$T_r = \frac{T}{T_c} = \frac{559}{386} = 1.45$$

$$P_r = \frac{P_{avg}}{P_c} = \frac{1248}{668} = 1.87$$

$Z = 0.81$ $T_{sc} = 520$ °R $P_{sc} = 13.3$ psi

$$B_g = Z \cdot \frac{T}{T_{sc}} \cdot \frac{P_{sc}}{P_{avg}} = 0.81 \cdot \frac{559}{520} \cdot \frac{13.3}{1248} = 0.0093 \text{ (Note 1)}$$

$q = 54$ Mcfd $\cdot$ 178.1 = 9617 b/d

$u = (1.26)\ (0.0107) = 0.0135$ cp (Note 2)

$$kh = \frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6\ (9617.4)\ (0.0135)\ (0.0093)}{2243}$$

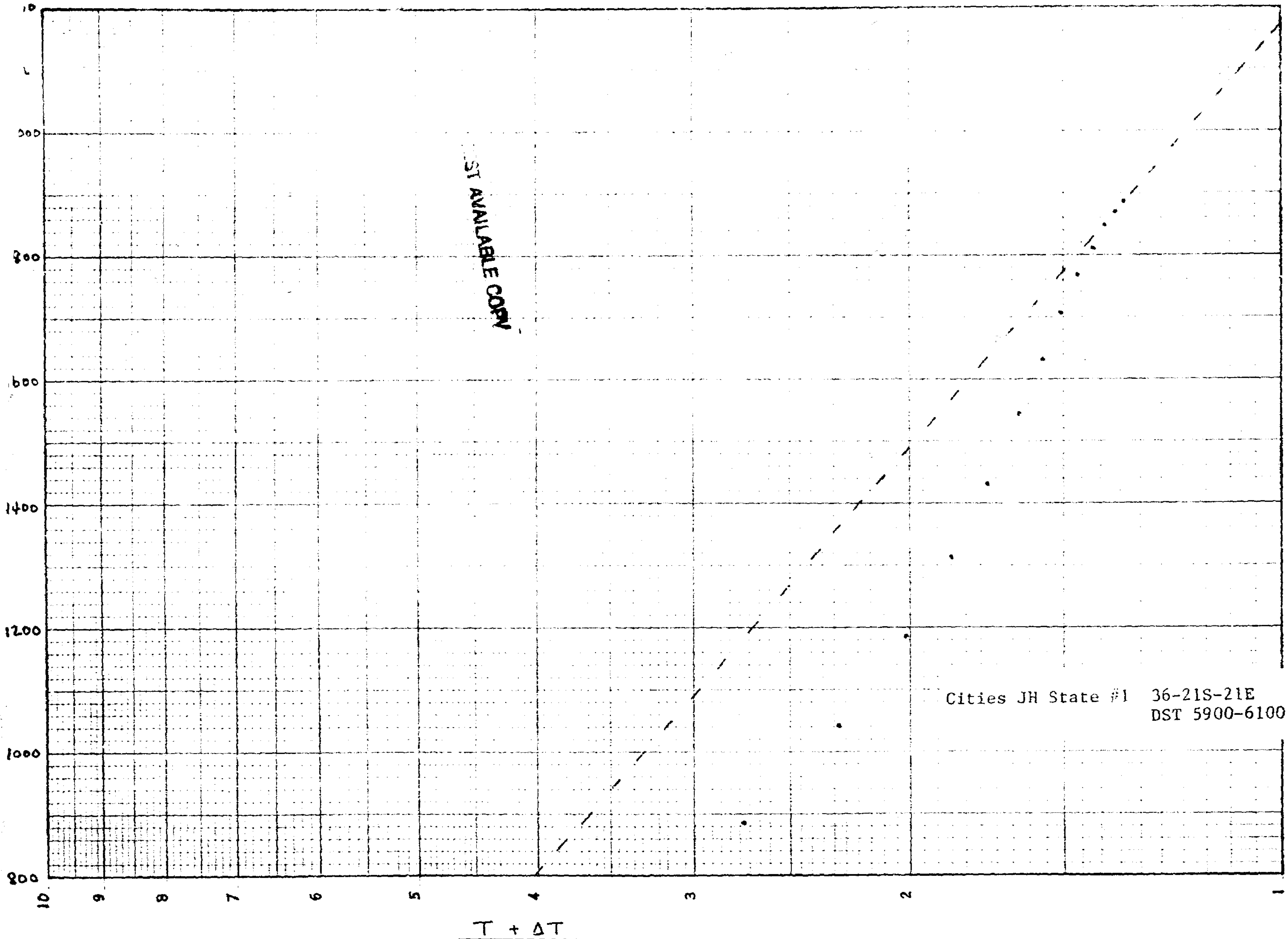
$kh = 0.0875$ md $\cdot$ ft

$h = 18$ ft (Note 3)

k 0.005 md

BEST AVAILABLE COPY

1) C.S. Matthews - D.G. Russell eqn. 3.21a
2) C.S. Matthews - D.G. Russell Fig. G.3A&B
3) h estimated from log


Cities JH State #1 36-21S-21E
DST 5900-6100
T + ΔT
800
1000
1200
1400
1600
1800
10
9
8
7
6
5
4
3
2
1

Supplement to Exhibit [illegible]
Page 3 - 3

EL PASO NATURAL GAS COMPANY

RPT-ASL 38 CHROMATOGRAPHIC GAS ANALYSIS REPORT

RPT DATE 07 27 79
ANAL DATE 07 12 79

METER STATION NAME
CITIES [illegible] STATES [illegible]

METER STA 58039
OPER 9841

TYPE CODE	SAMPLE DATE	EFF. DATE	OBS. NOS.	SCALE	H2S GRAINS	LOCATION
00	07 10 79	07 27 79	06		0000*	1 J [illegible]

	NORMAL MOL%	GPM
C O 2	00.48	0.000
H 2 S	00.00*	0.000
N2	01.26	0.000
METHANE	83.21	0.000
ETHANE	08.25	2.205
PROPANE	03.59	0.988
ISO-BUTANE	00.64	0.209
NORM-BUTANE	01.22	0.384
ISO-PENTANE	00.41	0.150
NORM-PENTANE	[illegible]	0.150
HEXANE PLUS	00.58	0.253
TOTALS	100.00	4.319

SPECIFIC GRAVITY [illegible]

MIXTURE HEATING VALUE
(BTU/CF [illegible] 14.73 [illegible]) [illegible]

RATIO OF [illegible] [illegible]
* NO [illegible]

Legal Location Sec. - Twp. - Rng. 36-21-21

Field Area WILDCAT

County EDDY

State NEW MEXICO

FLUID SAMPLE DATA

Sampler Pressure	300
Recovery: Cu. Ft. Gas	.935
cc. Oil	
cc. Water	
cc. Mud	
Tot. Liquid cc.	
Gravity	°API @ °F.
Gas/Oil Ratio	cu. ft./bbl.

	Resistivity	Chloride Content
Recovery Water	@ °F.	ppm
Recovery Mud	@ °F.	ppm
Recovery Mud Filtrate	@ °F.	ppm
Mud Pit Sample	@ °F.	28,000 ppm
Mud Pit Sample Filtrate	@ °F.	ppm

Mud Weight 8.6 vis 28 sec

Date	4-7-78	Ticket Number	253346
Kind of Job	OPEN HOLE PITTMAN	Halliburton District	ARTESIA
Tester	DAVIS	Witness	WILLIS
Drilling Contractor	CAPITAN RIG # 2		DR

EQUIPMENT & HOLE DATA

Formation Tested	Cisco
Elevation	4615' GL Ft.
Net Productive Interval	16' Ft.
All Depths Measured From	Kelly Drive Bushing(13)
Total Depth	6100' Ft.
Main Hole/Casing Size	7 7/8"
Drill Collar Length	593' I.D. 2.25"
Drill Pipe Length	5300' I.D. 3.340"
Packer Depth(s)	5894'-5900' Ft.
Depth Tester Valve	5877' Ft.

Cushion Type	Amount	Depth Back Pres. Valve	Surface Choke	Bottom Choke
		Ft.	1" Adj.	.75"

Meas. From Tester Valve

Recovered 810' Feet of gas cut drilling fluid

Recovered Feet of

Recovered Feet of

Recovered Feet of

Recovered Feet of

BEST AVAILABLE COPY

Remarks SEE PRODUCTION TEST DATA SHEET

TEMPERATURE	Gauge No. 1114 Depth 5879' Ft.		Gauge No. 1113 Depth 6097 Ft.		Gauge No. Depth Ft.		TIME	
Est. 99 °F.	24 Hour Clock Blanked Off NO		24 Hour Clock Blanked Off Yes		Hour Clock Blanked Off		Tool Opened 1700 A.M. P.M.	
Actual °F.	Pressures		Pressures		Pressures		Opened Bypass 2300 A.M. P.M.	
	Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic	2642	2645	2745	2745				
First Period Flow Initial	71	66	[illegible]	91			—	—
First Period Flow Final	284	294	[illegible]	390			30	31
First Period Closed in	1470	1474	[illegible]	1577			90	90
Second Period Flow Initial	248	255	[illegible]	257			—	—
Second Period Flow Final	[illegible]	[illegible]	[illegible]	353			60	60
Second Period Closed in	1878	[illegible]	[illegible]	1929			180	179
Third Period Flow Initial							—	—
Third Period Flow Final								
Third Period Closed in								
Final Hydrostatic	2642	2608		2701			—	—

FORMATION TEST DATA

Casing perfs ______ Bottom choke .75" ______ Surf. temp ______ °F Ticket No. 253346
Gas gravity ______ Oil gravity ______ GOR ______
Spec. gravity ______ Chlorides ______ ppm Res ______ @ ______ °F
INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED 1/4 x 60 PSI Gauge

Date Time a.m. p.m.	Choke Size	Surface Pressure psi	Gas Rate MCF	Liquid Rate BPD	Remarks
1700					Opened tool with a weak blow
1708					Fair blow
1715					Good blow
1720					Good blow
1730					Closed tool with a good blow
1900					Opened tool with a strong blow
1905	1/4"	27			Put on choke
1911	"	52			Gas to surface in 11 minutes
1915	"	58			
1917	"	59			Peaked and dropping
1930	"	40			PSI dropping
1940	"	30			"
1950	"	25			"
2000	"	23			Closed tool
2300					Pulled tool loose

PRODUCTION TEST DATA

Gauge No. 1114		Depth 5879'	Clock No. 13428	24 hour	Ticket No.	253346

	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.
0	.000	64	.000		294	.000	255	.000		321					
1	.0201	59*	.0299		470	.0337	343	.0369		539**					
2	.0369	170	.0598		599	.0673	351	.0772		706					
3	.0537	207	.0897		738	.1010	340	.1175		888					
4	.0704	246	.1196		863	.1347	332	.1578		1041					
5	.0872	280	.1495		991	.1684	324	.1981		1186					
6	.1040	294	.1794		1111	.2020	321	.2384		1316					
7			.2093		1216			.2787		1437					
8			.2392		1314			.3190		1544					
9			.2691		1408			.3593		1633					
10			.2990		1474			.3995		1707					
11								.4398		1771					
12								.4801		1816					
13								.5204		1851					
14								.5607		1872					
15								.6010		1887					

Gauge No. 1113	Depth 6097'	Clock No. 6728	hour	24

	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
0	.000	91	.000		390	.000	257	.000		353					
1	.0199	201*	.0299		514	.0335	320	.0367		540**					
2	.0366	253	.0598		563	.0670	367	.0767		741					
3	.0532	297	.0897		302	.1005	367	.1167		916					
4	.0698	337	.1196		933	.1340	362	.1568		1072					
5	.0864	371	.1495		1056	.1675	357	.1968		1219					
6	.1030	390	.1794		1178	.2010	353	.2368		1346					
7			.2093		1287			.2768		1471					
8			.2392		1390			.3168		1520					
9			.2691		1488			.3569		1659					
10			.2990		1577			.3969		1740					
11								.4369		1805					
12								.4769		1855					
13								.5169		1890					
14								.5570		1913					
15								.5970		1929					
Reading Interval	5		9			10		12							Minutes

REMARKS: *-6 minutes **-11 minutes.

Supplement to Exhibit 12
Page 3 - 6

Cities JH State #1

DST 5900-6100

Contributions to log height h:

Interval	Feet
5936-5938	2
5952-5960	8
6034-6042	8
	18 ft.

Cities JH State #1

DST 5900-6100

Time to Reach Pseudosteady State

A) Average Porosity = 0.033 (Note 1)

Interval	Porosity
5936-5938	0.014
5952-5960	0.024
6034-6042	0.046

B) Total Compressibility $\approx C_{g}S_{g}$

$$C_t = (0.7)\ (0.00093) = 0.00065\ \text{psi}^{-1}$$ (Note 2)

C) Time $t = \dfrac{1136\phi\mu C_t r_e^2}{k}$

$$t = \frac{1136\ (0.033)\ (0.0135)\ (0.00065)\ (2106)^2}{0.005}$$

t = 292,000 hr

t = 33.3 yr

BEST AVAILABLE COPY

1) Porosity averaged over 18 ft of pay
2) C.S. Matthews - D.G. Russell Fig. G7.A

FORMATION DENSITY

COMPANY

WELL

FIELD

COUNTY

STATE

COUNTY
FIELD
LOCATION
WELL
COMPANY

Permanent Datum: GL
Log Measured From KB
Drilling Measured From KB

Elev. 4612
Ft. Above Perm. Datum

Elev.: K.B. 4622
D.F.
G.L. 4612

Date	Apr. 28, 1978		
Run No.	ONE		
Depth—Driller	8900		
Depth—Logger	8898		
Btm. Log Interval	8894		
Top Log Interval	000		
Casing—Driller	8 5/8 @ 1557		
Casing—Logger	1560		
Bit Size	7 7/8		
Type Fluid in Hole	Salt		
Dens. | Visc.	9.1 | 48		
pH | Fluid Loss	9.5 | 5 ml	ml	ml
Source of Sample	Pit		
Rm @ Meas. Temp.	.125 @ 74 F	@ F	@ F
Rmf @ Meas. Temp.	.103 @ 76 F	@ F	@ F
Rmc @ Meas. Temp.	.160 @ 76 F	@ F	@ F
Source: Rmf | Rmc	M | C		
Rm @ BHT	.064 @ 154 F	@ F	@ F
Circulation Stopped	2000 (4-27)		
Logger on Bottom	1400 (4-28)		

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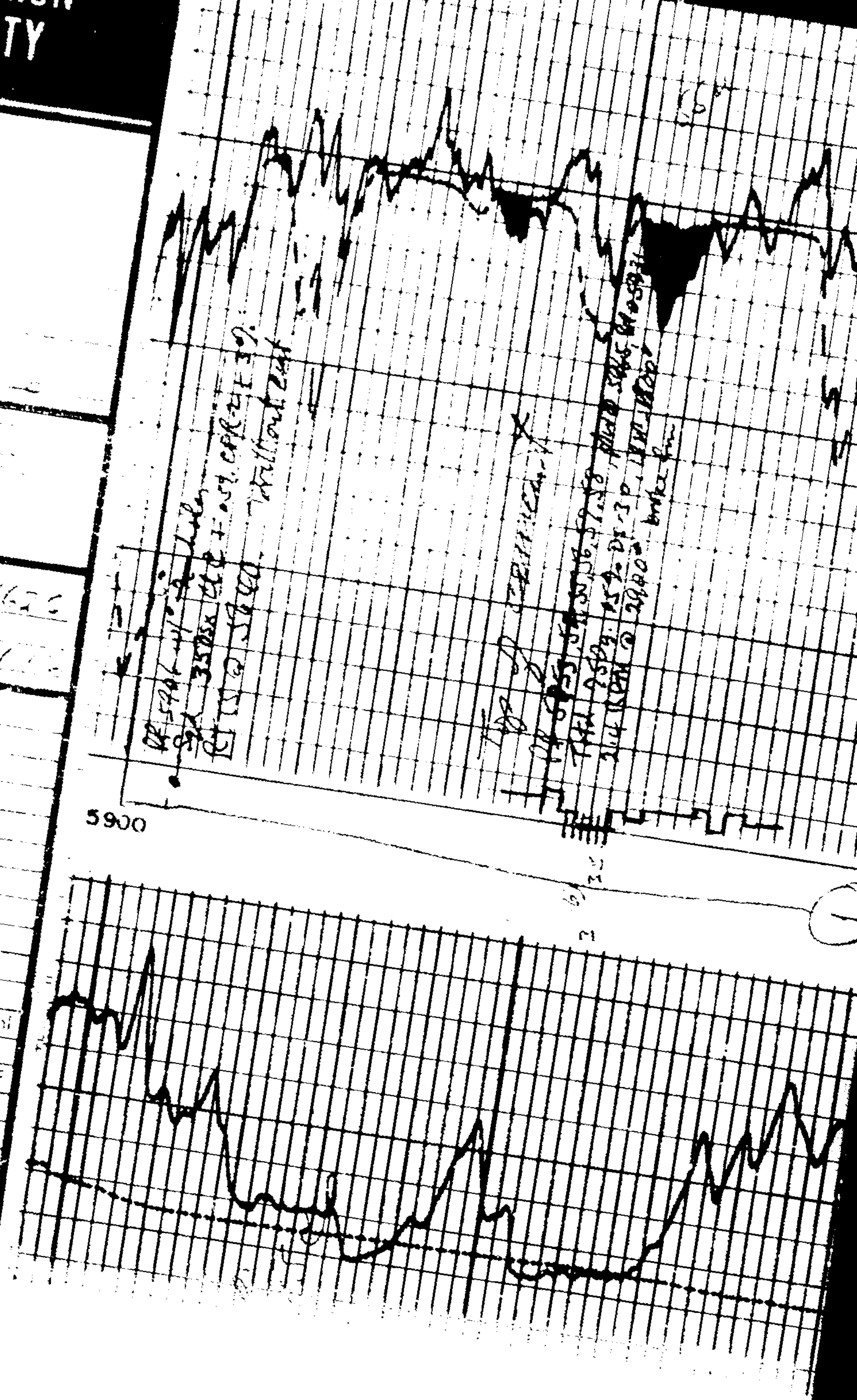
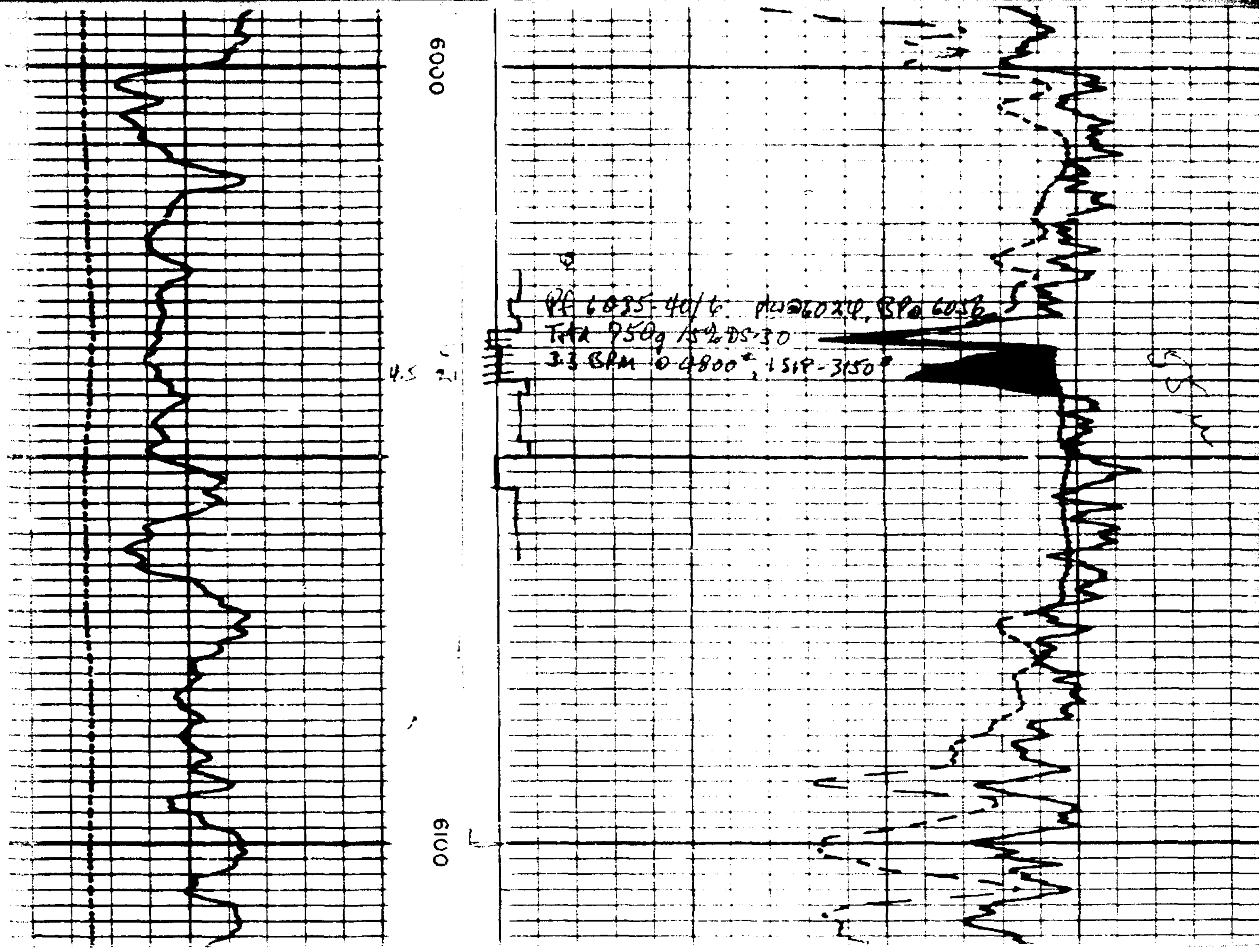


5900


6000
6100
4.5
3.3 BPM

WELL NAME: City of Artesia Eq #1

LOCATION: 24-17S-25E

DST INTERVAL: 6435-6650

$P^* = 2331$ psi   Slope (M) = 151 psi/cycle

$T_c = 377\ ^{\circ}R$ $P_c = 657$ psi

$T = 115 + 460^{\circ} = 575\ ^{\circ}R$ $P_{wf} = 175$ psi

$$P_{avg} = \frac{P^* + P_{wf}}{2} = \frac{2331 + 175}{2} = 1253 \text{ psi} \quad \text{(Note 1)}$$

$$T_r = \frac{T}{T_c} = \frac{575}{377} = 1.53$$

$$P_r = \frac{P_{avg}}{P_c} = \frac{1253}{675} = 1.86$$

$Z = 0.84$ $T_{sc} = 520^{\circ}R$ $P_{sc} = 13.3$ psi

$$B_g = Z \cdot \frac{T}{T_{sc}} \cdot \frac{P_{sc}}{P_{avg}} = 0.84 \cdot \frac{575}{520} \cdot \frac{13.3}{1253} = 0.0099 \quad \text{(Note 1)}$$

$q = 83$ Mcfd $\cdot$ 178.1 = 14782 b/d

$u = (1.22)\ (0.0111) = 0.0135$ cp (Note 2)

$$kh = \frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6\ (14782)\ (0.0135)\ (0.0099)}{151}$$

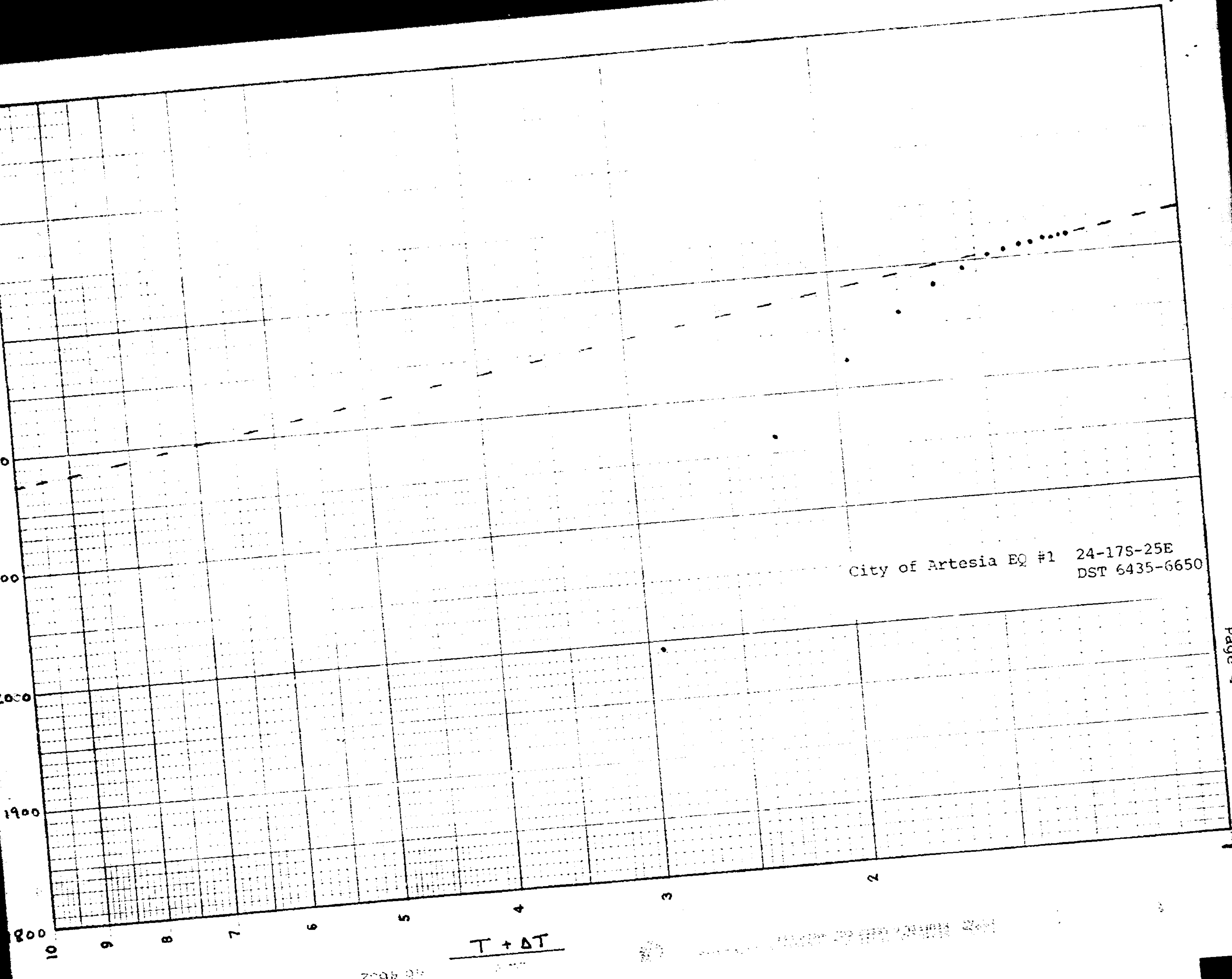
$kh = 2.127$ md $\cdot$ ft

$h = 32$ ft (Note 3)

$k = 0.066$ md (Note 4)

BEST AVAILABLE COPY

1) C. S. Matthews - D.G. Russell eqn 3.21a
2) C. S. Matthews - D.G. Russell Fig. G.3A&B
3) h estimated from log
4) Also k = 0.066 md for q = 116 Mcfd and h = 45 ft.



Supplement to Exhibit 12
Page 4 - 2

BEST AVAILABLE COPY

TUB

RECEIVED MAY 29 1977

...AS QUALITY TEST REPORT

W. Amoza

Peru

Cay de Amoza

STA. NO. 1269

CONTRACT NO. 3161

TEST DATE 04.28.77

CAR 4

COMPOUND COMPONENTS	COMPONENT SPECIFIC GRAVITY	COMPONENT MOLE FRACTION
NITROGEN	.9672	.0062
CARBON DIOXIDE	1.5195	.0143
HELIUM	.1382	
OXYGEN	1.1048	.0001
HYDROGEN SULFIDE	1.1766	—
WATER VAPOR	.6220	—
HYDROCARBON DILUENTS		.0209
METHANE	.5539	.8666
ETHANE	1.0382	.0669
PROPANE	1.5225	.0257
ISO-BUTANE	2.0068	.0036
N-BUTANE	2.0068	.0069
ISO-PENTANE	2.4910	.0022
N-PENTANE	2.4910	.0018
HEXANES	2.9753	.0040
HEPTANES +	3.7018	.0019

COMPOSITION ... 1.0000

LIQUEFIABLE HYDROCARBONS	COMPONENT G.P.M.	MOLE FRACTION	G.P.M. CONTENT
PROPANE	27.514	.	
ISO-BUTANE	32.698	.	
N-BUTANE	31.510	.	
LPG			
ISO-PENTANE	36.582	.	
N-PENTANE	36.213	.	
HEXANES	41.111	.	
HEPTANES +	46.126	.	
NATURAL GASOLINE			
TOTAL LIQUEFIABLE GPM			

WATER VAPOR CONTENT:

Gas Mixture Static Pressure PSI ______

Hydrocarbon Dew Point °F ______

Water Vapor Dew Point °F ______

Lbs Water Vapor per MMCF ______

Conversion Constant X 0.000021

Water Vapor Mole Fraction ______

Moisture recorder reading 4.6#

Recorder type DuPont

MIXTURE SPECIFIC GRAVITY:

Calculated From Analysis .667

Determined by Test Instrument .665

Instrument Make & Type Ranarex

SULFUR CONTENT:

H_2S — Hydrogen Sulfide, Gr./100 cf No Trace

RSH — Mercaptans " ______

RSR — Sulfides " ______

RSSR — Disulfides " ______

Total Sulfur, Gr./100 cf ______

H_2S ... conversion X 0.0000157

H_2S Mole Fraction ______

MIXTURE HEATING VALUE:

Btu/cf at 14.73 Psia, 60 F, (dry)

Calculated From Analysis 1108

Determined by Calorimeter 1111

Calorimeter Verified 04-29-77

Critical Pressure 675 Critical Temperature 377

REMARKS: ______

MEASUREMENT OPR. Rosales

GAS ANALYST R. Arenal

FLUID SAMPLE DATA

Sampler Pressure	200	P.S.I.G.
Recovery: Cu. Ft. Gas	.65	
cc. Oil		
cc. Water		
cc. Mud	450	
Tot. Liquid cc.		
Gravity		°API @ °F
Gas/Oil Ratio		cu. ft./bbl.

	Resistivity	Chloride Content
Recovery Water	@ °F	ppm
Recovery Mud	@ °F	ppm
Recovery Mud Filtrate	@ °F	ppm
Mud Pit Sample	@ °F	ppm
Mud Pit Sample Filtrate	@ °F	ppm

Mud Weight 8.6 vis 36 cp

Date	8-31-75	Ticket Number	788048
Kind of Job	OPEN HOLE	Halliburton District	ARTESIA
Tester	GULLEY	Witness	MAHFOOD
Drilling Contractor	A&D DRILLING COMPANY		NM S

EQUIPMENT & HOLE DATA

Formation Tested	Cisco		
Elevation	3465' K.B.		Ft.
Net Productive Interval	-		Ft.
All Depths Measured From	Kelly Bushing - 15'		
Total Depth	6650'		Ft.
Main Hole/Casing Size	7 7/8"		
Drill Collar Length	948'	I.D.	2.25"
Drill Pipe Length	5637'	I.D.	3.826"
Packer Depth(s)	6429' - 6435'		Ft.
Depth Tester Valve	6406'		Ft.

Legal Location Sec. - Twp. - Rng.: 24 - 17 - 25

Cushion Type	Amount		Depth Back Pres. Valve	Surface Choke	Bottom Choke
	NONE	Ft.	NONE	1" ADJ.	.75"

Recovered 420' Feet of drilling fluid - gas cut

Recovered Feet of

Recovered Feet of

Recovered Feet of

Recovered Feet of

Meas. From Tester Valve

Field Area: WILDCAT -SW ARTESIA

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Remarks Tool opened for a 22 minute first flow. Had gas to the surface in 18 minutes. Maximum pressure was 24# on ¼" choke. Closed tool for a 79 minute first closed in pressure. Tool reopened for a 60 minute second flow with a maximum pressure of 35# on ¼" choke. Took a 239 minute second closed in pressure. SEE PRODUCTION TEST DATA SHEET.

County: EDDY

State: NEW MEXICO

Temperature	Gauge No. 512		Gauge No. 113		Gauge No.		Time	
	Depth 6411' Ft.		Depth 6646' Ft.		Depth Ft.			
	12 Hour Clock		12 Hour Clock		Hour Clock		Tool Opened 820	A.M. / P.M.
°F.	Blanked Off NO		Blanked Off YES		Blanked Off		Opened Bypass 300	A.M. / P.M.
Actual 115°F.	Pressures		Pressures		Pressures			
	Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic	2900	3001	-	3110				
Flow Initial	171	188	-	297				
Flow Final	131	136	-	215			20	22
Closed in	2240	2279	-	2363			80	79
Flow Initial	131	217	-	329				
Flow Final	158	175	-	243			60	60
Closed in	2268	2316	-	2397			240	239
Flow Initial								
Flow Final								
Closed in								
Final Hydrostatic	2980	[illegible]		[illegible]				

FORMATION TEST DATA

Casing perfs. Bottom choke Surf. temp. °F Ticket No. 788048
Gas gravity Oil gravity GOR
Spec. gravity Chlorides ppm Res. @ °F
INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED

Date 8-31-75 Time a.m. p.m.	Choke Size	Surface Pressure psi	Gas Rate MCF	Liquid Rate BPD	Remarks
820					Opened tool with a fair building blow.
824	3/16"	6			Opened choke to 3/16"
830	"	17			Opened choke to a ¼"
835	¼"	21			
838	"	23			Gas to the surface.
840	"	24			Closed tool
1000	"				Opened on ¼" choke.
1010	"	65	115.83		
1020	"	60			
1030	"	48			
1040	"	45			
1050	"	44			
1100	"	43	33		Closed tool.
0300					Pulled tools.

BEST AVAILABLE COPY

PRODUCTION TEST DATA

Gauge No. 512 | Depth 6411' | Clock No. 11888 | 12hour | Ticket No. 788048

	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$Log \frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$Log \frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$Log \frac{t+\theta}{\theta}$	PSIG Temp. Corr.
0	.000	[illegible]	[illegible]		116	[illegible]	217	.000		175					
1	.0305	[illegible]	[illegible]		611**	[illegible]	147	.1008		1344***					
2	.0641	1230	.0604		896	.1337	157	.2084		1992					
3	.0897	131	.0939		1228	.2005	169	.3160		2164					
4	.1154	134	.1275		1616	.2673	173	.4236		2224					
5	.1410	136	.1610		1774	.3342	173	.5312		2261					
6			.1946		1959	.4010	175	.6390		2282					
7			.2281		2059			.7468		2294					
8			.2616		2153			.8539		2303					
9			[illegible]		2213			.9615		2308					
10			.3287		2236			1.0691		2310					
11			.3623		2243			1.1768		2311					
12			.3958		2253			1.2842		2314					
13			.4294		2266			1.3918		2314					
14			.4629		2271			1.4994		2315					
15			.4965		2275			1.6070		2316					
			.5300		2279										

Gauge No. 113 | Depth 6646' | Clock No. 7282 | hour 12

	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure		
	Time Defl.	PSIG	Time Defl.	Log	PSIG	Time Defl.	PSIG	Time Defl.	Log	PSIG
0	.000	[illegible]	.000		[illegible]	[illegible]	[illegible]	.000		248
1	.0401	192*	.0269		[illegible]**	.0678	224	.1078		1423***
2	.0668	2120	.0604		[illegible]	.1357	231	.2088		2073
3	.0935	210	.0939		1315	.2035	244	.3166		2243
4	.1203	212	.1275		1616	.2715	248	.4244		2303
5	.1470	215	.1610		1859	.3392	248	.5322		2339
6			.1946		2043	.4070	248	.6399		2363
7			.2281		2166			.7477		2376
8			.2616		2247			.8555		2384
9			.2952		2285			.9633		2386
10			.3287		2317			1.0711		2392
11			.3623		2332			1.1789		2393
12			.3958		2343			1.2866		2396
13			.4294		2349			1.3944		2396
14			.4629		2355			1.5022		2397
15			.4965		2359			1.6100		2397
			.5300		2363					

Reading Interval 4

REMARKS:

5 10 16 Minutes

* INTERVAL = 6 MINUTES. ** INTERVAL = 4 MINUTES. *** INTERVAL = 15 MINUTES

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Supplement to Exhibit 12
Page 4 - 6

City of Artesia EQ #1

DST 6435-6650

Contributions to log height h:

Interval	Feet
6492-6494	2
6496-6500	4
6530-6541	11
6554-6560	6
6568-6571	3
6595-6601	6
	32 ft.

City of Artesia EQ #1

DST 6435-6650

Time to Reach Pseudostead

A) Average Porosity = 0.034 (Note 1)

Interval	Porosity
6492-6494	0.032
6496-6500	0.010
6530-6541	0.047
6554-6560	0.021
6568-6571	0.017
6595-6601	0.048

B) Total Compressibility = $S_g C_g$

$$Ct = 0.7\ (0.00090) = 0.00063\ psi^{-1}$$ (Note 2)

C) Time

$$t = \frac{1136 \phi u C_t r_e^2}{k}$$

$$t = \frac{1136\ (0.034)\ (0.0135)\ (0.00063)\ (2106)^2}{0.066}$$

t = 22,100 hr

t = 2.5 yr

1) Porosity averaged over [illegible] ft of pay
2) C.S. Matthews - D.G. Russell Fig. G7.A

FORMATION DENSITY

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COUNTY / FIELD / LOCATION / WELL / COMPANY   S.O. #41935

COMPANY Yates Petroleum Corporation

WELL City of Artesia "EQ" #1

FIELD Wildcat

COUNTY Eddy   STATE New Mexico

LOCATION 1650 FSL & 1980 FEL

API SERIAL NO.	SEC	TWP	RANGE
	24	17-S	25-E

Other Services: S-DLL/Rxo

Permanent Datum: G.L. ; Elev.: 3450

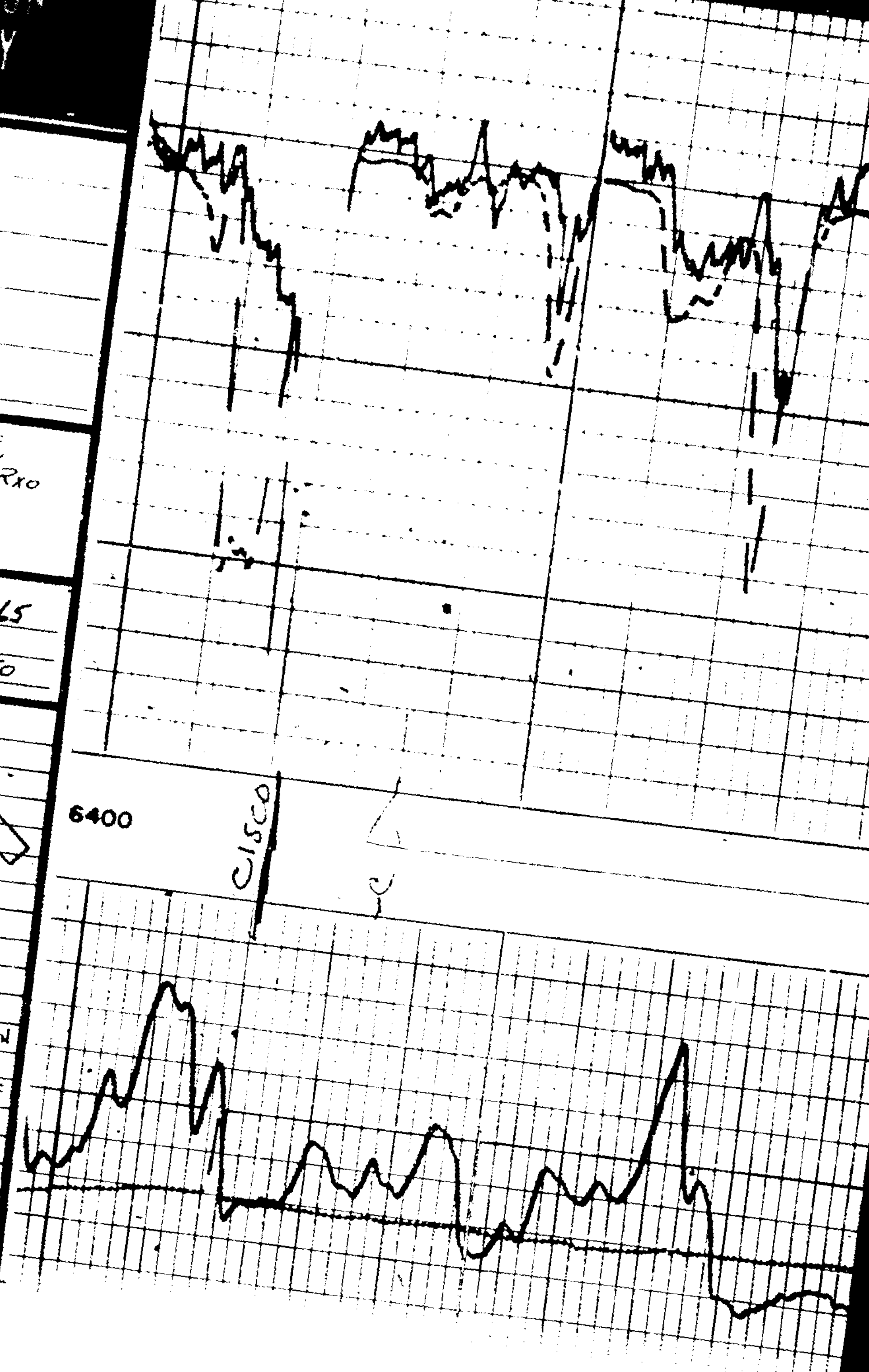
Log Measured From K.B. , 15 Ft. Above Perm. Datum

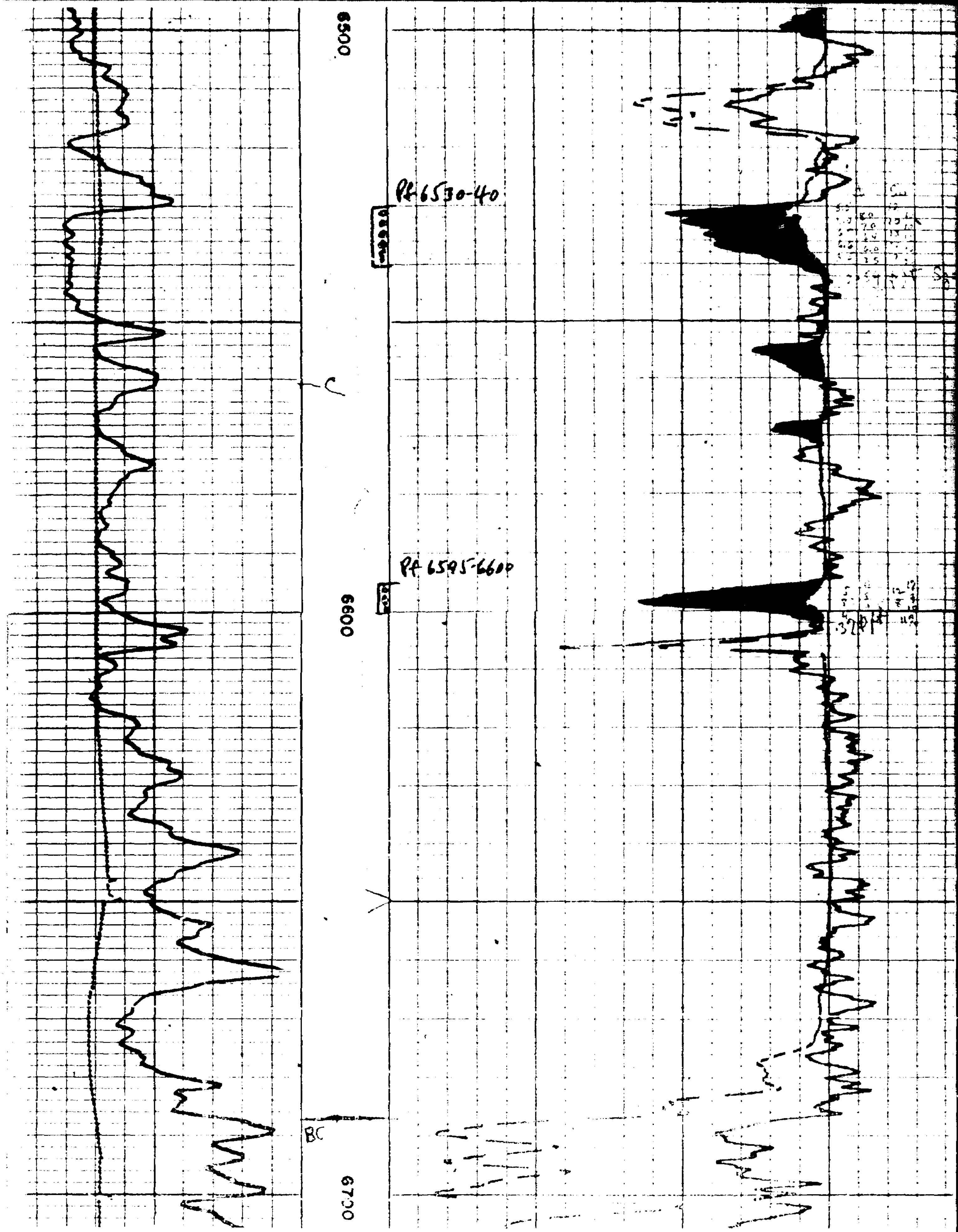
Drilling Measured From K.B.

Elev.: K.B. 3465 D.F. – G.L. 3450

Date	9-6-75			
Run No.	ONE			
Depth—Driller	8350			
Depth—Logger	8399			
Btm. Log Interval	8397			
Top Log Interval	Surface			
Casing—Driller	8 5/8 @ 1262	@	@	@
Casing—Logger	1266			
Bit Size	7 7/8			
Type Fluid in Hole	Flosal Drispak			
Dens. | Visc.	8.9 | 36			
pH | Fluid Loss	11.0 | 8.0 ml	ml	ml	ml
Source of Sample	Linewiper			
Rm @ Meas. Temp.	.21 @ 75 °F	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	.195 @ 76 °F	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	.315 @ 75 °F	@ °F	@ °F	@ °F
Source: Rmf | Rmc	M | C			
Rm @ BHT	.12 @ 134 °F	@ °F	@ °F	@ °F
Circulation Stopped	9-6 0300			
Logger on Bottom	9-6 0900			
Max. Rec. Temp.				

FIELD PRINT




6500
Pf 6530-40
C
Pf 6595-6600
6600
BC
6700

WELL NAME: Federal BZ #12

LOCATION: 21-17S-25E

DST INTERVAL: 6380-6600

$P^* = 2322$ psi slope (M) = 242 psi/cycle

$T_c = 380\ ^\circ R$ $P_c = 679$ psi

$T = 115 + 460^\circ = 575\ ^\circ R$ $P_{wf} = 60$ psi

$$P_{avg} = \frac{P^* + P_{wf}}{2} = \frac{2322 + 60}{2} = 1191 \text{ psi (Note 1)}$$

$$T_r = \frac{T}{T_c} = \frac{575}{380} = 1.51$$

$$P_r = \frac{P_{avg}}{P_c} = \frac{1191}{679} = 1.75$$

$Z = 0.84$ $T_{sc} = 520^\circ R$ $P_{sc} = 13.3$ psi

$$B_g = Z \cdot \frac{T}{T_{sc}} \cdot \frac{P_{sc}}{P_{avg}} = 0.84 \cdot \frac{575}{520} \cdot \frac{13.3}{1191} = 0.010 \text{ (Note 1)}$$

$q = 29$ Mcfd $\cdot$ 178.1 = 5165 b/d

$u = (1.21)(0.0112) = 0.0136$ cp (Note 2)

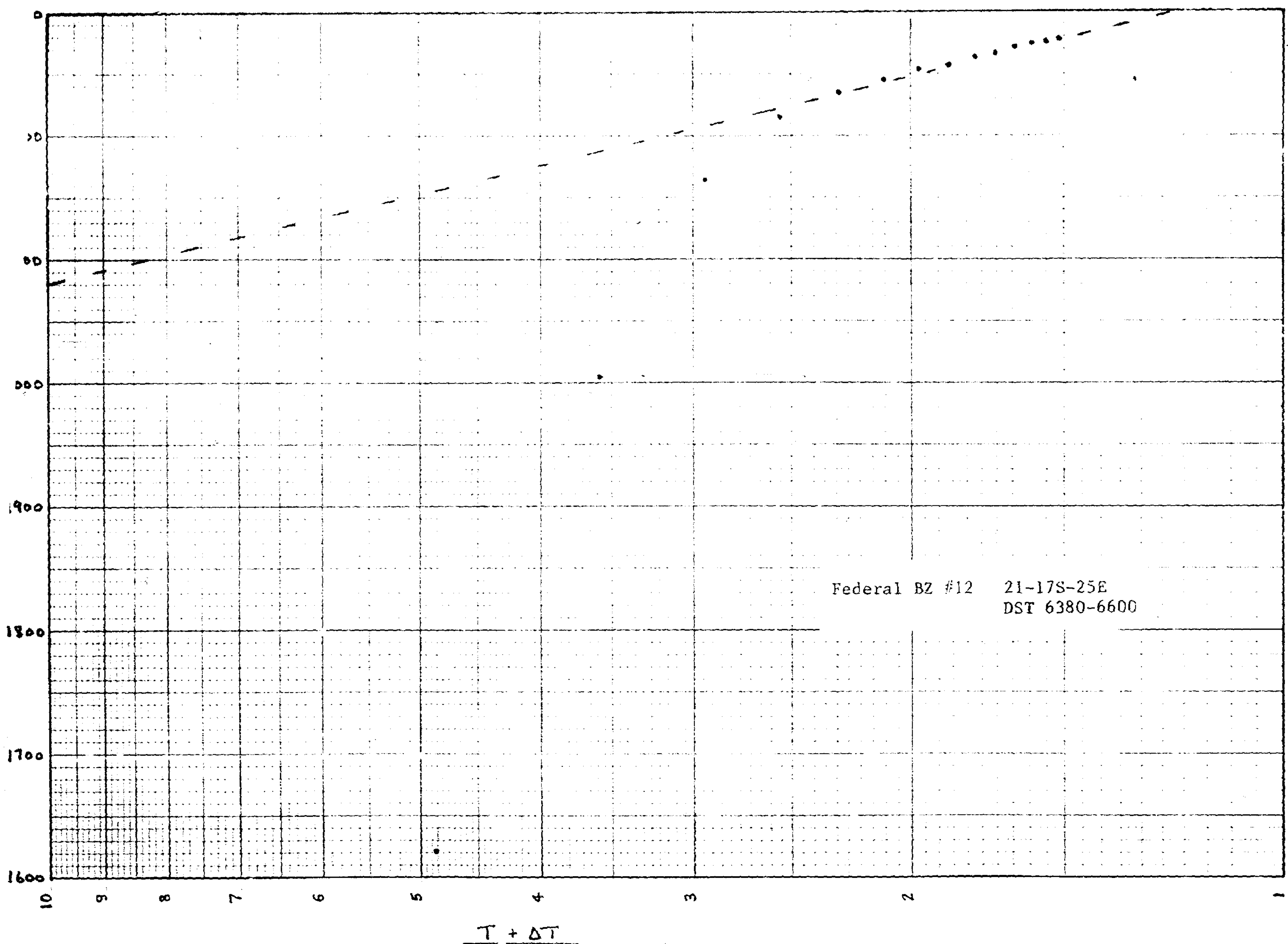
$$kh = \frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6\ (5165)\ (0.0136)\ (0.010)}{242}$$

$kh = 0.472$ md $\cdot$ ft

$h = 30$ ft (Note 3)

$k = 0.016$ md (Note 4)

1) C.S. Matthews - D.G. Russell eqn 3.21a
2) C.S. Matthews - D.G. Russell Fig G.3A&B
3) h estimated from log
4) k = 0.005 for $p^* = 2722$ and M = 642 psi/cycle



Federal BZ #12 21-17S-25E
DST 6380-6600
1900
1800
1700
1600
10
9
8
7
6
5
4
3
2
1
T + ΔT
ΔT

Supplement to Exhibit 12
Page 5 - 3

TUI

GAS QUALITY TEST REPORT

STA. NO. 1273-2

CONTRACT NO.

TEST DATE 0101,79

LAB 1

COMPOUND COMPONENTS	COMPONENTS SPECIFIC GRAVITY	COMPONENT MOLE FRACTION
NITROGEN	.9672	.0110
CARBON DIOXIDE	1.5195	.0246
HELIUM	.1382	.
OXYGEN	1.1048	.0008
HYDROGEN SULFIDE	1.1766	.
WATER VAPOR	.6220	.
HYDROCARBON DILUENTS		(.0364)
METHANE	.5539	.8391
ETHANE	1.0382	.0711
PROPANE	1.5225	.0318
ISO-BUTANE	2.0068	.0060
N-BUTANE	2.0068	.0092
ISO-PENTANE	2.4910	.0048
N-PENTANE	2.4910	[illegible]
HEXANES	2.9753	.0004
HEPTANES +	3.7018	[illegible]

COMPOSITION

LIQUEFIABLE HYDROCARBONS	COMPONENT G.P.M.	MOLE FRACTION	G.P.M. CONTENT
PROPANE	27.514	.	
ISO-BUTANE	32.698	.	
N-BUTANE	31.510	.	
LPG			
ISO-PENTANE	36.582	.	
N-PENTANE	36.213	.	
HEXANES	41.111	.	
HEPTANES +	46.124	.	
NATURAL GASOLINE			
TOTAL LIQUEFIABLE GPM			

WATER VAPOR CONTENT:

Test Station Line Pressure PSI

Hydrocarbon Dew Point °F

Water Vapor Dew Point °F

Lbs Water Vapor per MMCF

Conversion Constant X 0.000021

Water Vapor Mole Fraction .

MIXTURE SPECIFIC GRAVITY:

Calculated From Analysis [illegible]

Determined By Test Instrument [illegible]

Instrument [illegible]

MIXTURE HEATING VALUE:

Btu/Cf at 14.73 Psia, 60 °F, Sat

Calculated From Analysis [illegible]

Determined by Calorimeter

Calorimeter Verified

SULFUR CONTENT:

H₂S	Hydrogen Sulfide, Gr/100 Cf	.00
RSH	Mercaptans "	.02
RSR	Sulfides "	.03
RSSR	Disulfides "	.07
Total Sulfur, Gr/100 Cf		.12
H₂S	Conversion constant	X 0.0000157
H₂S	Mole Fraction	

Critical Temperature 380

REMARKS [illegible]

MEASUREMENT [illegible]

FLUID SAMPLE DATA

Sampler Pressure	P.S.I.G.
Recovery: Cu. Ft. Gas	
cc. Oil	
cc. Water	
cc. Mud	
Tot. Liquid cc.	
Gravity	° API @ °F
Gas/Oil Ratio	cu. ft. per bbl.

	RESISTIVITY	CHLORIDE CONTENT
Recovery Water	@ °F	ppm
Recovery Mud	@ °F	ppm
Recovery Mud Filtrate	@ °F	ppm
Mud Pit Sample	@ °F	11,000 ppm
Mud Pit Sample Filtrate	@ °F	ppm
Mud Weight	8.6 vis 33	cp

Date	1-28-75	Ticket Number	773844
Kind of Job	OPEN HOLE TEST	Halliburton District	ARTESIA
Tester	R. PITTMAN	Witness	R. BECK
Drilling Contractor	ARO DRILLING COMPANY		RIG #6 TH S

EQUIPMENT & HOLE DATA

Formation Tested	Cisco		
Elevation	3572' G.L.		Ft.
Net Productive Interval	8'		Ft.
All Depths Measured From	Kelly Drive	Bushing (15')	
Total Depth	6600'		Ft.
Main Hole/Casing Size	7 7/8"		
Drill Collar Length	659'	I.D.	2.25"
Drill Pipe Length	5700'	I.D.	3.826"
Packer Depth(s)	6374' - 6380'		Ft.
Depth Tester Valve	6358'		Ft.

Legal Location Sec. - Twp. - Rng.: 21 - 17 - 25

Cushion	TYPE	AMOUNT	Depth Back Pres. Valve	Ft.	Surface Choke	1" Adj.	Bottom Choke	.75"

Recovered 110 Feet of drilling fluid.

Recovered Feet of

Recovered Feet of

Recovered Feet of

Recovered Feet of

Meas. From Tester Valve

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Remarks SEE PRODUCTION TEST DATA SHEET . . .

Field Area: EAGLE CREEK

County: EDDY

State: NEW MEXICO

TEMPERATURE	Gauge No. 1114 Depth 6359 Ft.		Gauge No. 1113 Depth 6597 Ft.		Gauge No. Depth Ft.		TIME	
Est. 115 °F.	24 Hour Clock, Blanked Off NO		24 Hour Clock, Blanked Off YES		Hour Clock, Blanked Off		Tool Opened 0630 A.M./P.M.	
Actual °F.	Pressures		Pressures		Pressures		Opened Bypass 1430 A.M./P.M.	
	Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic	[illegible]36	29[illegible]	[illegible]	3058				
First Period Flow Initial	53	[illegible]1	[illegible]	149			—	—
First Period Flow Final	[illegible]3	6[illegible]	[illegible]	142			30	29
First Period Closed in	[illegible]	2020	[illegible]	[illegible]77			90	90
Second Period Flow Initial	[illegible]3	40	[illegible]	139			—	—
Second Period Flow Final	[illegible]	[illegible]	[illegible]	151			120	121
Second Period Closed in	29[illegible]	2[illegible]	[illegible]	[illegible]3			240	240
Third Period Flow Initial							—	—
Third Period Flow Final								
Third Period Closed in								
Final Hydrostatic	2[illegible]36	2920	[illegible]	[illegible]025			—	—

FORMATION TEST DATA

Casing perfs. ______ Bottom choke .75" ______ Surf. temp. ______ °F Ticket No. 773844

Gas gravity ______ Oil gravity ______ GOR ______

Spec. gravity ______ Chlorides ______ ppm Res. ______ @ ______ °F

INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED 1/4 X [illegible] PSI gauge.

Date 9-28-75 Time a.m. p.m.	Choke Size	Surface Pressure psi	Gas Rate MCF	Liquid Rate BPD	Remarks
0630					Opened tool, fair blow.
0635		1 1/2			Good blow.
0640		2			Good blow.
0645		2			Strong blow.
0650		3			
0655		4			
0700		4 1/2			Closed tool.
0830					Opened tool with a strong blow.
	1/4	13 1/2			Pressure climbed, put on choke.
0841	"	13			Gas to surface in 11 minutes
0845		12			into final flow period.
0900	"	8			Decreased.
0915		6 3/4			
0930	"	5			Decreased.
0945		4 3/4			
1000	"	4 3/4			
1015		4 3/4			
1030	"	4 3/4	29,000		Closed tool.
1430					By-passed tool.

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Gauge No. 1114 | Depth 6359 | Clock No. 11955 | 24 hour | Ticket No. 773844

	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$\text{Log}\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$\text{Log}\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	$\text{Log}\frac{t+\theta}{\theta}$	PSIG Temp. Corr.
0	.0000	41	.0000		43	.0000	48	.0000		60					
1	.0920	43	.0195		475	.0710**	62	.0329		954					
2			.0391		782	.1386	60	.1059		1621					
3			.0586		1059	.2062	60	.1588		2005					
4			.0781		1313	.2738	60	.2117		2166					
5			.0977		1546	.3414	60	.2647		2216					
6			.1172		1755	.4090	60	.3176		2236					
7			.1367		1916			.3705		2246					
8			.1562		2032			.4234		2254					
9			.1758		2123			.4764		2259					
10			.1953		2182			.5293		2264					
11			.2148		2221			.5822		2268					
12			.2344		2250			.6352		2271					
13			.2539		2264			.6581		2275					
14			.2734		2273			.7410		2277					
15			.2930		2279			.7940		2279					

Gauge No. 1113 | Depth 6597 | Clock No. 6728 | 24 hour

	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
0	.0000	149	.0000		142	.0000	139	.0000		151					
1	.0134*	139	.0202		479	.0703**	154	.0535		1052					
2	.0301	140	.0404		793	.1372	153	.1069		1702					
3	.0468	140	.0606		1091	.2042	153	.1604		2097					
4	.0635	142	.0808		1360	.2711	151	.2138		2255					
5	.0803	142	.1010		1589	.3380	151	.2673		2308					
6	.0970	142	.1212		1796	.4050	151	.3208		2327					
7			.1414		1972			.3742		2340					
8			.1616		2109			.4277		2347					
9			.1818		2206			.4811		2352					
10			.2020		2275			.5346		2359					
11			.2222		2315			.5881		2363					
12			.2424		2343			.6415		2366					
13			.2626		2359			.6950		2368					
14			.2828		2370			.7484		2371					
15			.3030		2377			.8020		2373					
Reading Interval	5		6			20		16							Minute

REMARKS: * - first interval is equal to 4 minutes, ** - 21 minutes.

Federal BZ #12

DST 6380-6600

Contributions to log height h:

Interval	Feet
6380-6382	2
6387-6396	9
6401-6404	3
6471-6472	1
6476-6479	3
6487-6488	1
6490-6492	2
6501-6503	2
6504-6510	6
6520-6521	1
	30 ft.

Federal BZ #12

DST 6380-6600

Time to Reach Pseudosteady State

A) Average Porosity = 0.018 (Note 1)

Interval	Porosity
6380-6382	0.010
6387-6396	0.024
6401-6404	0.009
6471-6472	0.019
6476-6479	0.011
6487-6488	0.012
6490-6492	0.014
6501-6503	0.022
6504-6510	0.021
6520-6521	0.010

B) Total Compressibility = $S_g C_g$

$$C_t = 0.7\ (0.00099) = 0.00069\ \text{psi}^{-1}$$ (Note 2)

C) Time $t = \dfrac{1136 \phi u C_t r_e^2}{k}$

$$t = \frac{1136\ (0.018)\ (0.0136)\ (0.00069)\ (2106)^2}{0.016}$$

t = 53,200 hr

t = 6.1 yr

1) Porosity averaged over [illegible] ft of pay
2) C.S. Matthews - D.G. Russell Fig. C7.A

Schlumberger

COMPENSATED NEUTRON-FORMATION DENSITY

COUNTY EDDY
FIELD WILDCAT
LOCATION
WELL FEDERAL "BZ" 12
COMPANY YATES PETRO.

COMPANY YATES PETROLEUM

WELL FEDERAL "BZ" 12

FIELD WILDCAT

COUNTY EDDY STATE NEW MEXICO

LOCATION: 1980' FSL. & 1980' FWL.

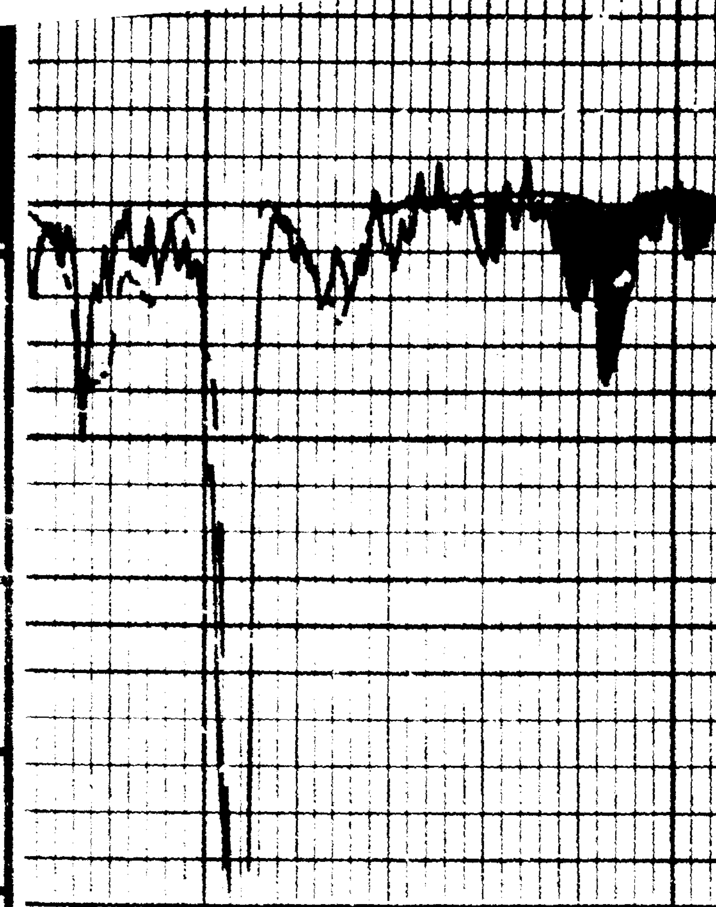
Other Services: DLL

Sec. 21 Twp. 17-S Rge. 25-E

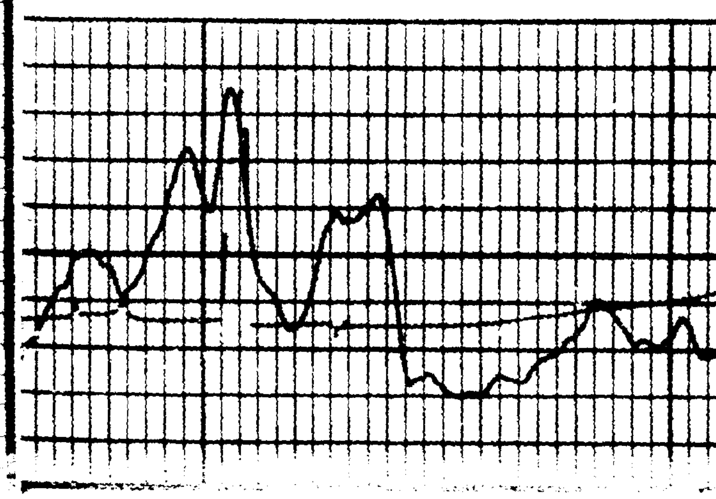
Permanent Datum: G.L. Elev.: 3572
Log Measured From K.B. 15 Ft. Above Perm. Datum
Drilling Measured From K.B.

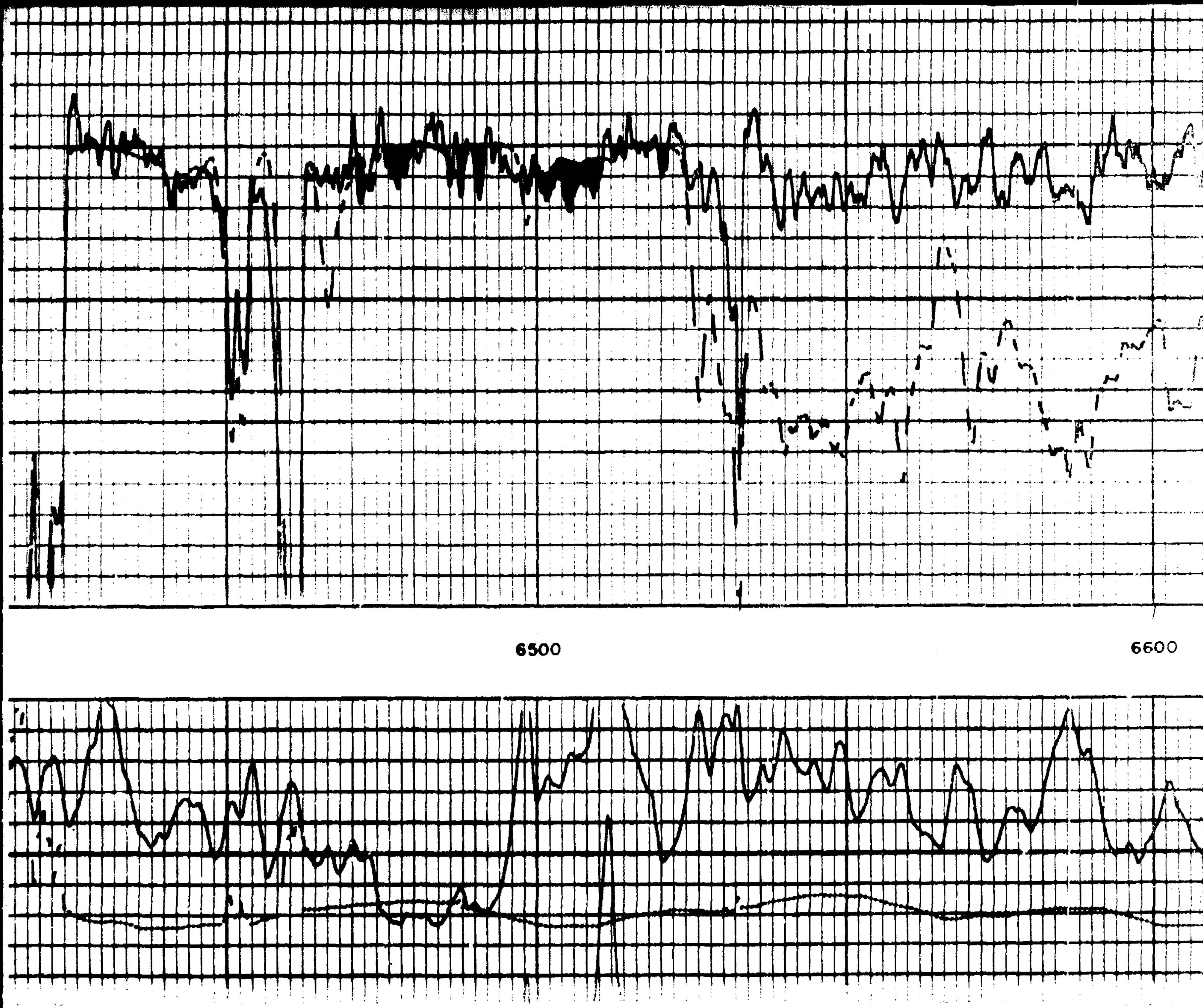
Elev.: K.B. 3587
D.F.
G.L. 3572

Date	10-7-75			
Run No.	ONE			
Depth—Driller	8180			
Depth—Logger	8179			
Btm. Log Interval	8178			
Top Log Interval	100			
Casing—Driller	8 5/8 @ 1102	@	@	@
Casing—Logger	1100			
Bit Size	7 7/8			
Type Fluid in Hole	FLOSAL DRISPAK			
Dens. / Visc.	9.1 / 39			
pH / Fluid Loss	11 / 7.6 ml	ml	ml	ml
Source of Sample	CIRC.			
Rm @ Meas. Temp.	.24 @ 76 F	@ F	@ F	@ F
Rmf @ Meas. Temp.	.22 @ 76 F	@ F	@ F	@ F
Rmc @ Meas. Temp.	@ F	@ F	@ F	@ F
Source: Rmf / Rmc	M			
Rm @ BHT	.13 @ 136 F	@ F	@ F	@ F
Circulation Stopped	2400 10-6			



6400




6500
6600

WELL NAME: Griffin JJ Com #1

LOCATION: 4-18S-25E

DST INTERVAL: 6560-6643

$P^* = 2495$ psi slope (M) = 3545 psi/cycle

$T_c = 377\ ^{\circ}R$ $P_c = 670$ psi

$T = 121 + 460^{\circ} = 581\ ^{\circ}R$ $P_{wf} = 120$ psi

$$P_{avg} = \frac{P^* + P_{wf}}{2} = \frac{2495 + 120}{2} = 1307.5 \text{ psi (Note 1)}$$

$$T_r = \frac{T}{T_c} = \frac{581^{\circ}}{377^{\circ}} = 1.54$$

$$P_r = \frac{P_{avg}}{P_c} = \frac{1307.5}{670} = 1.95$$

$Z = 0.84$ $T_{sc} = 520^{\circ}R$ $P_{sc} = 13.3$ psi

$$B_g = Z \cdot \frac{T}{T_{sc}} \cdot \frac{P_{sc}}{P_{avg}} = 0.84 \cdot \frac{581}{520} \cdot \frac{13.3}{1307.5} = 0.010 \text{ (Note 1)}$$

$q = 27$ Mcfd $\cdot$ 178.1 = 4,809 b/d

$u = 1.23 \times 0.0112 = 0.014$ cp (Note 2)

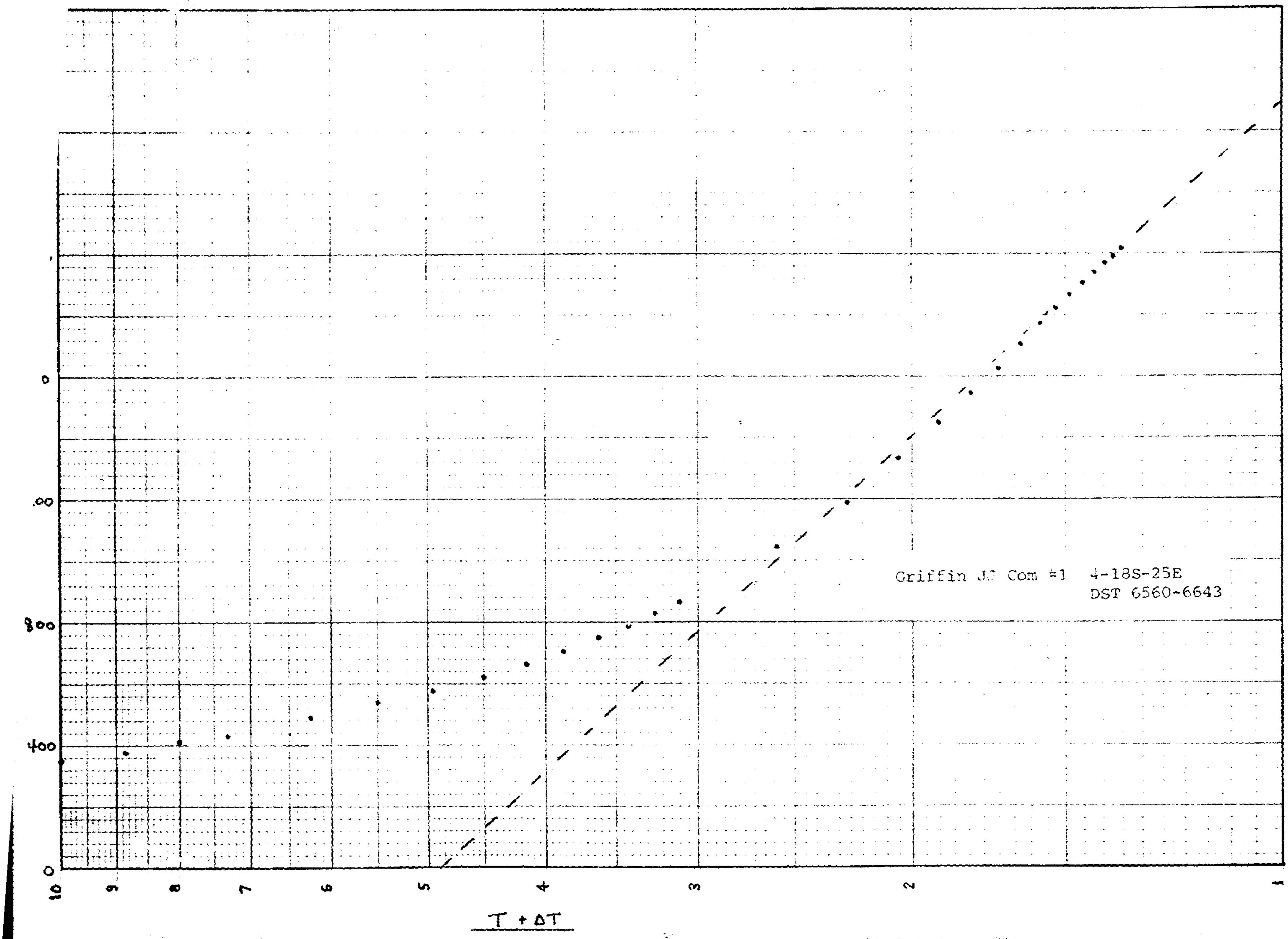
$$kh = \frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6\ (4809)\ (0.014)\ (0.010)}{3545}$$

$kh = 0.031$ md $\cdot$ ft

$h = 20$ ft (Note 3)

$k = 0.002$ md (Note 4)

1) C.S. Matthews - D.G. Russell eqn 3.21a
2) C.S. Matthews - D.G. Russell Fig G.3A&B
3) h estimated from log
4) k = 0.009 md for q = 100 Mcfd and h = 24 ft.



Griffin JJ Com #1 4-18S-25E
DST 6560-6643
800
400
0
10
9
8
7
6
5
4
3
2
1
T + ΔT

TW

GAS QUALITY TEST REPORT

Yates Pet. Co.
W. Aidez R. Knob
Perm Penn
Griffin Com #1

STA. NO. 1239-1
CONTRACT NO. 3694
TEST DATE 01 23 79
LAB 4

COMPOUND COMPONENTS	COMPONENT SPECIFIC GRAVITY	COMPONENT MOLE FRACTION
NITROGEN	.9672	.0070
CARBON DIOXIDE	1.5195	.0009
HELIUM	.1382	.
OXYGEN	1.1048	.0002
HYDROGEN SULFIDE	1.1766	.
WATER VAPOR	.6220	.
HYDROCARBON DILUENTS		(.0081)
METHANE	.5539	.8660
ETHANE	1.0382	.0768
PROPANE	1.5225	.0303
ISO-BUTANE	2.0068	.0040
N-BUTANE	2.0068	.0083
ISO-PENTANE	2.4910	.0021
N-PENTANE	2.4910	.0019
HEXANES	2.9753	.0015
HEPTANES +	3.7018	.0010
COMPOSITION		1.0000

LIQUEFIABLE HYDROCARBONS	COMPONENT G.P.M.	MOLE FRACTION	G.P.M. CONTENT
PROPANE	27.514	.	
ISO-BUTANE	32.698	.	.
N-BUTANE	31.510	.	
LPG			
ISO-PENTANE	36.582	.	
N-PENTANE	36.213	.	
HEXANES	41.111	.	
HEPTANES +	46.126	.	
NATURAL GASOLINE			
TOTAL LIQUEFIABLE GPM			

WATER VAPOR CONTENT:

Gas Mixture Static Pressure PSI
Hydrocarbon Dew Point °F
Water Vapor Dew Point °F
Lbs Water Vapor per MMCF
Conversion Constant X 0.000021
Water Vapor Mole Fraction
Moisture recorder reading 6.0#
Make or type DuPont

MIXTURE SPECIFIC GRAVITY:

Calculated From Analysis .657
Determined by Test Instrument .657
Instrument Make or Type Ranarex

SULFUR CONTENT:

H_2S	Hydrogen Sulfide, Gr./100 cf	.00
RSH	Mercaptans "	.02
RSR	Sulfides "	.04
RSSR	Residuals "	.05
	Total Sulfur, Gr./100 cf	.11
H_2S	Grains to fraction conversion	X 0.0000157
H_2S	Mole Fraction	

MIXTURE HEATING VALUE:
(Btu/cf at 14.73 Psia, 60°F, Sat.)

Calculated From Analysis 1141
Determined by Calorimeter
Calorimeter Verified ( )

Critical Pressure ______ Critical Temperature ______

REMARKS

MEASUREMENT AREA Roswell

GAS ANALYST Aston 24

JOHNSTON
Schlumberger

SURFACE INFORMATION

Description (Rate of Flow)	Time	Pressure P.S.I.G.	Surface Choke
Opened Tool	1433	--	-
GOOD BLOW, INCREASING TO STRONG BLOW			
	1437	2	CLOSED
CLOSED FOR INITIAL SHUT-IN	1438	--	''
FINISHED SHUT-IN	1608	-	''
RE-OPENED TOOL	1609	5	1/4''
STRONG BLOW, SLOWLY DECREASING DURING FLOW PERIOD			
	1624	3 1/2	''
	1641	1 1/2	''
GAS TO SURFACE	1654	1	''
CLOSED FOR FINAL SHUT-IN	1710	2/3	''
FINISHED SHUT-IN	2010	-	''
PULLED PACKER LOOSE	2011	--	-

Cushion Type	Amount	Pressure	Bottom Choke
	-		Size 5/8''

MUD DATA

Mud Type DRISPAC - PERMALOID Wt 10.3
Viscosity - Water Loss 8.0 C.C.
Resist. of Mud - @ - °F; of Filtrate .06 @ 72 °F
Chloride Content 116,000 PPM

EQUIPMENT & HOLE DATA

Type Test M.F.E. SELECTIVE ZONE STRADDL
Formation Tested CISCO /OPEN HOLE(INFLATA
Elevation 3567 K.B.
Net Productive Interval -
Estimated Porosity -
All Depths Measured From KELLY BUSHING
Total Depth 8505
Main Hole/Casing Size 7 7/8''
Rat Hole/Liner Size -
Drill Collar Length 663' I.D. 2.25''
Drill Pipe Length 5843' I.D. 3.8''
Packer Depth(s) 6560 & 6643

MULTI-FLOW EVALUATOR FLUID SAMPLE DATA

Sampler Pressure 70.0 P.S.I.G. at Surf.
Recovery: Cu. Ft. Gas 0.2
cc. Oil -
cc. Water -
cc. Mud 1020
Tot. Liquid cc 1020
Gravity - °API @ - °F
Gas/Oil Ratio - cu. ft./

	RESISTIVITY	CHLORIDE CONTENT
Recovery Water	- @ - °F.	- P.
Recovery Mud	- @ - °F.	
Recovery Mud Filtrate	.06 @ 72 °F.	115,000 P.
Mud Pit Sample	- @ - °F.	
Mud Pit Sample Filtrate	.06 @ 72 °F.	116,000 P.

RECOVERY DESCRIPTION	FEET	BARRELS	% OIL	% WATER	% OTHERS	API GRAVITY	RESISTIVITY	CHL. PPM
SLIGHTLY GAS CUT DRILLING MUD	200	0.98				@ °F.	.06 @ 72 °F.	115,000
						@ °F.	@ °F.	
						@ °F.	@ °F.	
						@ °F.	@ °F.	
						@ °F.	@ °F.	
						@ °F.	@ °F.	
						@ °F.	@ °F.	
						@ °F.	@ °F.	

Remarks:

BEST AVAILABLE COPY

Address P.O. DRAWER ''A''; LEVELLAND, TEXAS 79336

Company AMOCO PRODUCTION COMPANY
Well GRIFFIN COM. #1
Test Interval 6560' TO 6643'
Field RICHARD KNOB ATOKA
Location 1650' FNL & 1980' FWL SEC. 4 - T-10S - R-25
Test # 3
Date 3-26-78
County EDDY
State NEW MEXICO
Technician CLAMON (HOBBS)
Test Approved by

Field Report No. 05873 D
No. Reports Requested 9 (6X)

BOTTOM HOLE PRESSURE AND TIME DATA

JOHNSTON Schlumberger

INSTRUMENT NO.: J-09[illegible]   CAPACITY(P.S.I.): 6400   DEPTH: 6522 FT.

PORT OPENING: INSIDE   BOTTOM HOLE TEMP.: 121   PAGE 1 OF 2

DESCRIPTION	LABELED POINTS	PRESSURE (P.S.I.)	GIVEN TIME	COMPUTED TIME
INITIAL HYDROSTATIC MUD	1	3473.8		
INITIAL FLOW(1)	2	54.0		
INITIAL FLOW(2)	3	52.8	5	5
INITIAL SHUT-IN	4	1909.9	90	91
FINAL FLOW(1)	5	71.8		
FINAL FLOW(2)	6	120.0	61	58
FINAL SHUT-IN	7	2015.3	180	182
FINAL HYDROSTATIC MUD	8	3475.1		

INCREMENTAL READINGS

LABEL POINT	DELTA TIME	PRESSURE (P.S.I.)	T + DT/DT	LOG	PW - PF (P.S.I.)	COMMENTS
1		3473.8				HYDROSTATIC MUD
2	0	54.0				INITIAL FLOW(1)
3	5	52.8				INITIAL FLOW(2)
3	0	52.8				STARTED SHUT-IN
	5	339.6	2.000	0.301	286.9	
	10	540.2	1.500	0.176	487.4	
	15	698.9	1.333	0.125	646.1	
	20	837.2	1.250	0.097	784.5	
	25	960.4	1.200	0.079	907.6	
	30	1072.1	1.167	0.067	1019.3	
	35	1177.4	1.143	0.058	1124.7	
	40	1276.5	1.125	0.051	1223.7	
	45	1367.9	1.111	0.046	1315.1	
	50	1449.1	1.100	0.041	1396.3	
	55	1524.0	1.091	0.038	1471.2	
	60	1591.3	1.083	0.035	1538.5	
	65	1656.0	1.077	0.032	1603.3	
	70	1714.4	1.071	0.030	1661.6	
	75	1767.7	1.067	0.028	1715.0	
	80	1817.2	1.063	0.026	1764.5	
	85	1861.7	1.059	0.025	1808.9	
	90	1903.5	1.056	0.023	1850.8	
4	91	1909.9	1.055	0.023	1857.1	INITIAL SHUT-IN
5	0	71.8				FINAL FLOW(1)
	5	102.3				
	10	107.3				
	15	112.4				
	20	115.0				
	25	116.2				
	30	116.[illegible]				
	35	116.2				
	40	116.2				
	45	117.5				
	50	118.[illegible]				
	55	120.[illegible]				

JOHNSTON
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LABEL POINT	DELTA TIME	PRESSURE (P.S.I.)	T + DT/DT	LOG	PW - PF (P.S.I.)	COMMENTS
6	58	120.9				FINAL FLOW(2)
6	0	120.0				STARTED SHUT-IN
	1	144.2	64.000	1.806	24.1	
	2	205.1	32.500	1.512	85.0	
	3	240.6	22.000	1.342	120.6	
	4	268.6	16.750	1.224	148.5	
	5	297.8	13.600	1.134	177.7	
	6	325.7	11.500	1.061	205.6	
	7	353.6	10.000	1.000	233.6	
	8	381.5	8.875	0.948	261.5	
	9	406.9	8.000	0.903	286.9	
	10	433.6	7.300	0.863	313.5	
	12	486.9	6.250	0.796	366.9	
	14	535.1	5.500	0.740	415.1	
	16	580.8	4.937	0.694	460.8	
	18	626.5	4.500	C.653	506.5	
	20	669.7	4.150	0.618	549.7	
	22	712.8	3.864	0.587	592.8	
	24	754.7	3.625	0.559	634.7	
	26	794.1	3.423	0.534	674.1	
	28	832.2	3.250	0.512	712.1	
	30	870.3	3.100	0.491	750.2	
	40	1044.2	2.575	0.411	924.1	
	50	1196.5	2.260	0.354	1076.5	
	60	1331.0	2.050	0.312	1211.0	
	70	1449.1	1.900	0.279	1329.1	
	80	1549.4	1.787	0.252	1429.3	
	90	1635.7	1.700	0.230	1515.7	
	100	1709.3	1.630	0.212	1589.3	
	110	1771.5	1.573	0.197	1651.5	
	120	1826.1	1.525	0.183	1706.1	
	130	1871.8	1.485	0.172	1751.8	
	140	1908.6	1.450	0.161	1788.6	
	150	1940.4	1.420	0.152	1820.3	
	160	1967.0	1.394	0.144	1847.0	
	170	1991.1	1.371	0.137	1871.1	
	180	2011.4	1.350	0.130	1891.4	
7	182	2015.3	1.346	0.129	1895.2	FINAL SHUT-IN
8		3475.1				HYDROSTATIC MUD

Supplement to Exhibit 12
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JOHNSTON
Schlumberger

BOTTOM HOLE PRESSURE AND TIME DATA

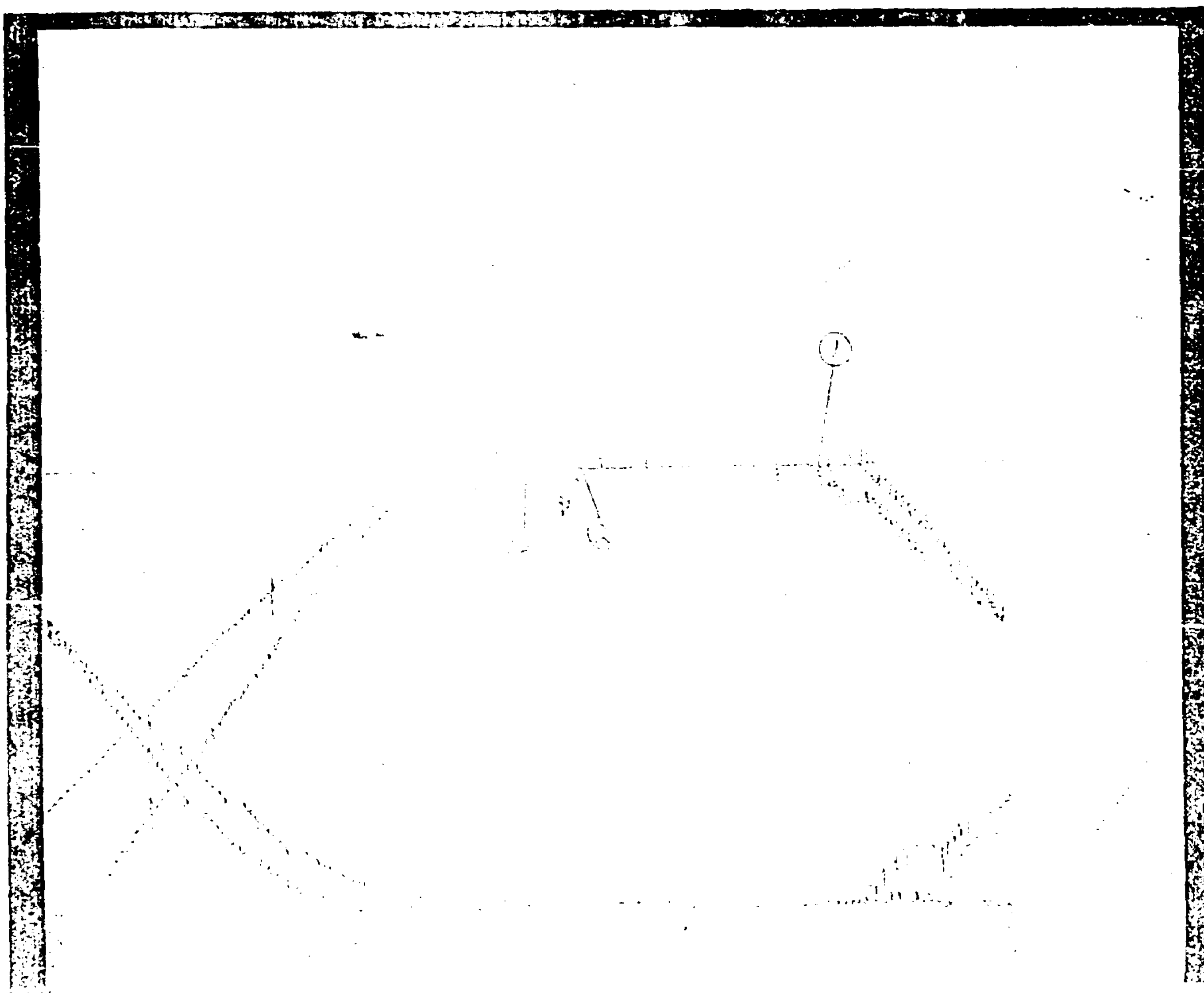
INSTRUMENT NO.: T-971 CAPACITY (P.S.I.): 7000# DEPTH 6645 FT.

PORT OPENING: OUTSIDE BOTTOM HOLE TEMP.: 121° F. FIELD REPORT NO. 05873 [

DESCRIPTION	LABEL POINT	PRESSURE (P.S.I.)	GIVEN TIME	COMPUTED TIME
INITIAL HYDROSTATIC MUD	1	3548.3		
INITIAL FLOW (1)				
INITIAL FLOW (2)				
INITIAL SHUT-IN				
SECOND FLOW (1)				
SECOND FLOW (2)				
SECOND SHUT-IN				
FINAL FLOW (1)				
FINAL FLOW (2)				
FINAL SHUT-IN				
FINAL HYDROSTATIC MUD	3	3492.7		
	2	3546.9		

REMARKS: BELOW STRADDLE.

9+



Griffin JJ Com #1

DST 6560-6643

Contributions to log height h:

Interval	Feet
6569-6571	2
6606-6624	18
	20 ft.

Griffin JJ Com #1

DST 6560-6643

Time to Reach Pseudosteady State

A) Average Porosity = 0.028 (Note 1)

Interval	Porosity
6569-6571	0.009
6606-6624	0.030

B) Total Compressibility = $S_g C_g$

$C_t = 0.7\ (0.00087) = 0.00061\ \text{psi}^{-1}$ (Note 2)

C) Time $t = \dfrac{1136 \phi \mu C_t r_e^2}{k}$

$t = \dfrac{1136\ (0.028)\ (0.014)\ (0.00061)\ (2106)^2}{0.002}$

$t = 602{,}000$ hr

$t = 68.7$ yr

1) Porosity averaged over 20 ft of pay
2) C.S. Matthews - D.G. Russell Fig. G7.A

Schlumberger

COMPENSATED NEUTRON FORMATION DENSITY

COMPANY AMOCO PROD. CO

API # 30 025 - 25724

WELL GRIFFIN COM # 1

FIELD RICHARD KNOB ATOKA - MORROW

COUNTY LEA STATE N. M.

LOCATION 1650' FNL & 1980' FWL

Other Services: DLL - RXO

API SERIAL NO. / SEC. / TWP. / RGE.: 4 / 18S / 25E

COUNTY / FIELD / LOCATION / WELL / COMPANY

Permanent Datum: ℄ OF 2" BRADENHEAD OUTLET; Elev.: ______

Log Measured From RDB 3.7 Ft. Above Perm. Datum

Drilling Measured From RDB

Elev.: RDB 3567

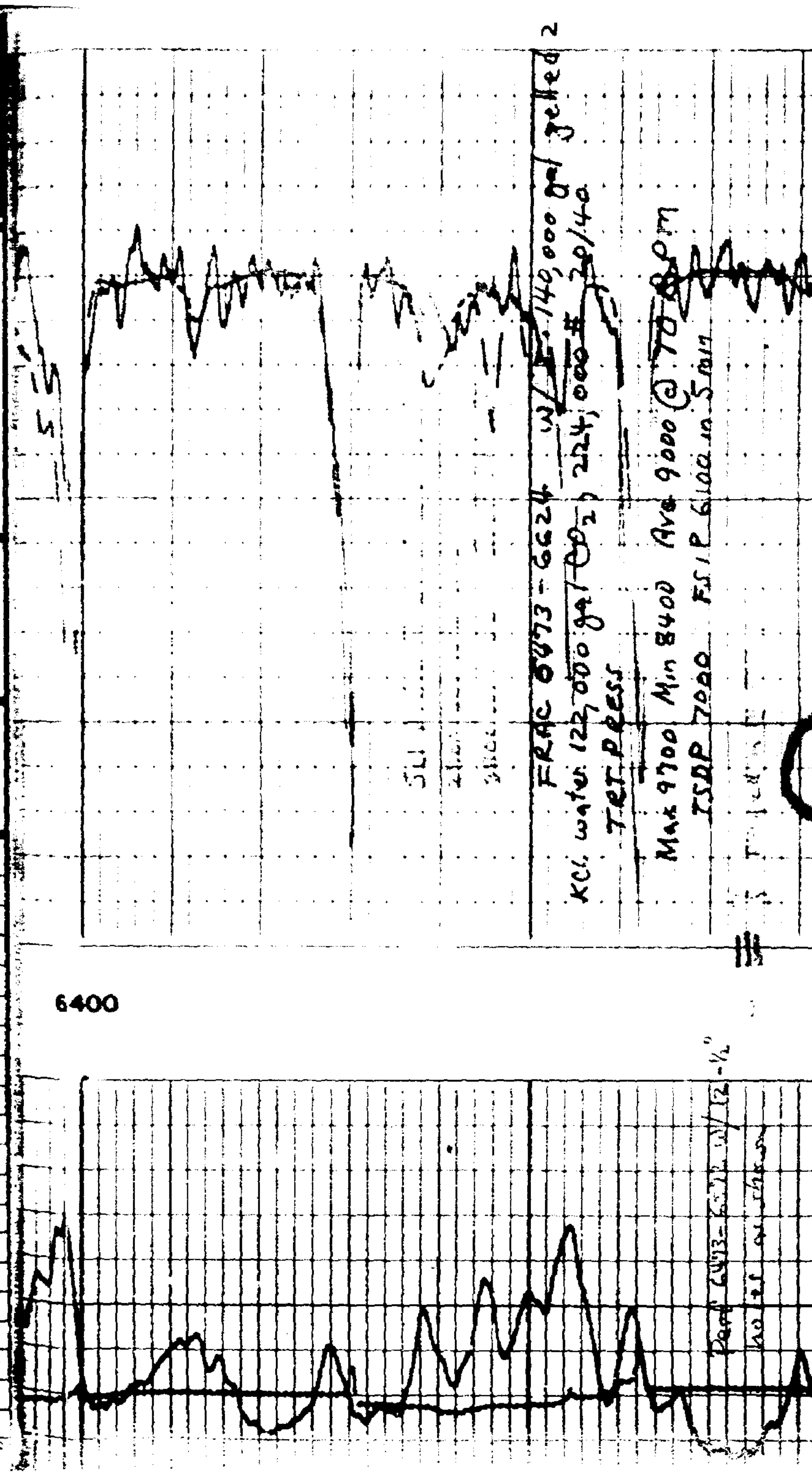
D.F. ______

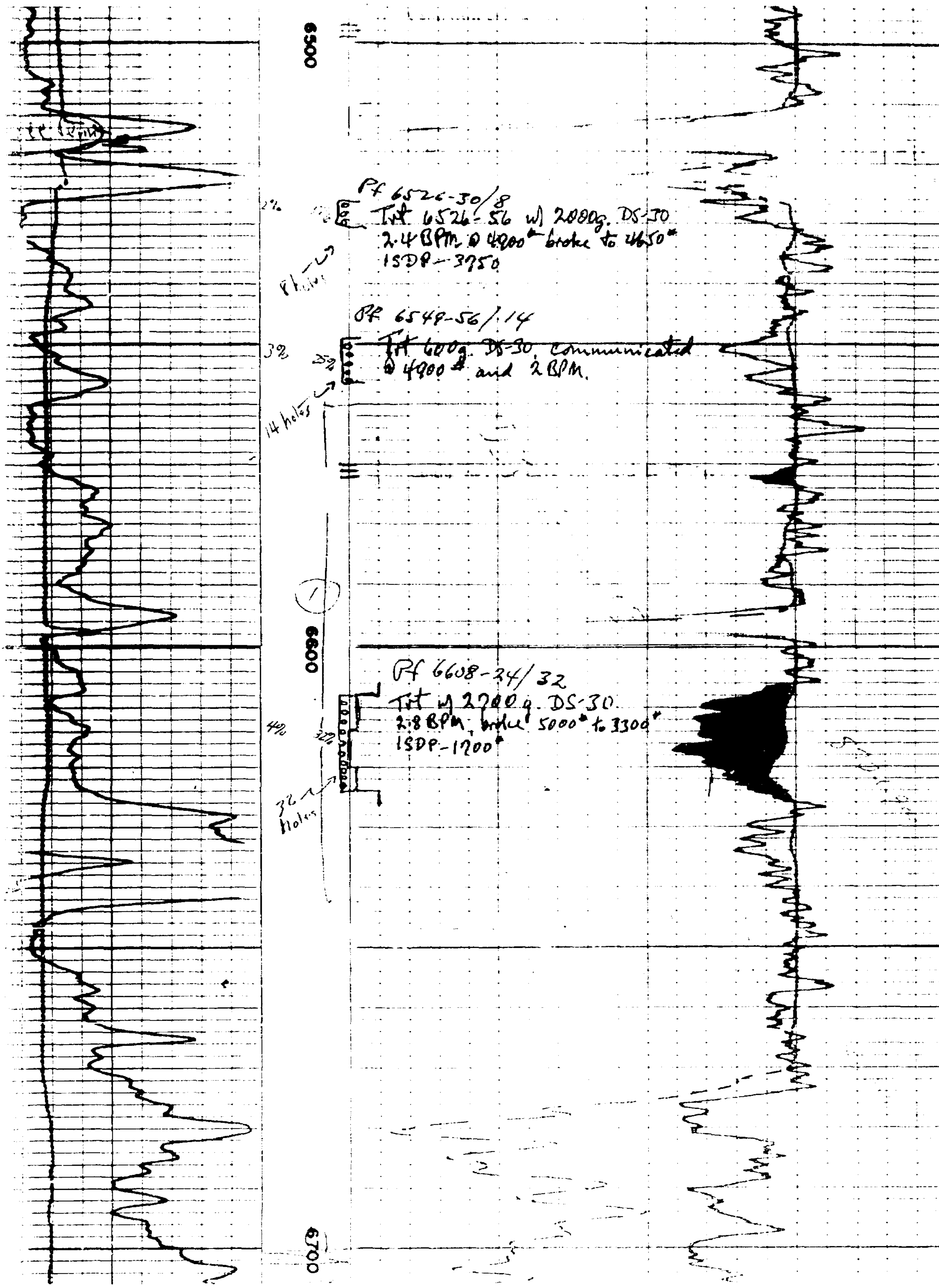
G.L. 3554

Date	3-22-76			
Run No.	ONE			
Depth—Driller	8500			
Depth—Logger	8505			
Btm. Log Interval	8504			
Top Log Interval	0			
Casing—Driller	8 5/8 @ 1251	@	@	@
Casing—Logger	1251			
Bit Size	7 7/8			
Type Fluid in Hole	DRISPAK - PERMALOID			
Dens. | Visc.	10.2 | 40	|	|	|
pH | Fluid Loss	9.0 | 16 ml	| ml	| ml	| ml
Source of Sample	CIRC			
Rm @ Meas. Temp.	.051 @ 84 °F	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	.042 @ 84 °F	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	.085 @ 84 °F	@ °F	@ °F	@ °F
Source: Rmf | Rmc	M | C	|	|	|
Rm @ BHT	.0 @ 127 °F	@ °F	@ °F	@ °F
TIME Circulation Stopped	1300			
TIME Logger on Bottom	1700			

PRINT

FIELD THANKS





6500
2%
Pf 6526-30/8
Trt 6526-56 w/ 2000g. DS-30
2.4 BPM @ 4900# broke to 4650#
ISDP - 3750
8 holes
Pf 6548-56/14
3%
~~Trt 600g. DS-30 communicated @ 4900# and 2 BPM.~~
14 holes
1
6600
Pf 6608-24/32
Trt w/ 2700 g. DS-30
2.8 BPM, broke 5000# to 3300#
ISDP - 1700#
4%
32 holes
6700

WELL NAME: Irish Hills KW #2

LOCATION: 2-19S-24E

DST INTERVAL: 6532-6640

$P^* = 2440$ psi   slope (M) = 2305 psi/cycle

$T_c = 370°R$ $P_c = 670$ psi

$T = 125 + 460° = 585°R$ $P_{wf} = 77.4$ psi

$$P_{avg} = \frac{P^* + P_{wf}}{2} = \frac{2440 + 77.4}{2} = 1259 \text{ psi}$$ (Note 1)

$$T_r = \frac{T}{T_c} = \frac{585}{370} = 1.58$$

$$P_r = \frac{P_{avg}}{P_c} = \frac{1259}{670} = 1.90$$

$Z = 0.86$ $T_{sc} = 520°R$ $P_{sc} = 13.3$ psi

$$B_g = Z \cdot \frac{T}{T_{sc}} \cdot \frac{P_{sc}}{P_{avg}} = 0.86 \cdot \frac{585}{520} \cdot \frac{13.3}{1259} = 0.010$$ (Note 1)

$q = 69.7$ mcfd $\cdot$ 178.1 = 12414 b/d

$u = 1.20 \times 0.0114 = 0.0137$ cp (Note 2)

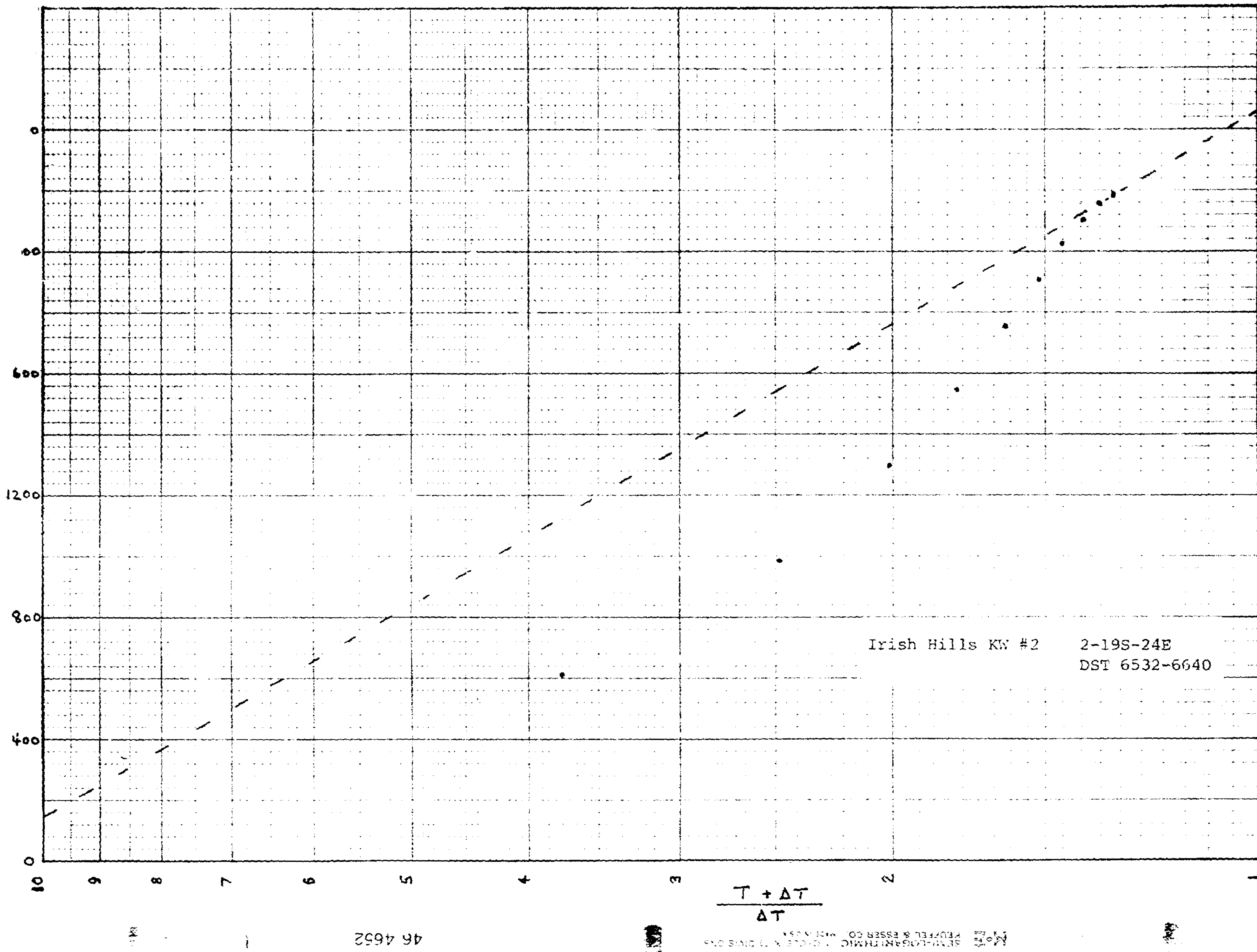
$$kh = \frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6\,(12414)\,(0.0137)\,(0.010)}{2305}$$

$kh = 0.1200$ md $\cdot$ ft

$h = 58$ ft (Note 3)

$k = 0.0021$ md (Note 4)

1) C. S. Matthews - D.G. Russell eqn. 3.21a
2) C. S. Matthews - D.G. Russell Fig. G.3A&B
3) h estimated from Log
4) k = 0.0026 md for T=192°F



Irish Hills KW #2
2-19S-24E
DST 6532-6640
$\frac{T + \Delta T}{\Delta T}$

Supplement to Exhibit 12 — Page 2 3

GAS QUALITY TEST REPORT

COMPANY	Yates Pet. Co.	STA. NO.	1397-1
FIELD OR LOCATION		CONTRACT NO.	
POOL OR RESERVOIR		TEST DATE	03268
WELL OR STATION NAME	Trish Hills "KW" #2		4

COMPOUND COMPONENTS	COMPONENT SPECIFIC GRAVITY	COMPONENT MOLE FRACTION
NITROGEN	.9672	.0124
CARBON DIOXIDE	1.5195	.0008
HELIUM	.1382	.
OXYGEN	1.1048	.
HYDROGEN SULFIDE	1.1766	.
WATER VAPOR	.6220	.
HYDROCARBON DILUENTS		(.0132)
METHANE	.5539	.8859
ETHANE	1.0382	.0613
PROPANE	1.5225	.0230
ISO-BUTANE	2.0068	.0035
N-BUTANE	2.0068	.0066
ISO-PENTANE	2.4910	.0020
N-PENTANE	2.4910	.0018
HEXANES	2.9753	.0017
HEPTANES +	3.7018	.0010
COMPOSITION		1.0000

LIQUEFIABLE HYDROCARBONS	COMPONENT G.P.M.	MOLE FRACTION	G.P.M. CONTENT
PROPANE	27.514	.	
ISO-BUTANE	32.698	.	
N-BUTANE	31.510	.	
LPG			
ISO-PENTANE	36.582	.	
N-PENTANE	36.213	.	
HEXANES	41.111	.	
HEPTANES +	46.126	.	
NATURAL GASOLINE			
TOTAL LIQUEFIABLE GPM			

WATER VAPOR CONTENT:

Gas Mixture Static Pressure PSIG 610# 65°

Hydrocarbon Dew Point °F

Water Vapor Dew Point °F

Lbs Water Vapor per MMCF 30#

Conversion Constant X 0.000021

Water Vapor Mole Fraction .

Moisture recorder reading

Make or type

MIXTURE SPECIFIC GRAVITY:

Calculated From Analysis REAL .643

Determined by Test Instrument .645

Instrument Make or Type RNX.

SULFUR CONTENT:

H_2S Hydrogen Sulfide, Gr./100 cf .00

RSH Mercaptans " .

RSR Sulfides " .

RSSR Residuals " .

Total Sulfur, Gr./100 cf .

H_2S ... fraction conversion X 0.0000157

MIXTURE HEATING VALUE:

(Btu/cf at 14.73 Psia, 60 F, Sat.)

Calculated From Analysis

Determined By Calorimeter

Calorimeter Verified

... 667.4 Critical Temperature 369.7

REMARKS [illegible]

MEASUREMENT AREA /

[illegible] Watt/Milston 27

Ticket Number 879639

BOTTOM HOLE OFF
BOTTOM STRADDLE ... ARTESIA
MR. LAMAR
MR. MC KEE ... Witness MR. D. JACKSON

CAPITAN DRILLING COMPANY RIG # 14 sm

EQUIPMENT & HOLE DATA

Formation Tested	Cisco
Elevation	3718' Ft.
Net Productive Interval	- Ft.
All Depths Measured From	Kelly bushing(AGL)
Total Depth	9190' Ft.
Main Hole Casing Size	7 7/8"
Drill Collar Length	660' I.D. 2.25"
Drill Pipe Length	5835' I.D. 3.340"
Packer Depth(s)	6526-6532-6640-6646' Ft.
Depth Tester Valve	6507' Ft.

Recovery Water

Recovery Mud

Recovery Mud Filtrate

Mud Pit Sample

Mud Pit Sample Filtrate

Mud Weight 8.9

Cushion TYPE AMOUNT ... Depth Back Pres. Valve ... Surface Choke 3/8" Adj. choke ... Bottom Choke .75"

Recovered 130 Feet of drilling fluid

Recovered Feet of

Recovered Feet of

Recovered Feet of

Recovered Feet of

Meas. From Tester Valve

Remarks SEE PRODUCTION TEST DATA SHEET

TEMPERATURE	Gauge No. 512	Gauge No. 113	Gauge No.	TIME (00:00-24:00 hrs.)
	Depth 6511 Ft.	Depth 6583 Ft.	Depth Ft.	Tool 7-6-80
	24 Hour Clock	24 Hour Clock	Hour Clock	Opened 1900
Est. 192 °F.	Blanked Off no	Blanked Off yes	Blanked Off	Opened 7-7-80
Actual °F	Pressures	Pressures	Pressures	Bypass 0100

	Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic	3022	3057.[illegible]	[illegible]	3104.5				
First Period Flow Initial	[illegible]	[illegible]	[illegible]	106.0			—	—
Flow Final	[illegible]	[illegible]	[illegible]	100.0			30	29
Closed in	[illegible]	[illegible]	[illegible]	1509.2			90	89
Second Period Flow Initial	[illegible]	[illegible]	[illegible]	102.5			—	—
Flow Final	[illegible]	[illegible]	[illegible]	[illegible]			60	58
Closed in	[illegible]	[illegible]	[illegible]	[illegible]			180	183
Third Period Flow Initial								
Flow Final								
Closed in								
Final Hydrostatic	[illegible]	[illegible]	[illegible]	[illegible]			—	—

Legal Location Sec. - Twp. - Rng. 2 19 24

Field Area WILDCAT

County EDDY

State NEW MEXICO

FORMATION TEST DATA

Supplement to Exhibit 12
Page 7 - 5

Casing perfs ______ Bottom choke ______ Surf temp ______ °F Ticket No 879639
Gas gravity ______ Oil gravity ______ GOR ______
Spec gravity ______ Chlorides ______ ppm Res ______ °F
INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED ______

Date Time a.m. p.m.	Choke Size	Surface Pressure psi	[illegible]	Liquid Rate BPD	Remarks
0700					Called out
1145					On location
1300					Picked up tools
1400					Started in hole with tools
1900					Opened with a weak blow
1905					Weak blow
1910					Blow increased to good
1915	3/8"	1½			Opened 3/8" choke
1930	"	0			Closed tool -no gas to the surface
2100	"	10			Opened tool on 3/8" choke
2105	"	12			
2106	"	11	99.4		Gas to the surface
2110	"	5½	69.7		Pressure dropped
2115	"	1/2	TSTM		"
2130	"		TSTM		"
2145	"		TSTM		"
2200	"		TSTM		Closed tool
7-7-80					
0100					Opened bypass and started out of hole.

TSTM = too small to measure

PRODUCTION TEST DATA

	Gauge No. 51[illegible]		Depth 6511'			Clock No. 13528				24 hour		Ticket No. 879639			
	First Flow Period		First [illegible]			Second [illegible]		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
	Time Defl .000"	PSIG Temp Corr	[illegible]	[illegible]	[illegible]	Time Defl	PSIG Temp Corr	Time Defl	[illegible]	PSIG Temp Corr	Time Defl	PSIG Temp Corr	Time Defl	[illegible]	PSIG Temp Corr
0	.0000	57.7	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]		[illegible]					
1	.0133*	80.0	[illegible]		[illegible]	[illegible]**	72.1	[illegible]***		[illegible]					
2	.0313	81.3	.0579		[illegible]	.0602	70.8	[illegible]		990.7					
3	.0488	81.3	.0885		602.6	.0935	74.6	.1912		1301.3					
4	.0662	80.0	.1192		764.4	.1271	76.1	.2516		1557.9					
5	.0836	80.0	[illegible]		910.5	.1606	76.1	.3120		1760.5					
6	.1010	80.0	[illegible]		[illegible]	[illegible]	77.4	.3724		1911.[illegible]					
7			.2111		[illegible]			[illegible]		2018.4					
8			.2417		[illegible]			[illegible]		[illegible]					
9			[illegible]		[illegible]			[illegible]		[illegible]					
10			[illegible]		[illegible]			[illegible]		[illegible]					
11															
12															
13															
14															
15															

	Gauge No. 113				Depth 6583'			Clock No. 6728		24 hour					
0	.0000	96.0	.0000		100.0	.0000	102.6	.0000		92.1					
1	.0135*	106.5	.0270**		242.1	.0270**	88.1	.0705***		609.5					
2	.0304	107.8	.0573		415.7	.0608	88.1	.1308		984.1					
3	.0473	107.8	.0876		575.2	.0946	89.4	.1912		1296.8					
4	.0642	103.9	.1180		733.5	.1284	92.1	.2516		1550.1					
5	.0811	100.0	.1483		881.2	.1622	92.1	.3120		1758.6					
6	.0980	100.0	.1787		1029.0	.1960	92.1	.3724		1915.6					
7			.2090		1163.6			.4328		2029.0					
8			.2393		1287.6			.4932		2106.9					
9			.2697		1402.4			.5536		2160.9					
10			.3000		1509.2			.6140		2197.9					
11															
12															
13															
14															
15															
Reading Interval	5				9	10			18						Minutes

REMARKS: *First interval is equal to 4 minutes. ** = 8 minutes. *** = 21 minutes.

Supplement to Exhibit 12
Page 7 - 6

Irish Hills KW St #2

DST 6532-6640

Log footage contributing to height h:

Interval	Feet
6536-6538	2
6540-6552	12
6568-6570	2
6578-6592	14
6611-6619	8
6620-6640	20
	58 ft.

Irish Hills KW St #2

DST 6532-6640

Time to Reach Pseudosteady State

A) Average Porosity = 0.020 (Note 1)

Interval	Porosity
6536-6538	0.015
6540-6552	0.016
6568-6570	0.005
6578-6592	0.020
6611-6619	0.026
6620-6640	0.023

B) Total Compressibility = $S_g C_g$

$C_t = 0.7\ (0.00087) = 0.00061\ psi^{-1}$ (Note 2)

C) Time $t = \dfrac{1136 \phi u C_t r_e^2}{k}$

$t = \dfrac{1136\ (0.020)\ (0.0137)\ (0.00061)\ (2106)^2}{0.0021}$

$t =$ 401,000 hr

$t =$ 45.8 yr

1) Porosity averaged over 58 ft of pay
2) C.S. Matthews - D.G. Russell Fig. G7.A

FORMATION DENSITY

COUNTY
FIELD
LOCATION
WELL
COMPANY

COMPANY Yates Petroleum Corporation

WELL Irish Hills "KW" State Com. #1

FIELD Wildcat

COUNTY Eddy STATE New Mexico

LOCATION 1980' FNL & 1980' FEL

Other Services: DLL-MSG

SEC 2 TWP 19-S RANGE 24-E

Permanent Datum: GL ; Elev. 3709

Log Measured From KB 11.5 Ft. Above Perm. Datum

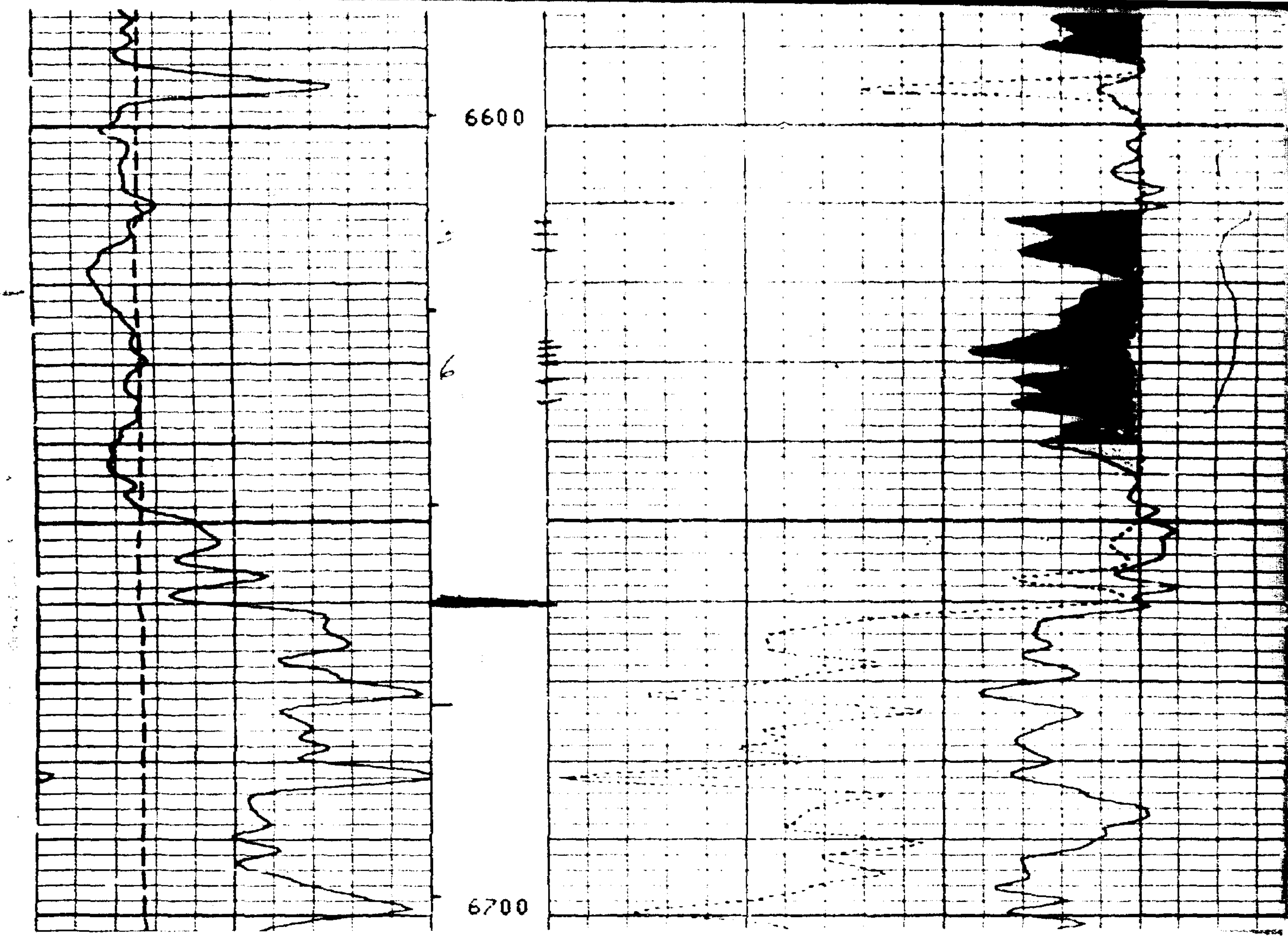
Drilling Measured From KB

Elev.: K.B. 3720.5

D.F.

G.L. 3709

Date	7-5-80			
Run No.	ONE			
Depth—Driller	9190			
Depth—Logger	9189			
Btm. Log Interval	9188			
Top Log Interval	Surf			
Casing—Driller	8 5/8 @ 950	@	@	@
Casing—Logger	948			
Bit Size	7 7/8			
Type Fluid in Hole	S.W. Gel, Starch			
Dens. / Visc.	9.0 / 38			
pH / Fluid Loss	10.0 / 9.4 ml	ml	ml	ml
Source of Sample	Circulated			
Rm @ Meas. Temp.	.17 @ 89 °F	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	.13 @ 89 °F	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	.25 @ 89 °F	@ °F	@ °F	@ °F
Source: Rmf / Rmc	M / M			
Rm @ BHT	.10 @ 149 °F	@ °F	@ °F	@ °F
TIME Circulation Stopped	0700 7-5			
Logger on Bottom	1130 7-5			
Max. Rec. Temp.	149	°F	°F	°F


6600
6700

WELL NAME: La Cama #1

LOCATION: 20-18S-25E

DST INTERVAL: 6812-7000

$p^* = 2418$ psi $\qquad$ slope (M) = 392 psi/cycle

$Tc = 374^{\circ}R$ $\qquad$ $Pc = 677$ psi

$T = 128 + 460^{\circ} = 588^{\circ}R$ $\qquad$ $Pwf = 551$ psi

$$Pavg = \frac{P^* + Pwf}{2} = \frac{2418 + 551}{2} = 1484.5 \text{ psi (Note 1)}$$

$$Tr = \frac{T}{Tc} = \frac{588}{374} = 1.57$$

$$Pr = \frac{Pavg}{Pc} = \frac{1484.5}{667} = 2.23$$

$Z = 0.84$ $\qquad$ $Tsc = 520^{\circ}R$ $\qquad$ $Psc = 13.3$ psi

$$Bg = Z \cdot \frac{T}{Tsc} \cdot \frac{Psc}{Pavg} = 0.84 \cdot \frac{588}{520} \cdot \frac{13.3}{1484.5} = 0.0085 \text{ (Note 1)}$$

$q = 390$ mcfd $\cdot$ $178.1 = 69459$ b/d (Note 2)

$u = (1.26)\,(0.0112) = 0.0141$ cp (Note 3)

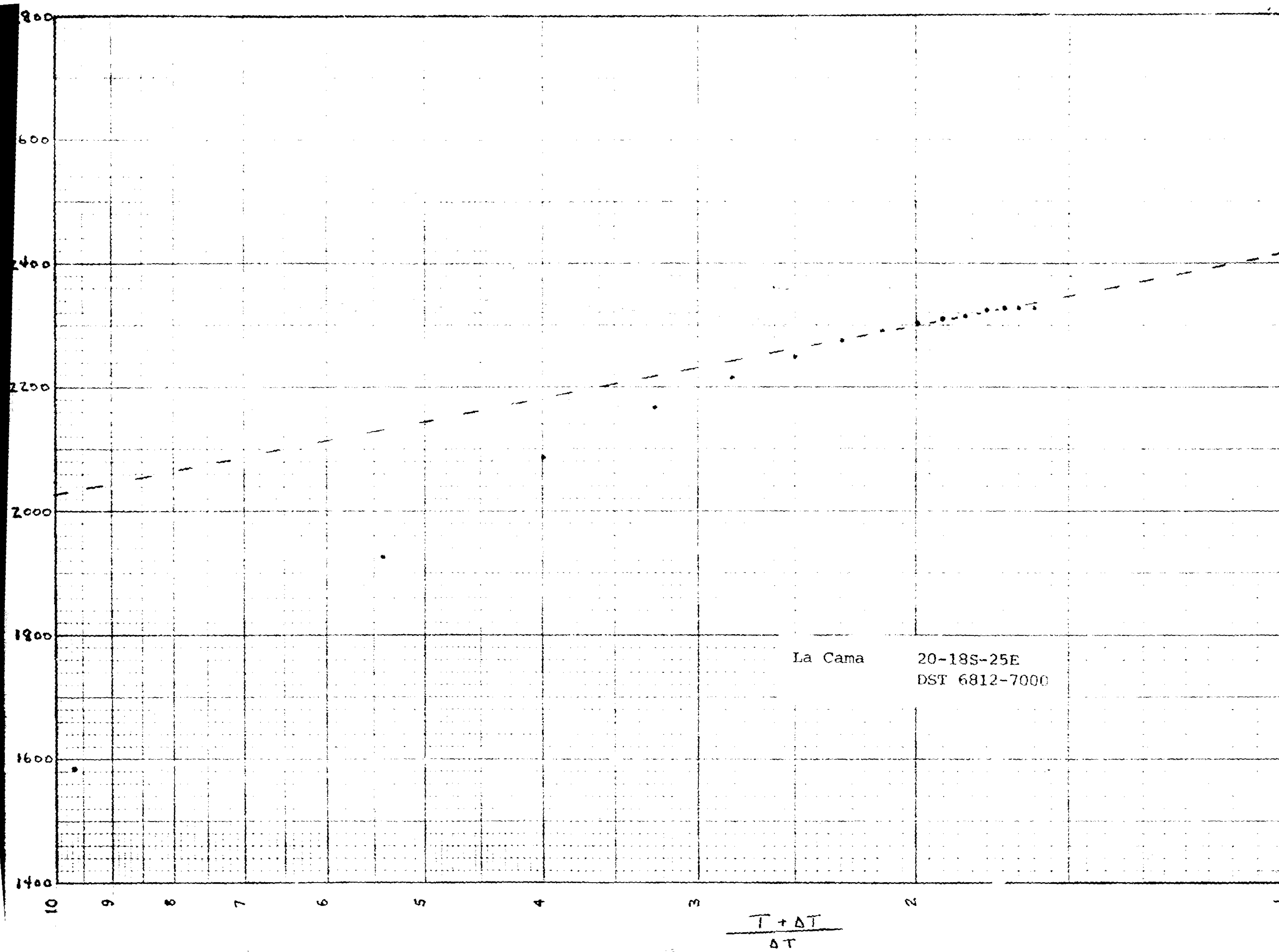
$$kh = \frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6\,(69459)\,(0.0141)\,(0.0085)}{392}$$

$kh = 3.45$ md $\cdot$ ft

$h = 38$ ft (Note 4)

$k = 0.091$ md

1) C.S. Matthews - D.G. Russell eqn. 3.21a
2) Flow rate is natural flow rate as reported on Drilling Report.
Flow during DST was [illegible] less.
3) C.S. Matthews - D.G. Russell Eq. G.3A&B
4) h estimated from log



2800
2600
2400
2200
2000
1800
1600
1400
10
9
8
7
6
5
4
3
2
La Cama
20-18S-25E
DST 6812-7000
T + ΔT
ΔT

EL PASO NATURAL GAS COMPANY

RPT-ASL 316 CHROMATOGRAPHIC GAS ANALYSIS REPORT

RPT DATE 02 03 81
ANAL DATE 01 29 81

METER STA 61894
OPER 9841

METER STATION NAME
[illegible] CAMA COM #1

TYPE CODE	SAMPLE DATE	EFF. DATE	USE MOS.	SCALE	H2S GRAINS	LOCATION
00	01 21 81	02 03 81	06		0000*	1 J 1

	NORMAL MOL%	GPM
C O 2	00.00	0.000
H 2 S	00.00*	0.000
N2	01.74	0.000
METHANE	83.51	0.000
ETHANE	08.93	2.387
PROPANE	03.21	0.883
ISO-BUTANE	00.36	0.118
NORM-BUTANE	01.14	0.359
ISO-PENTANE	00.34	0.124
NORM-PENTANE	00.35	0.127
HEXANE PLUS	00.42	0.183
TOTALS	100.00	4.181

SPECIFIC GRAVITY 0.684

MINIMUM HEATING VALUE
(BTU/CF @ 14.73 [illegible] DEGREES,DRY) 1187

RATIO OF SPECIFIC HEATS 1.287

* NO TEST SECURED FOR DETERMINATION H2S CONTENT.

FLUID SAMPLE DATA

Sampler Pressure	P.S.I.G. at Surface
Recovery: Cu. Ft. Gas	
cc. Oil	
cc. Water	
cc. Mud	
Tot. Liquid cc.	
Gravity	° API @ °F
Gas/Oil Ratio	cu. ft./bbl.

	RESISTIVITY		CHLORIDE CONTENT
Recovery Water	@	°F	ppm
Recovery Mud	@	°F	ppm
Recovery Mud Filtrate	@	°F	ppm
Mud Pit Sample	@	°F	ppm
Mud Pit Sample Filtrate	@	°F	ppm

Mud Weight 9.3 vis sec.

Date	10-9-77	Ticket Number	139167
Kind of Job	OPEN HOLE TEST	Halliburton District	ARTESIA
Tester	RAINES	Witness	J. MC DONALD
Drilling Contractor	MORAN BROTHERS DRILLING COMPANY PW		

EQUIPMENT & HOLE DATA

Formation Tested	Cisco
Elevation	3578' Ft.
Net Productive Interval	16' Ft.
All Depths Measured From	Kelly Bushing- AGL 3593'
Total Depth	7000' Ft.
Main Hole/Casing Size	7 7/8"
Drill Collar Length	379' ? I.D. 2.250"
Drill Pipe Length	6448' I.D. 3.340"
Packer Depth(s)	6800'- 6806' - 6812' Ft.
Depth Tester Valve	6775' Ft.

Cushion TYPE	AMOUNT	Depth Back Pres. Valve	Surface Choke	Bottom Choke
	Ft.		3/8"	.75"

Recovered 1383 Feet of drilling mud - 500' of water.

Recovered Feet of

Recovered Feet of

Recovered Feet of

Recovered Feet of

Meas. From Tester Valve

Remarks

SEE PRODUCTION TEST DATA SHEET.....

TEMPERATURE	Gauge No. 1114		Gauge No. 1113		Gauge No.		TIME	
	Depth 6784 Ft.		Depth 6844 Ft.		Depth: Ft.			
	24 Hour Clock		24 Hour Clock		Hour Clock		Tool Opened	1315 P.M.
Est. °F.	Blanked Off No		Blanked Off no		Blanked Off		Opened Bypass	2330 P.M.
Actual 127°F.	Pressures		Pressures		Pressures			
	Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic	3461	3225	3320	3299				
First Period Flow Initial	249	269	[illegible]	366			—	—
First Period Flow Final	392	400	405	405			45	45
First Period Closed in	2178	2157	2149	2149			90	90
Second Period Flow Initial	392	555	[illegible]	594			—	—
Second Period Flow Final	551	551	[illegible]	549			180	179
Second Period Closed in	2321	2327	[illegible]	2327			300	301
Third Period Flow Initial							—	—
Third Period Flow Final								
Third Period Closed in								
Final Hydrostatic	3264	3273	[illegible]	3288			—	—

Legal Location Sec. - Twp. - Rng.	20 - 18 - 25
Lease Name	
Well No.	
Test No.	
Tested Interval	
Field Area	DINKUS RANCH
County	EDDY
State	NEW MEXICO
Lease Owner/Company Name	

FORMATION TEST DATA

//

Casing perfs ________ Bottom choke .75" ________ Surf. temp ________ °F Ticket No. 139167
Gas gravity ________ Oil gravity ________ GOR ________
Spec. gravity ________ Chlorides ________ ppm Res. ________ @ ________ °F
INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED ________

Date Time a.m. p.m.	Choke Size	Surface Pressure psi	Gas Rate MCF	Liquid Rate BPD	Remarks
1315	3/8"	1#			Opened tool with a good blow.
1320	"	5			Good blow.
1325	"	15			Good blow - no gas.
1330	"	20			"
1335	"	23	129.20		Gas to the surface in 20 minutes.
1340	"	24	132.60		Flared gas.
1345	"	24	132.60		"
1350	"	"	"		"
1355	"	23	129.20		"
1400	"	"	"		" Closed tool.
1530	"	2			Reopened tool with a good blow.
1535	"	28	146		Gas to flare in 3 minutes.
1545	"	43	197		Gas flare.
1600	"	34	166		"
1615	"	25	136		"
1630	"	20	119		"
1645	"	17	108		"
1700	"	18	112		"
1730	"	23	129		"
1800	"	24	132		Slight increase.
1830	"	25	136		Closed tool.
2330					Opened bypass - pulled loose.

PRODUCTION TEST DATA

Gauge No. 1114			Depth 6784'					Clock No. 4365		24 hour	Ticket No. 139167			
	First Flow Period		First Closed In Pressure			Second Flow Period		Second Closed In Pressure			Third Flow Period		Third Closed In Pressure		
	Time Defl. .000"	PSIG Temp Corr	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp Corr	Time Defl. .000"	PSIG Temp Corr	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp Corr	Time Defl. .000"	PSIG Temp Corr	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp Corr
0	.000	269	.000		500	.000	555	.000		551					
1	.0164*	254	.0298		1048	.0969**	415	.0692***		1585					
2	.0428	295	.0596		1433	.1971	449	.1351		1926					
3	.0691	317	.0894		1658	.2973	488	.2010		2086					
4	.0954	349	.1192		1809	.3975	514	.2669		2164					
5	.1217	377	.1490		1913	.4978	535	.3329		2217					
6	.1480	400	.1788		1989	.5980	551	.3988		2251					
7			.2086		2046			.4646		2276					
8			.2384		2091			.5306		2292					
9			.2682		2129			.5965		2304					
10			.2980		2157			.6624		2313					
11								.7283		2318					
12								.7942		2324					
13								.8601		2326					
14								.9260		2327					
15								.9920		2327					

Gauge No. 1113			Depth 6844'					Clock No. 13433		24 hour					
0	.000	366	.000		405	.000	594	.000		549					
1	.0167*	271	.0300		1044	.0964**	415	.0698***		1552					
2	.0433	305	.0600		1422	.1961	449	.1362		1908					
3	.0700	322	.0900		1646	.2958	484	.2027		2066					
4	.0967	352	.1200		1796	.3956	512	.2691		2156					
5	.1234	379	.1500		1901	.4953	533	.3356		2210					
6	.1500	405	.1800		1977	.5950	549	.4020		2247					
7			.2100		2038			.4685		2271					
8			.2400		2084			.5349		2288					
9			.2700		2121			.6014		2301					
10			.3000		2149			.6678		2311					
11								.7343		2316					
12								.8007		2320					
13								.8672		2323					
14								.9336		2325					
15								1.0000		2327					
Reading Interval	8		9			30		20							Minutes

REMARKS: * = 5 minute interval. ** = 29 minute interval. *** = 21 minute interval.

FORM 185-R1—PRINTED IN U.S.A.

SPECIAL PRESSURE DATA

La Cama #1

DST 6812-7000

Log footage contributing to height h:

Interval	Feet
6896-6901	5
6919-6932	13
6933-6937	4
6939-6946	7
6947-6955	8
6960-6961	1
	38 ft.

La Cama #1

DST 6812-7000

Time to Reach Pseudosteady State

A) Average Porosity = 0.045 (Note 1)

Interval	Porosity
6896-6901	0.020
6919-6932	0.065
6933-6937	0.072
6939-6946	0.036
6947-6955	0.025
6960-6961	0.035

B) Total Compressibility = $S_g C_g$

$$C_t = 0.7\ (0.00077) = 0.00054\ psi^{-1}$$ (Note 2)

C) Time $t = \dfrac{1136 \phi u C_t r_e^2}{k}$

$$t = \frac{1136\ (0.045)\ (0.0141)\ (0.00054)\ (2106)^2}{0.091}$$

$t =$ 19,000 hr

$t =$ 2.2 yr

1) Porosity averaged over 38 ft of pay
2) C.S. Matthews - D.G. Russell Fig. G7.A

Schlumberger

COMPENSATED NEUTRON FORMATION DENSITY

COUNTY EDDY
FIELD DINKUS RANCH
LOCATION
WELL LA CAMA # 1
COMPANY MORRIS R. ANTWELL

COMPANY MORRIS R. ANTWELL

WELL LA CAMA # 1

FIELD DINKUS RANCH

COUNTY EDDY STATE NEW MEXICO

LOCATION 1980' FNL & 1980' FWL

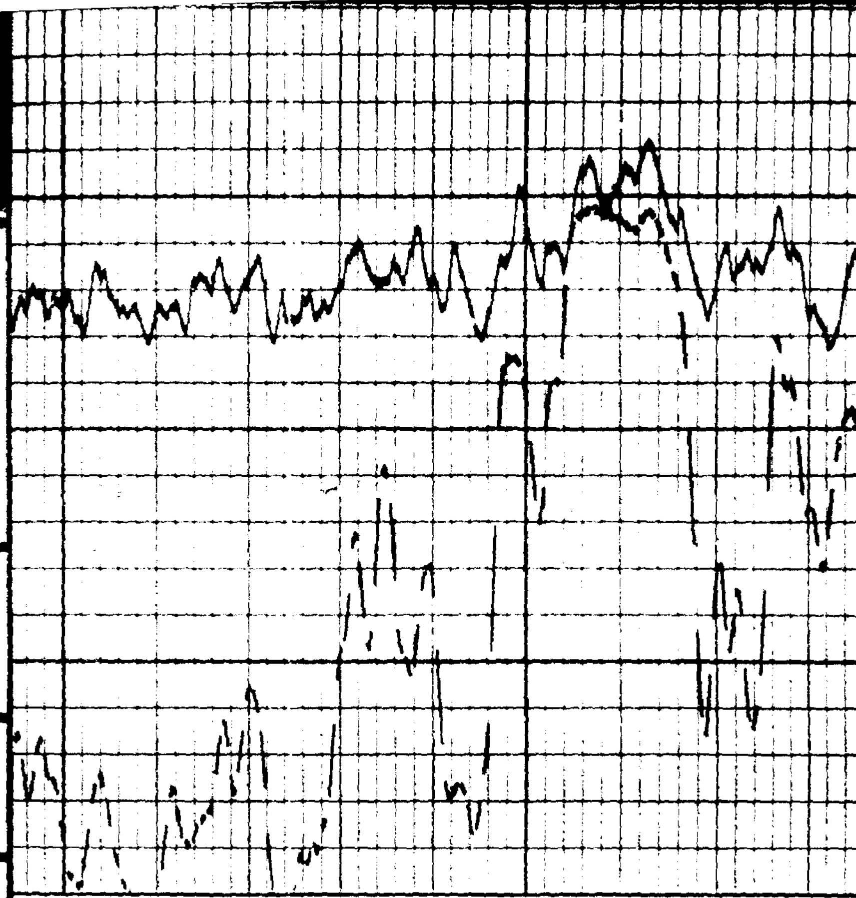
Other Services: DLL

API SERIAL NO.	SEC	TWP	RANGE
	20	18-S	25-E

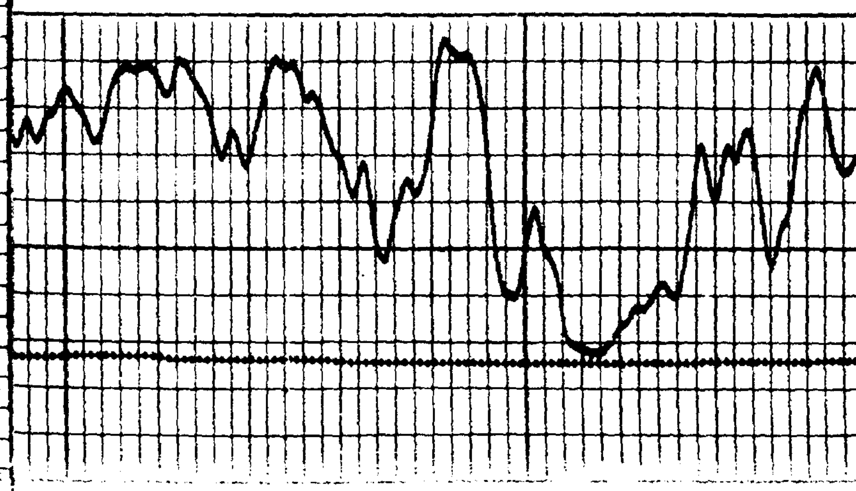
Permanent Datum: G.L. ; Elev.: 3578
Log Measured From K.B. 15 Ft. Above Perm. Datum
Drilling Measured From K.B.

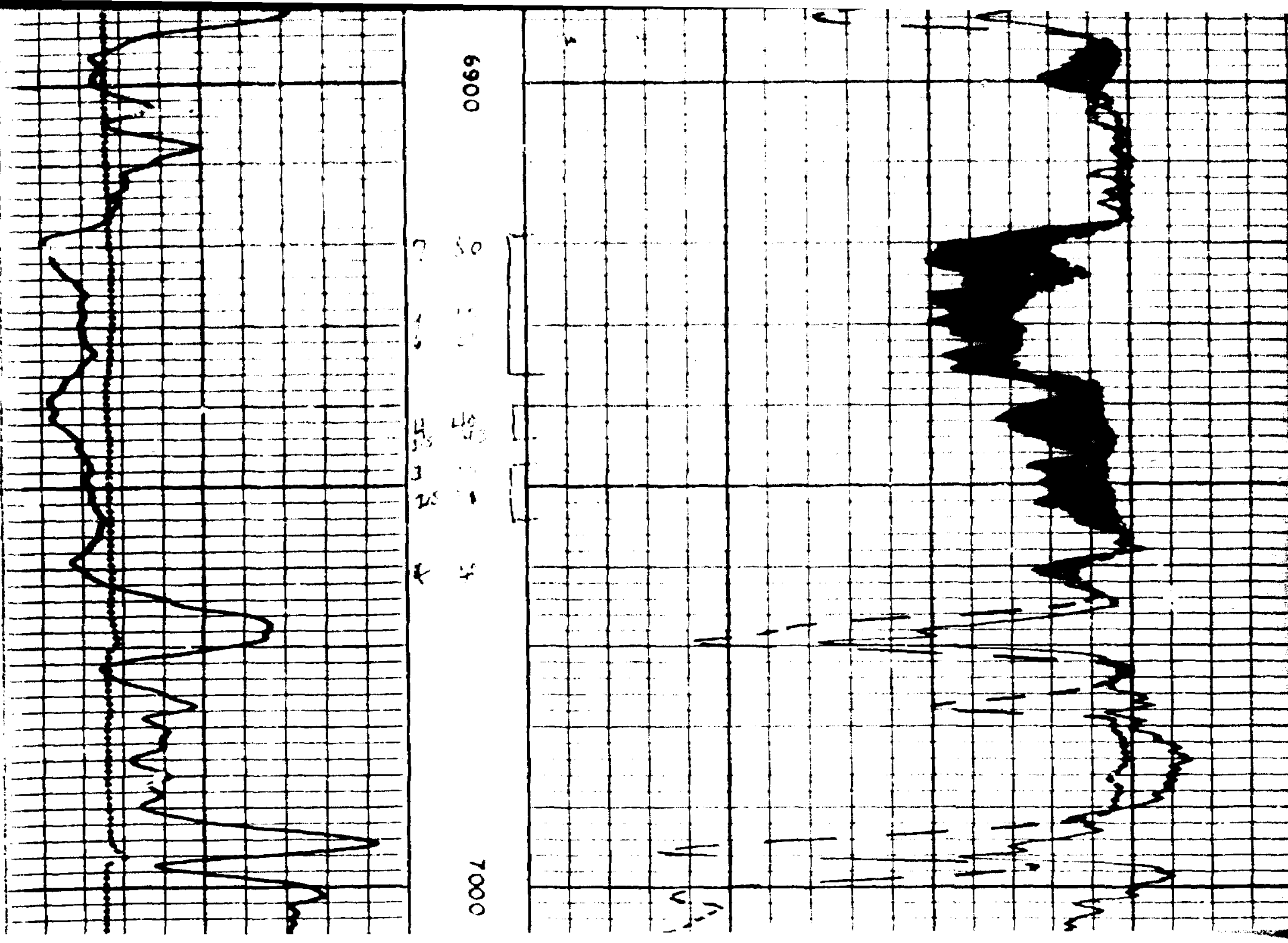
Elev.: K.B. 3593
D.F. 3592
G.L. 3578

Date	10-5-77			
Run No.	ONE			
Depth—Driller	8750			
Depth—Logger	8742			
Btm. Log Interval	8741			
Top Log Interval	SURFACE			
Casing—Driller	8 5/8 @ 1200	@	@	@
Casing—Logger	1203			
Bit Size	7 7/8			
Type Fluid in Hole	BRINE-GEL			
Dens. / Visc.	9.3 / 60	/	/	/
pH / Fluid Loss	10 / 6 ml	/ ml	/ ml	/ ml
Source of Sample	PIT			
Rm @ Meas. Temp.	.11 @ 86 °F	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	.082 @ 86 °F	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	.16 @ 86 °F	@ °F	@ °F	@ °F
Source: Rmf / Rmc	M / C	/	/	/
Rm @ BHT	.066 @ 148 °F	@ °F	@ °F	@ °F
TIME Circulation Stopped	0630			
TIME Logger on Bottom	1230			
Max. Rec. Temp.	[illegible]			



6800




6900
7000

WELL NAME: Murphy NW Fed #1

LOCATION: 3-18S-25E

DST INTERVAL: 6540-6661

$P^* = 2505$ psi   slope (M) = 513 psi/cycle

$Tc = 377\ ^{\circ}R$ $Pc = 670$ psi (Note 1)

$T = 120 + 460^{\circ} = 580\ ^{\circ}R$ $Pwf = 196$ psi

$$Pavg = \frac{P^* + Pwf}{2} = \frac{2505 + 196}{2} = 1350.5 \text{ psi (Note 2)}$$

$$Tr = \frac{T}{Tc} = \frac{580}{377} = 1.54$$

$$Pr = \frac{Pavg}{Pc} = \frac{1350.5}{670} = 2.02$$

$Z = 0.84$ $Tsc = 520^{\circ}R$ $Psc = 13.3$ psi

$$Bg = Z \cdot \frac{T}{Tsc} \cdot \frac{Psc}{Pavg} = 0.84 \cdot \frac{580}{520} \cdot \frac{13.3}{1350.5} = 0.0092$$
(Note 2)

$q = 221$ Mcfd $\cdot$ 178.1 = 39360 b/d

$u = (1.25)\ (0.0111) = 0.0139$ cp (Note 3)

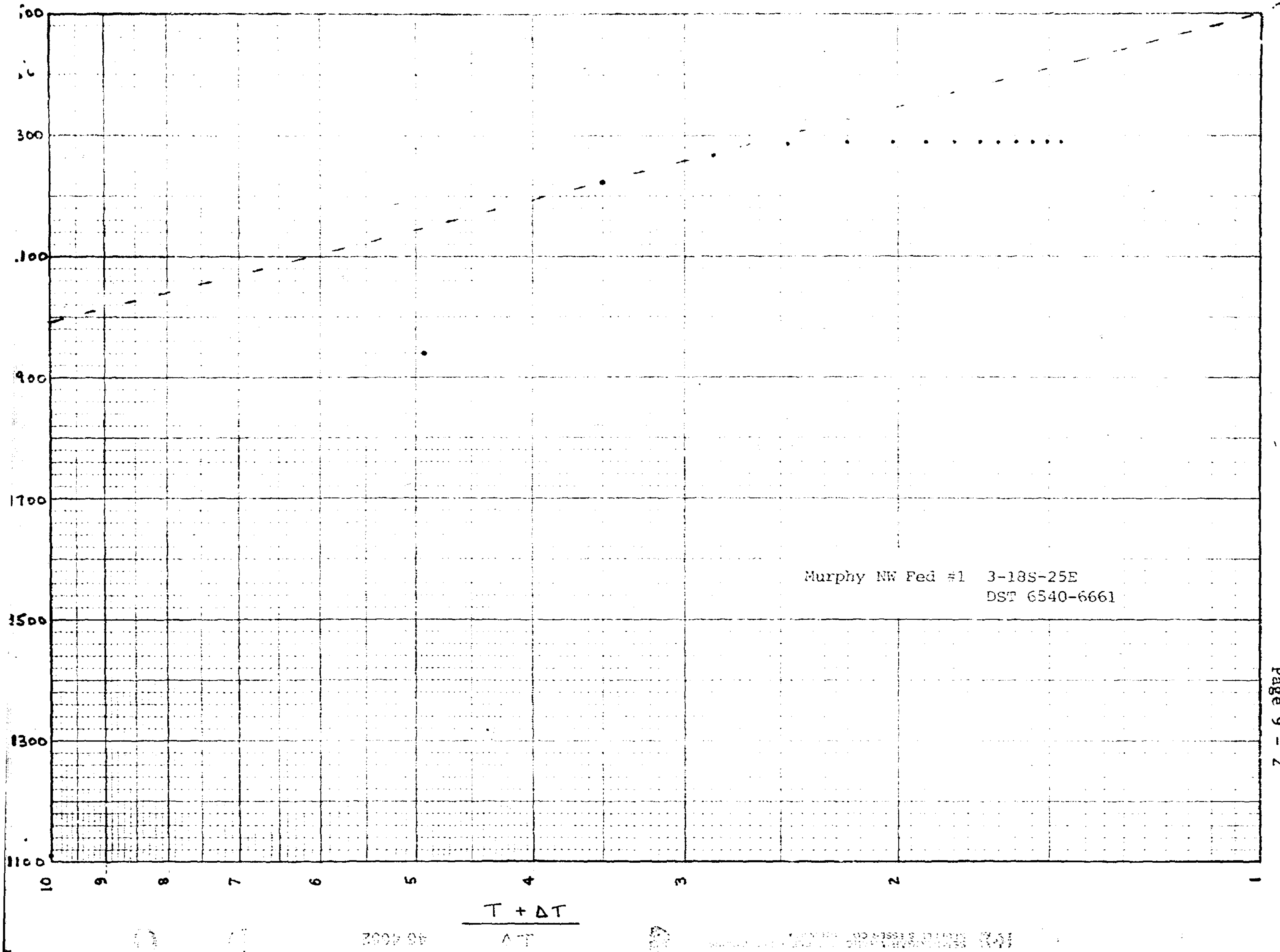
$$kh = \frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6\ (\ 39360\ )\ (\ 0.0139\ )\ (\ 0.0092\ )}{513}$$

$kh = 1.60$ md $\cdot$ ft

$h = 46$ ft (Note 4)

$k = 0.035$ md (Note 5)

1) Tc & Pc from gas analyses for Griffin JJ
2) C.S. Matthews - D. G. Russell eqn 3.21a
3) C.S. Matthews - D. G. Russell Fig G.3A&B
4) h estimated from log
5) Also k = 0.035 md for [illegible] psi and h = 50 ft.



Supplement to Exhibit 12
Page 9 - 2

FLUID SAMPLE DATA

Sampler Pressure 250 P.S.I.G. at Surface
Recovery: Cu. Ft. Gas .615
cc. Oil
cc. Water
cc. Mud
Tot. Liquid cc.
Gravity °API @ °F
Gas/Oil Ratio cu. ft./bbl.

	RESISTIVITY	CHLORIDE CONTENT
Recovery Water	@ °F	ppm
Recovery Mud	@ °F	ppm
Recovery Mud Filtrate	@ °F	ppm
Mud Pit Sample	@ °F	20625 ppm
Mud Pit Sample Filtrate	@ °F	ppm
Mud Weight	8.8	vis 34 sec.

Date 11-29-80 Ticket Number 934704
Kind of Job OPEN HOLE TEST Halliburton Location ARTESIA
Tester R. THOMAS Witness J. JONAS
Drilling Contractor KENAI #14 TJH S

EQUIPMENT & HOLE DATA

Formation Tested Ciscoe
Elevation 3519' Ft.
Net Productive Interval 4' Ft.
All Depths Measured From Kelly Bushing
Total Depth 6661' Ft.
Main Hole/Casing Size 7 7/8"
Drill Collar Length 615' I.D. 2.25"
Drill Pipe Length 5895' I.D. 3.826"
Packer Depth(s) 6534' - 6540' Ft.
Depth Tester Valve 6514' Ft.

Cushion TYPE AMOUNT Ft. Depth Back Pres. Valve Surface Choke Floor Manifold Bottom Choke .75"

Recovered 525 Feet of slightly gas cut drilling fluid.
Recovered Feet of
Recovered Feet of
Recovered Feet of
Recovered Feet of

Meas. From Tester Valve

Remarks SEE PRODUCTION TEST DATA SHEET
GAS TO SURFACE IN 13 MINUTES
CHART FOR GAUGE #513 NOT SENT IN FOR PROCESSING

TEMPERATURE	Gauge No. 513 Depth 6522 Ft.		Gauge No. 113 Depth 6658 Ft.		Gauge No. Depth Ft.		TIME (00:00-24:00 hrs.)	
	24 Hour Clock		24 Hour Clock		Hour Clock		Tool 11-29	
Est. °F.	Blanked Off NO		Blanked Off YES		Blanked Off		Opened 2215	
							Opened 11-30	
Actual 162 °F.	Pressures		Pressures		Pressures		Bypass 0445	
	Field	Office	Field	Office	Field	Office	Reported Minutes	Computed Minutes
Initial Hydrostatic	3120.1		3168.0	3174.6				
First Period Flow Initial	10.5		144.8	147.3			—	—
First Period Flow Final	144.4		154.3	192.4			30	29
First Period Closed in	2301.4		2308.3	2305.5			90	85
Second Period Flow Initial	144.4		144.8	164.4			—	—
Second Period Flow Final	170.7		[illegible]	196.0			90	88
Second Period Closed in	2301.4		[illegible]	2292.3			180	187
Third Period Flow Initial							—	—
Third Period Flow Final								
Third Period Closed in								
Final Hydrostatic	3120.1		3154.0	3154.7			—	—

Legal Location Sec. - Twp. - Rng. 3 - 18S - 25E
Field Area WILDCAT
County EDDY
State NEW MEXICO
Lease Name / Well No. / Test No. / Tested Interval / Lease Owner/Company Name

FORMATION TEST DATA

T-7

Casing perfs ______ Bottom choke .75" ______ Surf. temp ______ °F Ticket No 984704
Gas gravity ______ Oil gravity ______ GOR ______
Spec. gravity ______ Chlorides 20625 ppm Res. ______ @ ______ °F
INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED 6" Positive Flow Manifold

Date Time a.m. p.m.	Choke Size	Surface Pressure psi	Gas Rate MCF	Liquid Rate BPD	Remarks
11-29-80 1530					On location.
1630					Rigged up test tools.
2215					Opened tool witn a weak blow.
2220	3/8	10			Opened on choke.
2225	"	19			No gas.
2227	"	26	139.4		Gas to surface in 13 minutes.
2230	"	28	146.2		
2235	"	32	159.8		
2240	"	35	170		
2245	"	36	173.4		Closed tool.
0015	"				Opened tool - gas flare.
0020	"	50	221		
0025	"	65	272		
0030	"	60	255		
0035	"	60	255		
0040	"	50	221		Pressure decreasing.
0045	"	50	221		Stabilized.
0100	"	50	221		"
0115	"	"	"		"
0130	"	"	"		"
0145	"	"	"		Closed tool.
0445					Opened bypass and pulled loose.
11-30-80 0900					Rig test tools down.
1100					Left location.

PRODUCTION TEST DATA

Gauge No. 513 | Depth 6522 | Clock No. 7282 | 24 hour | Ticket No. 984704

	First Flow Period Time Defl. .000"	First Flow Period PSIG Temp. Corr.	First Closed In Pressure Time Defl. .000"	First Closed In Pressure $Log\frac{t+\theta}{\theta}$	First Closed In Pressure PSIG Temp. Corr.	Second Flow Period Time Defl. .000"	Second Flow Period PSIG Temp. Corr.	Second Closed In Pressure Time Defl. .000"	Second Closed In Pressure $Log\frac{t+\theta}{\theta}$	Second Closed In Pressure PSIG Temp. Corr.	Third Flow Period Time Defl. .000"	Third Flow Period PSIG Temp. Corr.	Third Closed In Pressure Time Defl. .000"	Third Closed In Pressure $Log\frac{t+\theta}{\theta}$	Third Closed In Pressure PSIG Temp. Corr.
0															
1															
2															
3															
4															
5															
6			CHART FOR GAUGE #513 NOT SENT IN FOR PROCESSING . . .												
7															
8															
9															
10															
11															
12															
13															
14															
15															

Gauge No. 113 | Depth 6657 | Clock No. 13528 | 24 hour

	First Flow Time Defl.	First Flow PSIG	First CIP Time Defl.	First CIP Log	First CIP PSIG	Second Flow Time Defl.	Second Flow PSIG	Second CIP Time Defl.	Second CIP Log	Second CIP PSIG	Third Flow Time Defl.	Third Flow PSIG	Third CIP Time Defl.	Third CIP Log	Third CIP PSIG
0	.0000	147.3	.0000		193.4	.0000	164.4	.0000		196.0					
1	.0166	147.3	.0133*		621.3	.0502	190.7	.0333**		1110.8					
2	.0333	152.6	.0332		1254.6	.1003	197.3	.0767		1940.6					
3	.0500	161.8	.0531		1769.1	.1505	197.3	.1200		2223.5					
4	.0666	181.5	.0730		2056.8	.2006	197.3	.1633		2269.8					
5	.0833	196.0	.0929		2198.4	.2508	196.0	.2067		2287.0					
6	.1000	193.4	.1128		2256.6	.3010	196.0	.2500		2292.3					
7			.1327		2272.4			.2933		2293.6					
8			.1526		2279.1			.3366		2293.6					
9			.1725		2284.4			.3800		2292.3					
10			.1924		2287.0			.4233		2292.3					
11			.2123		2292.3			.4666		2292.3					
12			.2322		2298.9			.5100		2292.3					
13			.2521		2301.5			.5533		2292.3					
14			.2720		2304.2			.5966		2292.3					
15			.2920		2305.5			.6400		2292.3					
Reading Interval	5		6			15		13							Minutes

REMARKS: * - first interval is equal to 4 minutes, ** - 10 minutes.

Murphy NW Federal #1

DST 6540-6661

Contributions to log height h:

Interval	Feet
6545-6554	9
6562-6567	5
6582-6594	12
6600-6607	7
6608-6610	2
6632-6636	4
6648-6653	5
6659-6661	2
	46 ft.

Murphy NW Fed #1

DST 6540-6661

Time to Reach Pseudosteady State

A) Average Porosity = 0.027 (Note 1)

Interval	Porosity
6545-6554	0.035
6562-6567	0.027
6582-6594	0.030
6600-6607	0.028
6608-6610	0.005
6632-6636	0.008
6648-6653	0.025
6659-6661	0.035

B) Total Compressibility = $S_g C_g$

C_t = 0.7 (0.00084) = 0.00059 psi^{-1} (Note 2)

C) Time $t = \dfrac{1136 \phi u C_t r_e^2}{k}$

$t = \dfrac{1136\ (0.027)\ (0.0139)\ (0.00059)\ (2106)^2}{0.035}$

t = 31,900 hr

t = 3.6 yr

1) Porosity averaged over 46 ft of pay
2) C. S. Matthews - D.G. Russell Fig. G7.A

FORMATION DENSITY

COMPANY

WELL

FIELD

COUNTY

STATE

COUNTY
FIELD
LOCATION
WELL
COMPANY

LOCATION

Other Services

Permanent Datum:
Log Measured From
Drilling Measured From

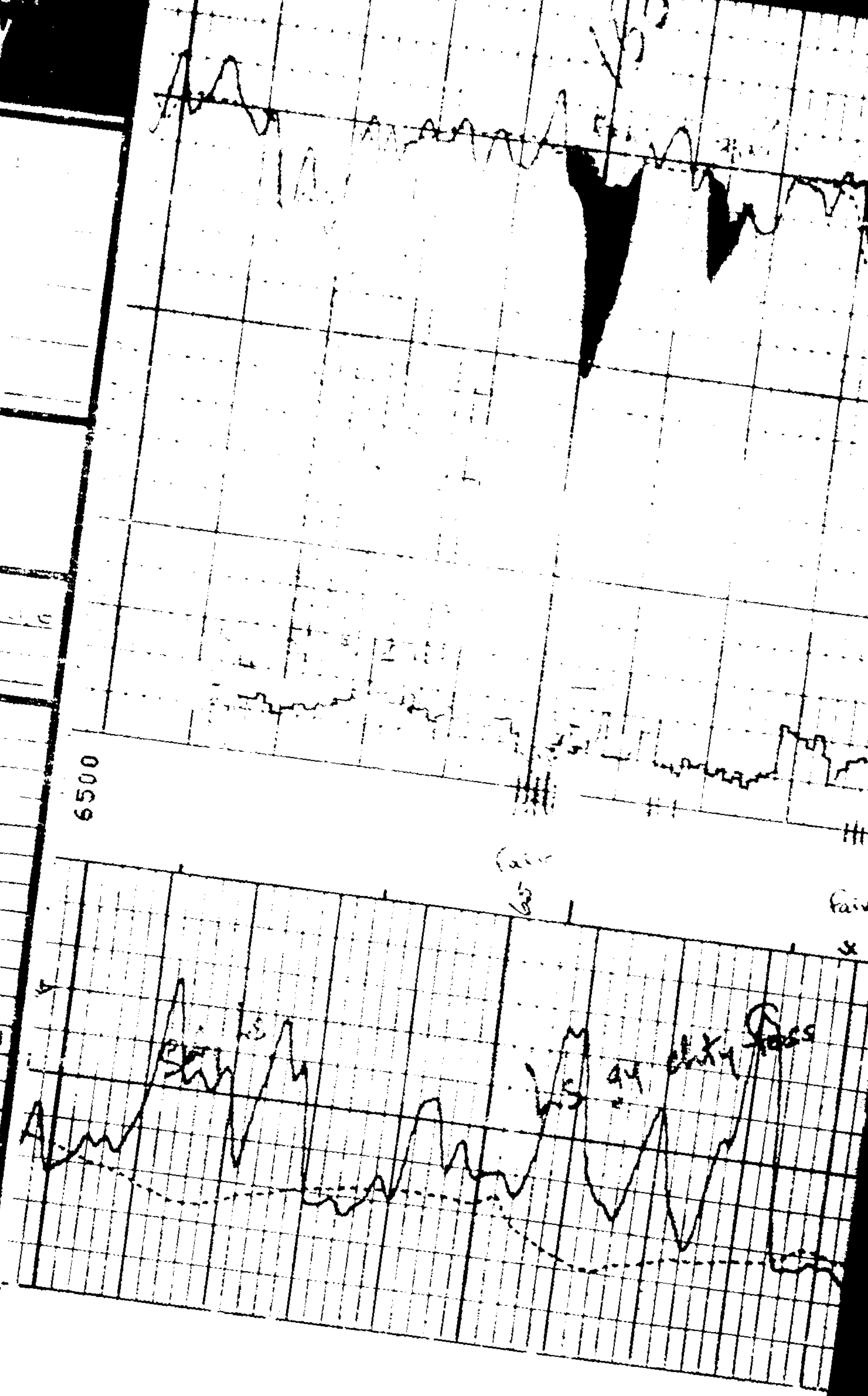
Elev.

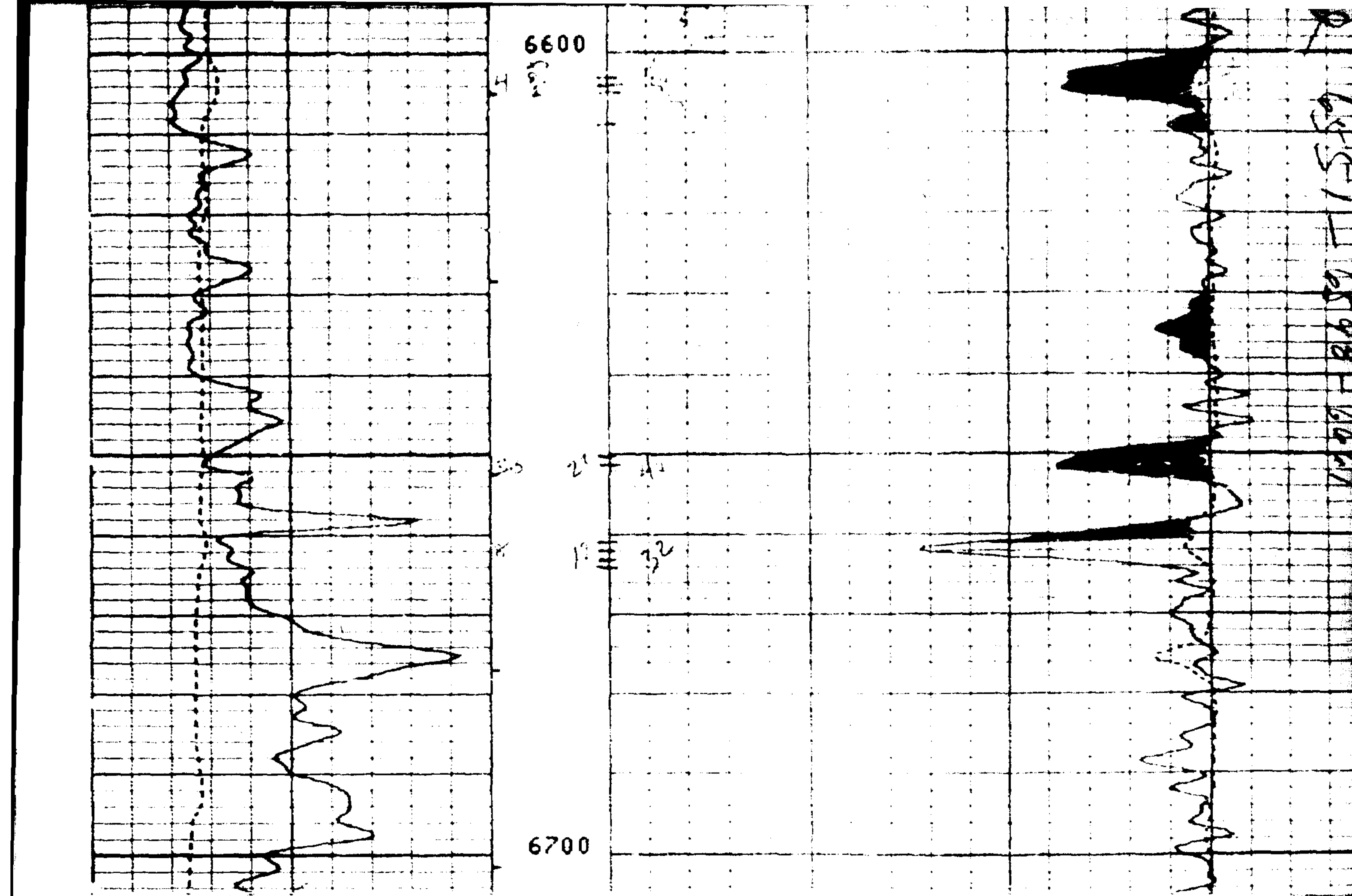
Ft. Above Perm. Datum

Elev.: K.B.
D.F.
G.L.

BEST AVAILABLE COPY

Date				
Run No.				
Depth—Driller				
Depth—Logger				
Btm. Log Interval				
Top Log Interval				
Casing—Driller	@	@	@	@
Casing—Logger				
Bit Size				
Type Fluid in Hole				
Dens. | Visc.				
pH | Fluid Loss	ml	ml	ml	ml
Source of Sample				
Rm @ Meas. Temp.	@ °F	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	.160 @ 51 °F	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	— @ — °F	@ °F	@ °F	@ °F
Source: Rmf | Rmc	M | —			
Rm @ BHT	@ °F	@ °F	@ °F	@ °F
Circulation Stopped				
Logger on Bottom				
Max. Rec. Temp.	°F	°F	°F	°F




6600
6700

WELL NAME: Powell DC #1

LOCATION: 35-17S-25E

DST INTERVAL: 6445-6653

P* = 2760 psi   slope (M) = 6240 psi/cycle

Tc = 379 °R   Pc = 671 psi

T = 115 + 460° = 575 °R   Pwf = 378 psi

Pavg = $\frac{P^* + Pwf}{2}$ = $\frac{2760 + 378}{2}$ = 1569 psi (Note 1)

Tr = $\frac{T}{Tc}$ = $\frac{575}{379}$ = 1.52

Pr = $\frac{Pavg}{Pc}$ = $\frac{1569}{671}$ = 2.34

Z = 0.81   Tsc = 520°R   Psc = 13.3 psi

Bg = Z · $\frac{T}{Tsc}$ · $\frac{Psc}{Pavg}$ = 0.81 · $\frac{575}{520}$ · $\frac{13.3}{1569}$ = 0.0076 (Note 1)

q = 48 Mcfd · 178.1 = 8549 b/d (Note 1)

u = (1.32) (0.011) = 0.0145 cp (Note 2)

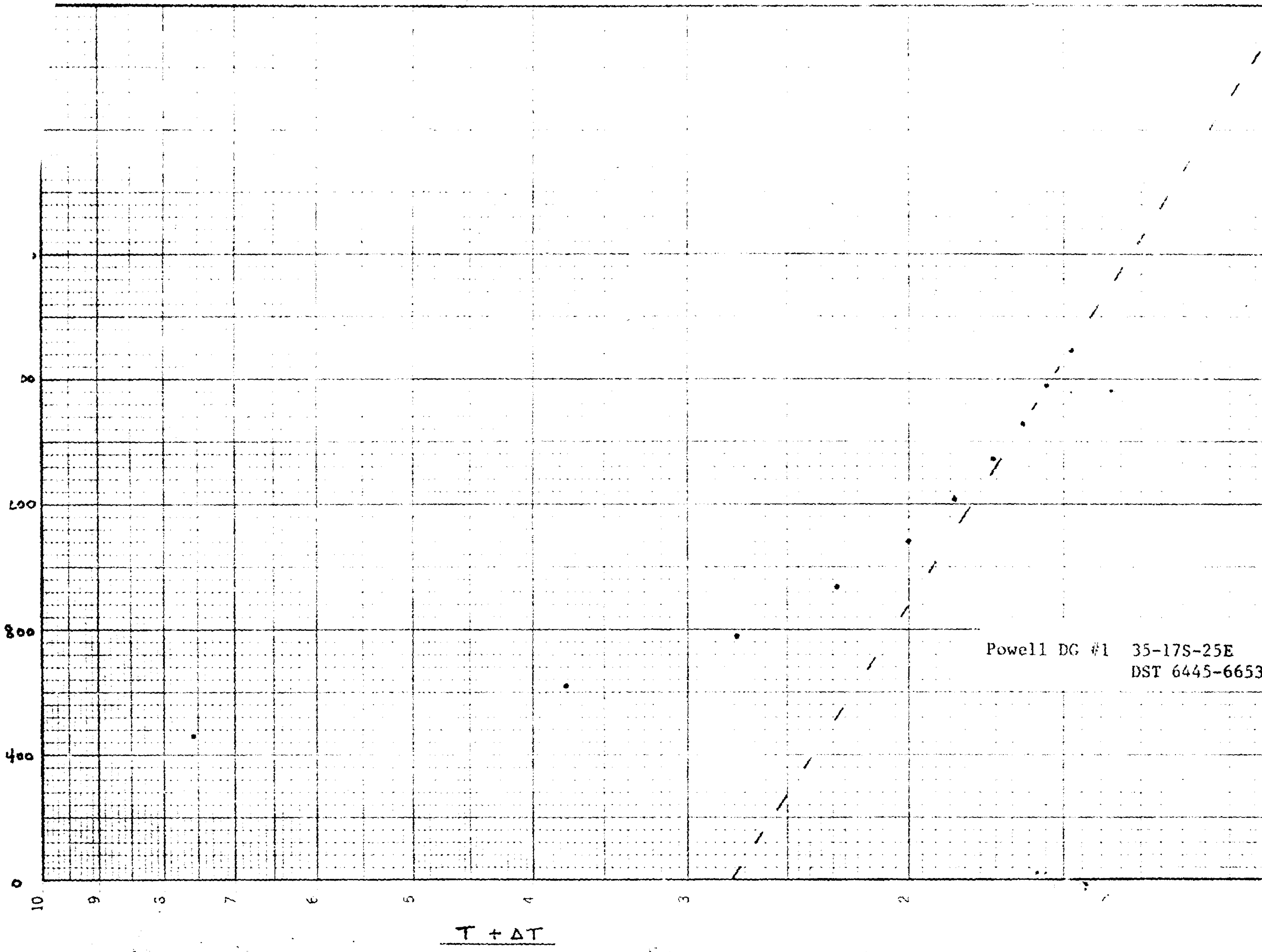
kh = $\frac{162.6 \cdot q \cdot u \cdot B}{M}$ = $\frac{162.6\ (8549)\ (0.0145)\ (0.0076)}{6240}$

kh = 0.0245 md · ft

h = 40 ft (Note 3)

k = 0.001 md (Note 4)

1) C.S. Matthews - D.G. Russell eqn 3.21a
2) C.S. Matthews - D.G. Russell Fig G.3A&B
3) h estimated from log
4) k = 0.009 md for P* = 1696 and M = 596 psi/cycle


Powell DG #1 35-17S-25E
DST 6445-6653
T + ΔT
0
400
800
10
9
7
6
5
4
3
2

TU

GAS QUALITY TEST REPORT

Yates Petr. Co.
W. Aroma
Cisco
Yates-Pecos "DG" Com #1

STA. NO. 1275-2
CONTRACT NO. 329
TEST DATE 06/21/
LAB 1

COMPOUND COMPONENTS	COMPONENT SPECIFIC GRAVITY	MOLE FRACTION
NITROGEN	.9672	.0137
CARBON DIOXIDE	1.5196	.0006
HELIUM	.1382	
OXYGEN	1.1048	.0001
HYDROGEN SULFIDE	1.1766	.
WATER VAPOR	.6220	.
HYDROCARBON DILUENTS		.0144
METHANE	.5539	.8516
ETHANE	1.0382	.0811
PROPANE	1.5225	.0322
ISO-BUTANE	2.0068	.0041
N-BUTANE	2.0068	.0090
ISO-PENTANE	2.4910	.0025
N-PENTANE	2.4910	.0023
HEXANES	2.9753	.0018
HEPTANES +	3.7018	.0010
COMPOSITION		1.0000

COMPONENT	COMPONENT G.P.M.	MOLE FRACTION	G.P.M. CONTENT
PROPANE	27.514	.	
ISO-BUTANE	32.698	.	
N-BUTANE	31.510	.	
LPG			
ISO-PENTANE	36.582	.	
N-PENTANE	36.213	.	
HEXANES	41.111	.	
HEPTANES +	46.126	.	
NATURAL GASOLINE			
TOTAL LIQUEFIABLE GPM			

WATER VAPOR CONTENT:

Gas Mixture Static Pressure PSI
Hydrocarbon Dew Point °F
Water Vapor Dew Point °F
Lbs. Water Vapor per MMCF
Conversion Constant X 0.000021
Water Vapor Mole Fraction
Moisture recorder reading 40 # +
Make or type DuPont

MIXTURE SPECIFIC GRAVITY:

Calculated From Analysis .667
Determined By Test .670
Instrument Ranarex

SULFUR CONTENT:

H2S	Hydrogen Sulfide, Gr./100 cf	.02
	Mercaptans "	.03
	Sulfides "	.11
	Residuals "	.10
	Total Sulfur	.26
	Conversion Factor	X 0.0000157

MIXTURE HEATING VALUE
(Btu/cf at 14.73 ...)
Calculated From Analysis 1141
Determined By Test
Calorimeter

Temperature

REMARKS

MEASUREMENT AREA Ralston

GAS Floyd

Supplement to Exhibit 12
Page 10 - 4

997327

ARTESIA

Witness MR. MAHFOOD

COMPANY DR S

HOLE DATA

Sampler Pressure 306
Recovery 1.71

Formation CISCO
6490' Ft.
Kelly Drive Bushing (15') Ft.
Total Depth 6653' Ft.
7 7/8"
Drill Collar Length - I.D. -
Drill Pipe Length - I.D. -
Packer Depth(s) 6439'-6445' Ft.
Depth Tester Valve 6411' Ft.

Mud Weight 8.5 35

Cushion — Surface Choke 1" Adj. Bottom Choke .75"

Recovered 910 feet of drilling fluid (gas cut)
Recovered Feet of
Recovered Feet of
Recovered Feet of
Recovered Feet of

Remarks SEE PRODUCTION TEST DATA SHEET

Field Area WILDCAT
County EDDY
State NEW MEXICO

Temperature — Gauge No. 512 / 113
Depth 6425 / 6649
12 Hour Clock / 12 Hour Clock
No / Yes

Opened 13:00 P.M.
7-4-74
12:15 P.M.

Actual 115 °F

					Reported	Computed
Initial Hydrostatic	2971	2925	3025			
Flow Initial					0	41
Closed in					5	73
Flow						86
Closed in	1657					175

FORMATION TEST DATA

Casing perfs. Bottom [illegible] [illegible]" [illegible] Ticket No. 897327
Gas gravity Oil [illegible]
Spec. gravity Chlorides [illegible] °F

INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED

Date Time a.m. p.m.	Choke Size	Surface Pressure psi	Gas Rate Mcf	Liquid Rate B/D	Remarks
18:00					Opened tool with a fair blow
18:05					Slight increase
18:10					Good blow
18:15					
18:20					
18:25					
18:30					Closed tool Customer requested tool to be cycled didn't believe opened.
19:30					
19:45					Opened tool with a good blow
19:50		4½			Increased in blow
19:55	1/4"	21			On choke
20:00		36			
20:05		41			Peak flow-no gas
20:08		39			Blow decreasing
20:10		37			Gas to surface
20:15		36			Flaring
20:20		32			
20:25		30			
20:30		29			
20:35		28			
20:40		[illegible]			
20:45		[illegible]			
20:50		[illegible]			
20:55		[illegible]			
21:00		[illegible]			
21:05		[illegible]			
21:10		[illegible]			
21:15		[illegible]			[illegible] tool
00:15					

PRODUCTION TEST DATA

Gauge No. 612		Depth 6425'					Clock No. 6234		12 hour	Ticket No. 897327					
	First Flow Period		**First Closed In Pressure**			**Second Flow Period**		**Second Closed In Pressure**			**Third Flow Period**		**Third Closed In Pressure**		
	Time Defl. .000"	PSIG Temp. Corr.	Time Defl.	Log	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. .000"	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl.	Log $\frac{t+\theta}{\theta}$	PSIG Temp. Corr.
0	.000	[illegible]	[illegible]		308	.000	379	.00?		375
1	.0413	174*	.0497		434	.0767	352**	.0917		487***
2	(.093	339M				.1814	396	.2173		633
3	.0894	202				.2861	390	.3435		734
4	.1375	236				.3908	386	.4697		937
5	.1856	262				.4955	382	.5959		1080
6	.2337	284				.6000	378	.7221		1212
7	.2820	306						.8483		1345
8								.9745		1454
9								1.1007		1581
10								1.2270		1692
11										
12										
13										
14										
15										

Gauge No. 113		Depth 6649'					Clock No. 6234		hour 12	
0	.000	164	.000		414	.000	397	[illegible]		390
1	.0407	275*	.049		528	.0746	394**	.0935		519**
2	(.093	451M				.1763	395	.2098		672
3	.0882	307				.2780	386	.3316		833
4	.1357	347				.3797	387	.4534		980
5	.1832	373				.4814	389	.5752		1120
6	.2307	394				.5830	390	.6970		1251
7	.2780	414						.8188		1380
8								.9406		1501
9								1.0624		1616
10								1.1840		1725
11										
12										
13										
14										
15										
Reading Interval	7					15		18		Minutes

REMARKS: * First interval equal to 6 minutes **-11 minutes ***-13 minutes

M-Maximum pressure.

Powell DC #1

DST 6445-6653

Contributions to log height h:

Interval	Feet
6491-6493	2
6494-6496	2
6500-6502	2
6536-6537	1
6539-6544	5
6574-6580	6
6581-6583	2
6593-6594	1
6610-6622	12
6637-6644	7
	40 Ft.

Powell DG #1

DST 6445-6653

Time to Reach Pseudosteady State

A) Average Porosity = 0.021 (Note 1)

Interval	Porosity
6491-6493	0.028
6494-6496	0.012
6500-6502	0.018
6536-6537	0.014
6539-6544	0.031
6574-6580	0.026
6581-6583	0.016
6593-6594	0.012
6610-6622	0.019
6637-6644	0.018

B) Total Compressibility = $S_g C_g$

$$C_t = 0.7\ (0.00075) = 0.00052\ \text{psi}^{-1}$$ (Note 2)

C) Time $t = \dfrac{1136\phi \mu C_t r_e^2}{k}$

$$t = \frac{1136\ (0.021)\ (0.0145)\ (0.00052)\ (2106)^2}{0.001}$$

$t =$ 798,000 hr

$t =$ 91.0 yr

1) Porosity averaged over 40 ft of pay
2) C.S. Matthews - D.G. Russell Fig. G7.A

FORMATION DENSITY

COUNTY EDDY
FIELD WILDCAT
LOCATION
WELL POWELL "DG" #1 COM.
COMPANY YATES PETR. CORP.

COMPANY YATES PETROLEUM CORPORATION

WELL POWELL "DG" 1 COM.

FIELD WILDCAT

COUNTY EDDY STATE NEW MEX CO

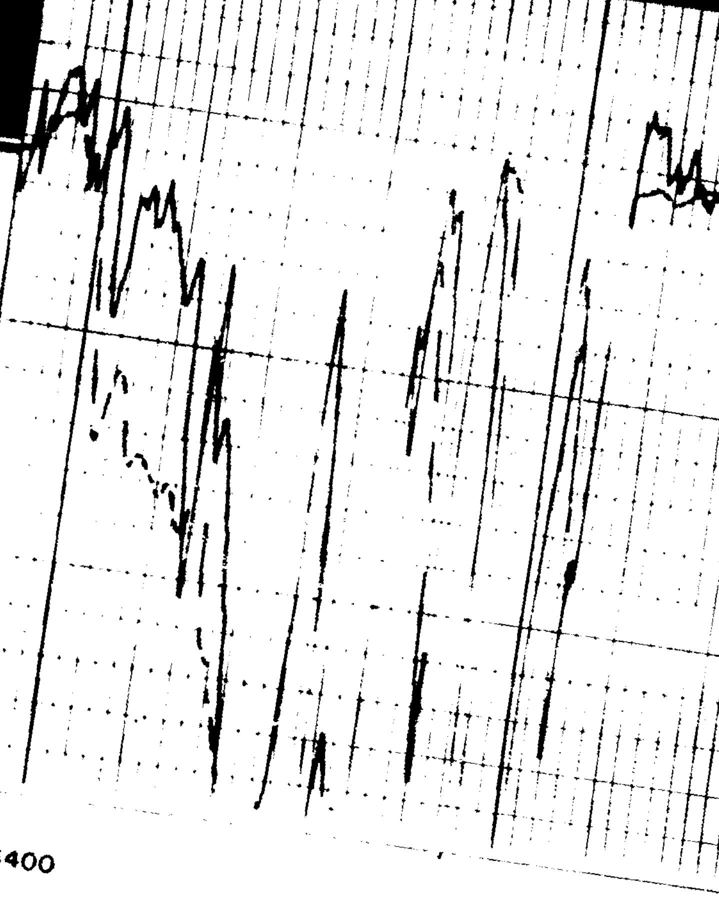
LOCATION 660 FSL FEL

API SERIAL NO. SEC. 35 TWP. 17-S RGE. 25-E

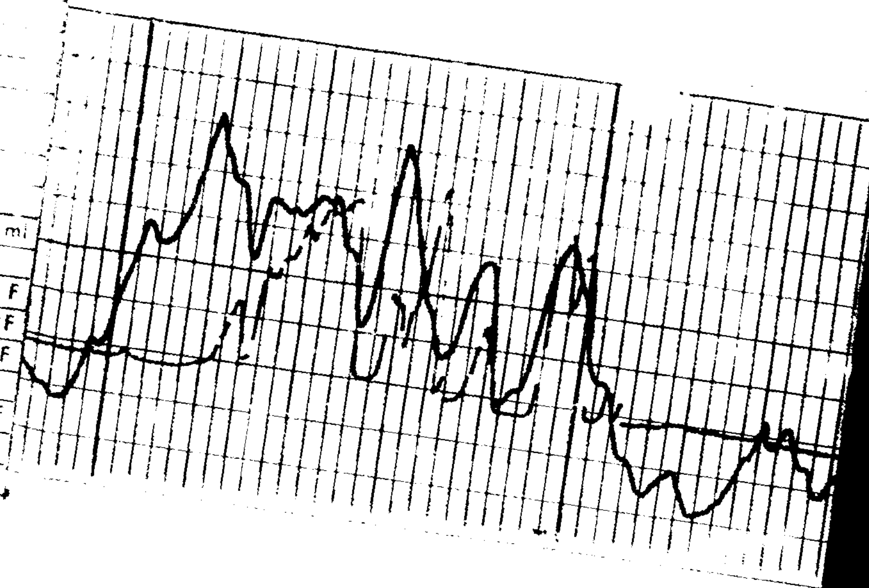
Permanent Datum: G.L.
Log Measured From K.B. 15 Ft. Above Perm. Datum
Drilling Measured From K.B.
Elev.: 3490

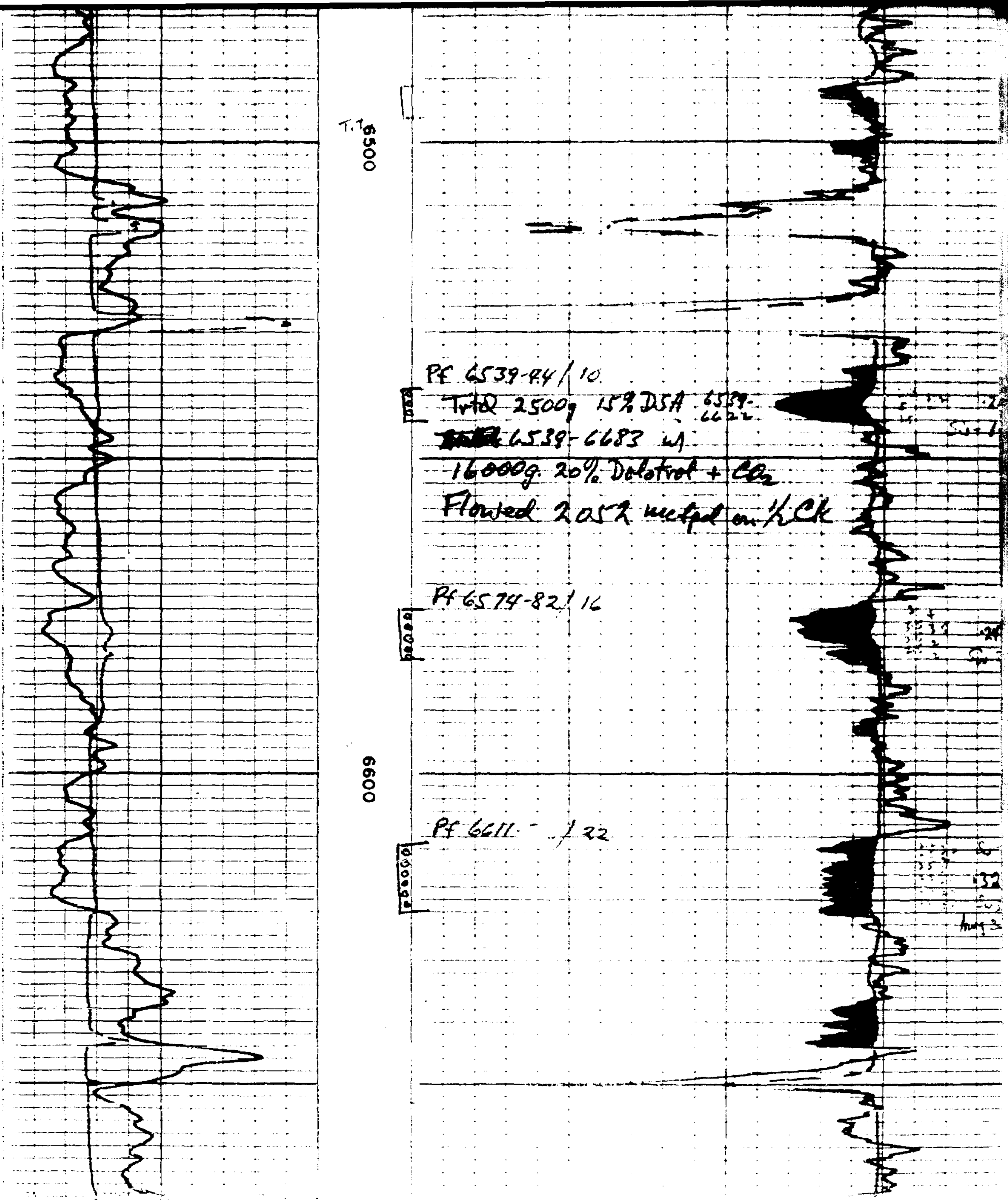
Elev.: K.B. 3505
D.F.
G.L. 3490

Date	7-16-74			
Run No.	ONE			
Depth—Driller	8700			
Depth—Logger	8741			
Btm. Log Interval	8740			
Top Log Interval	0			
Casing—Driller	8 5/8 @ 1238	@	@	@
Casing—Logger	1240			
Bit Size	7 7/8			
Type Fluid in Hole	FLOSAL DRISPAC			
Dens. | Visc.	8.9 | 43			
pH | Fluid Loss	10.5 | 8 ml	ml	ml	ml
Source of Sample	PIT			
Rm @ Meas. Temp.	.23 @ 85 °F	@ °F	@ °F	@ °F
Rmf @ Meas. Temp.	.17 @ 88 °F	@ °F	@ °F	@ °F
Rmc @ Meas. Temp.	.28 @ 88 °F	@ °F	@ °F	@ °F
Source: Rmf | Rmc	M | M			
Rm @ BHT	.14 @ 136 °F	@ °F	@ °F	@ °F
TIME Circulation Stopped	0800			
TIME Logger on Bottom				
Max. Rec. Temp.				



6400




T.T. 6500
Pf 6539-44 / 10
Trtd 2500g 15% DSA 6539-6622
~~[illegible]~~ 6539-6683 w/
16000g 20% Dolotrol + CO_2
Flowed 2052 mcfpd on ½ Ck
Pf 6574-82 / 16
6600
Pf 6611- / 22

Supplement to Exhibit 12
Page 11 - 1

Calculated Permeabilities From Drill Stem Tests (DST) After Corrections in Supplement

Well	Location	Date of DST	DST Interval	Feet of Pay	Calculated Permeability (md)	Years to Reach Pseudo-Steady State
Box Canyon #4A	23-21S-21E	02-04-78	5876-6051	40	0.021	4.5
Cities [illegible] St #1	13-18S-24E	11-14-78	6544-6865	45	0.069	1.8
Cities [illegible] St #1	36-21S-21E	04-07-78	5900-6100	18	0.005	33.3
City of Artesia EQ [illegible]	24-17S-25E	03-31-75	6435-6650	32	0.066	2.5
Federal [illegible]	21-17S-25E	09-28-75	6380-6600	30	0.016	6.1
Griffin [illegible] Com #1	4-18S-25E	03-26-78	6560-6643	20	0.002	68.7
Irish Hills KW St #2	2-19S-24E	07-07-80	6532-6640	58	0.002	45.8
La Cama #1	20-18S-25E	10-09-77	6812-7000	38	0.091	2.2
Murphy NW Fed #1	3-18S-25E	11-29-80	6540-6661	46	0.035	3.6
Powell DG #1	35-17S-25E	07-03-74	6445-6653	40	0.001	91.0
AVERAGE					0.031 md	26.0 years
MEDIAN					0.018 md	5.3 years

ENGINEERING TESTIMONY - CASE NO. 7352

BACKGROUND

The data presented in this testimony will show that the Permo-Penn interval defined by the previous witness meets the guidelines set forth by the Federal Energy Regulatory Commission for designation as a tight gas sand formation under Section 107 (b) of the Natural Gas Policy Act. These guidelines require that three engineering criteria be met:

a) The estimated average insitu gas permeability, throughout the pay section, is expected to be 0.1 millidarcy or less.

b) The stabilized production rate, against atmospheric pressure, of wells completed for production in the formation, without stimulation, is not expected to exceed 188 thousand cubic feet per day (Mcf/D) for production from an average depth of 5827 feet.

c) No well drilled into the proposed tight formation is expected to produce, without stimulation, more than five barrels of crude oil per day.

EXHIBIT NO. 2

Exhibit No. 2 is a map presented by the previous witness on which is outlined the area for which a tight gas sand designation is sought. The red dots show the location of the 50 wells completed in the designated Permo-Penn interval as of January 1, 1981. The triangles indicate wells where drill stem test data was used to calculate the insitu permeability of the pay section. We will discuss these permeability calculations in detail later. The square indicates the location of the one well where core data is available.

EXHIBIT NO. 9

Exhibit No. 9 is a list of all wells within the boundaries of the proposed area that were drilled deep enough to penetrate the designated Permo-Penn interval. Information on the 333 wells includes well name, location, operator, spud date, total depth. field and production up to January 1, 1981. The list is current to the start of 1981. Most of these wells were Morrow prospects drilled to depths near 9000 feet. There are 119 Morrow producers in the proposed area. These Morrow wells have produced a total of 82.21 billion SCF for an average of 691 million SCF per well. The Morrow is the principal gas-producing interval in this area. Many of the deep wells in Exhibit No. 9 will be recompleted in the designated Permo-Penn formation at some point in the future if the Permo-Penn gas can be produced economically. In addition, exploratory drilling for Morrow gas will be stimulated somewhat when the tight gas sand designation makes the Permo-Penn interval a more attractive salvage zone. The drilling of a Morrow well is always a risky project since the Morrow pay zone consists of a series of meandering channels that twist and turn in an impredictible fashion.

EXHIBIT NO. 10

Exhibit No. 10 is a list of the 50 wells completed in the designated Permo-Penn formation as of January 1, 1981. Most of the engineering data on the subject formation will come from the wells in Exhibit No. 10. Although (which is considered top) the average depth to the top of the designated Permo-Penn interval is 5822 feet, production from 49 of the 50 wells comes from below 5822 feet. The average depth to the top of the pay zone in these 50 wells is 6490 feet. These wells have produced a total of 9.01 billion SCF for an average of 180 million SCF per well. Although the designated Permo-Penn interval is less productive than the Morrow, it still represents a significant resource of natural gas to be utilized when economic conditions are favorable.

EXHIBIT NO. 11

Exhibit No. 11 lists the wells that were spudded or completed in the designated Permo-Penn interval after July 16, 1979. These eight wells are the only ones out of the 50 wells in Exhibit No. 10 that would be eligible for tight gas prices should the present application for tight gas designation be approved. Approximately five additional wells have come on line in 1981. These would also be eligible if the tight formation designation is approved. All production from the other 42 active wells will never be eligible for tight gas prices under current regulations. Our application mainly seeks a long-term opportunity to produce gas from the designated Permo-Penn formation by recompleting wells originally drilled to deeper horizons.

DESCRIPTION OF FORMATION BY ENGINEERING PARAMETERS

With the foregoing as background, we now consider in detail the engineering data available for the designated Permo-Penn formation in the proposed area. The data will demonstrate that three criteria are met:

a) The average permeability in the natural state is less than or equal to 0.1 millidarcy.

b) The stabilized flow rate before stimulation is less than 188 Mcf/D.

c) No well produces more than 5 barrels of oil per day.

The estimated average insitu gas permeability throughout the pay section was calculated by two standard methods that are widely accepted in the industry. These methods include:

1) Permeability calculation from pressure buildup data taken during drill stem tests.

2) Laboratory measurements on a cored section of the designated Permo-Penn interval from a single well.

In a pressure buildup test, a well is produced for a period of time and then shut-in. Bottom-hole pressure data is recorded throughout the shut-in period. Here the conventional Horner method of analysis was used to estimate formation permeability. In this method, the bottom-hole pressure after shut-in is plotted against the quantity $\frac{T+\Delta T}{\Delta T}$ on semilog paper and the slope of the straight-line portion of this plot is measured. Here T is the length of time the well was allowed to flow and ΔT is the variable time since the well was shut-in. The average permeability is calculated from the equation $k = \frac{162.6\, q\, B_g\, u}{mh}$ where

k = average permeability (millidarcys)

q = gas flow rate before shut-in (barrels per day)

B_g = gas formation volume factor (reservoir ft^3/standard ft^3)

u = viscosity of gas (centipoises)

m = slope of straight line on Horner plot (psi per cycle)

h = height of pay zone (feet).

Here, the gas flow rate (q) was measured during the flowing phase of the drill stem test. The formation volume factor (B_g) and the gas viscosity (u) were both calculated from the compositon of the gas recovered during the drill stem test.

The slope (m) was measured directly from the Horner plot and the height (h) of the pay zone was estimated from the section of the electric logs that covers the same interval as the drill stem test.

Permeability calculated from drill stem test data will give a good representation of insitu permeability since the drill stem test is performed while the well is still being drilled. The formation has been altered relatively little from its natural condition. If there is some formation damage due to the drilling mud, most of this damage is removed during the preflow phase of the drill stem test. In contrast, pressure data taken after the well is acidized or fractured will give higher values for the permeability because the formation has been etched and broken by the treatments.

<u>EXHIBIT NO. 12</u>

No [illegible] of calculations

Exhibit No. 12 shows data from drill stem tests at ten wells within the proposed area. The locations of these wells are indicated by the triangles on Exhibit No. 2. Of the ten wells, only Murphy NW Federal #1 is not completed in the designated Permo-Penn formation. This well was cored and drill stem tested in the Permo-Penn interval, but is now a completed Morrow producer. The values of permeability calculated from the drill stem tests range from 0.003 millidarcy for Irish Hills KW State #2 to 0.091 millidarcy for La Cama #1. The average permeability for the ten wells was determined to be 0.031 millidarcy.

The last column in Exhibit No. 12 (labelled "Years to Reach Pseudo-Steady State") gives the approximate time required for a pressure disturbance at the wellbore to reach the outer boundary of the reservoir feeding the well. Said another way, gas near the outer boundary of the reservoir begins to move toward the wellbore at the time indicated in Exhibit No. 12. Flush production of gas relatively near the well occurs until the whole reservoir is feeding the well. Then the pressure begins to drop with time uniformly throughout the reservoir and the flow rate becomes stabilized. The calculated time to reach stabilized flow ranges from 1.8 years for Cities JG State #1 to 33 years for Irish Hills KW State #2. The average time was determined to be 10.7 years.

The formula for the length of time required to reach stabilized, or pseudo-steady state, flow is

$$t = \frac{1136\,\phi\,\mu c_t\,r_e^2}{k}$$

Put perf. for each well and figure ϕ from logs to what Exhibit #12 figure

where

t = time to stabilize (hours)

ϕ = porosity of pay zone (fraction)

u = viscosity of gas (centipoises)

c_t = total compressibility of the rock - fluid system (psi^{-1})

r_e = radius to reservoir boundary (feet)

k = permeability (millidarcys)

In the calculation, the porosity (ϕ) was taken from the electric logs and the viscosity (u) was determined from the composition of the produced gas. Since the gas is so much more compressible than the rock or the water, the compressibilities of the rock and the water were ignored and the total compressibility was taken as the compressibility of the gas times the gas saturation ($C_t = S_g C_g$). The compressibility of the gas was determined from its composition while the gas saturation came from the electric logs. The drainage area was assumed to equal the 320-acre proration unit and the radius was set at 2106 feet for a 320-acre circle. The permeability of the formation was calculated from the pressure buildup data as described above. The idea of a time to reach stabilized flow was introduced here because it follows naturally from the calculation of the formation permeability. We will discuss stabilized flow in more detail after all the data on permeability have been presented.

[illegible]

EXHIBIT NO. 13

The second procedure for obtaining insitu permeability is to measure the permeability of actual cored sections of Permo-Penn rock in the laboratory. The only core data available comes from the Murphy NW Federal #1 well marked with a square in Exhibit No. 2. A log of the Permo-Penn interval in the Murphy well appears in Exhibit No. 5 (Well 6), and Exhibit No. 13 shows the permeabilities measured by Core Laboratories for the 72 feet of core recovered. Special tests were run on 16 samples from the Murphy core to evaluate the effects of overburden pressure on the core samples in order to determine a representative value for the insitu reservoir permeability. Routine core analyses are normally run with a confining or overburden pressure of only 200 psi. The overburden pressure within the Permo-Penn formation is really about 3300 psi and special core tests were required in order to correct the results of routine core analyses for the effects of the actual overburden pressure. The results of these special tests, performed

how were these determined

How are these special test done describe procedure here.

at an overburden pressure of 3300 psi, are listed in the last columns of Exhibit No. 13.

EXHIBIT NO. 14

Exhibit No. 14 shows the correlation that was developed between routine permeability at 200 psi overburden pressure and insitu permeability at actual overburden pressure of 3300 psi. Data from the petroleum literature was used to help define the relationship since there are relatively few data points available for the Murphy core. The dashed line in Exhibit No. 14 is a correlation developed by F. O. Jones and W. W. Owens of Amoco Production Company for rocks where overburden pressure has a minimum effect on permeability. This Amoco research work was reported in the Journal of Petroleum Technology in September of 1980 (pages 1631-1640). The solid line in Exhibit No. 14 was drawn parallel to the dashed line in order to better fit the actual data points for the Murphy core. Then this solid line was used to convert the routine permeability values into insitu permeabilities at 3300 psi overburden pressure.

reference to JPT article

EXHIBIT NO. 15

Exhibit No. 15 tabulates the permeabilities of the core material from the Permo-Penn pay section in the Murphy NW Federal #1. Those sections of the interval that the electric log condemned as non-productive are omitted. The average routine permeability for the Murphy well is 0.116 millidarcy. It happens that the insitu permeability corrected for overburden pressure from core data (Exhibit No. 15) and the insitu permeability from buildup data (Exhibit No. 12) are both 0.035 millidarcy for Murphy NW Federal #1. The Murphy well can be considered a typical well since its insitu permeability of 0.035 millidarcy is very close to the average 0.031 millidarcy for the ten wells in Exhibit No. 12.

Two standard types of permeability data have been presented. The average insitu permeability from drill stem test data is 0.031 millidarcy. The average insitu permeability from available core data is 0.035 millidarcy. Both types of engineering data indicate that the permeability of the designated Permo-Penn pay section is confortably below 0.1 millidarcy.

EXHIBIT NO. 16

Data on flow rates before stimulation are not available for the vast majority of the wells that produce from the designated Permo-Penn formation. Natural flow rates are so low that they are routinely neither measured nor recorded. The normal completion procedure has been to perforate and immediately treat the well. We recall that nearly all these wells were completed before there existed a tight gas designation. In the absence of data on natural flow rates, we propose to use production data for the stimulated wells at a time in their life when the production rates are approaching stabilized values. Exhibit No. 12 showed that the time to reach a stabilized rate varied form 1.8 to 33 years and averaged 10.7 years. Thus, actual flow rates measured two years into the lives of the Permo-Penn wells will be either near stabilized rates or considerably higher than stabilized rates. Exhibit No. 16 shows actual production rates for the 24th calender month in the producing lives of the wells that are producing from the designated Permo-Penn formation. Only 34 of the 50 wells have been producing for two years or longer. The average rate of gas production for these 34 wells is 144 thousand cubic feet per day and the average rate of oil production is 0.6 barrels of oil per day. The gas rates vary from 1 to 655 thousand cubic feet per day and only two wells produced over 300 thousand cubic feet per day. The oil rates vary from zero to 4.1 barrels of oil per day after two years. Only one well produced over 2.0 barrels of oil per day and no well produced as much as five barrels of oil per day in the 24th month after it began production.

The FERC guidelines require that the gas flow rate be measured against atmospheric pressure. The average flow rate of 144 Mcf/D calculated above for stimulated wells was measured against pipeline pressures of 150 to 300 psi. The corresponding flow rate at one atmosphere is given by the equation

$$q\ (1\text{ atm}) = q\ (\text{actual}) \times \frac{P_f^2 - P_s^2\ (1\text{ atm})}{P_f^2 - P_s^2\ (\text{actual})}$$

where

P_f = reservoir pressure (2294 psia on average)

P_s (1 atm) = bottom-hole flowing pressure corresponding to one atmosphere at surface (15 psia)

P_s (actual) = actual bottom-hole flowing pressure (292 psia on average).

Then

$$q(1\ \text{atm}) = 144\ \text{Mcf/D} \times \frac{2294^2 - 15^2}{2294^2 - 292^2} = 146\ \text{Mcf/D}$$

is an estimate of the average stabilized production rate against atmospheric pressure based on data from stimulated wells.

The rates in Exhibit No. 16 are maximum values since all data applies to stimulated wells and since many of the wells have not actually stabilized. Thus, the average gas production rate is about 146 thousand cubic feet per day or less and the maximum oil production rate is about 4.1 barrels of oil per day or less under stabilized non-stimulated conditions.

FORMATION WATER SANDS

The classificaiton of the designated Permo-Penn formation as a tight gas sand in the proposed area will not cause problems with respect to formation water sands. All of the area proposed for tight gas sand designation lies within the Roswell Artesian Water Basin as established by the New Mexico State Engineer. The Roswell Artesian Water Basin is a main source of fresh water for Chaves County and northern Eddy County. Regulations governing the drilling of oil and gas wells within the Basin are enforced by the New Mexico Oil Conservation Division in order to protect the fresh water formations. These regulations require that a water protection casing string be set and cemented through the fresh-water-bearing strata. The base of the Artesian aquifer lies at a depth of about 1000 feet at the north end of the proposed area and at a depth of about 1400 feet at the south end. In a typical casing program, conductor pipe is set at a depth of 300 to 400 feet and cement is circulated to surface in order to protect the shallow fresh water. Then, an intermediate string of casing is set about a hundred feet below the base of the Artesian aquifer at a depth of 1100 to 1500 feet. Cement is circulated to surface behind the intermediate string to protect the Artesian aquifer. The production casing is set at the total depth of the well (usually in the Morrow formation) and cemented with 400 to 1000 sacks of cement. This provides a cement shield approximately 1000 feet above the top of the Permo-Penn formation. The application to drill and the casing program for each individual well must be approved by the New

Mexico Oil Conservation Division and the United State Geological Survey for wells on federal lands.

EXHIBIT NO. 17

Exhibit No. 17 summarizes the engineering data that has been presented on the designated Permo-Penn formation. The average insitu reservoir permeability, determined by two standard methods, averages less than the allowed 0.1 millidarcy. The average stabilized flow rate for gas is below the maximum allowed daily rate of 188 thousand cubic feet per day. Lastly, no well produces as much as five barrels of oil per day under stabilized conditions.

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WELLS PENETRATING CISCO PORTION OF PERMO-PENN
Eddy County, New Mexico
1-1-81

TOWNSHIP 17S RANGE 24E

Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Divide Fed. JW #1	1980S	1980W	4	Yates	07-31-76	7160	Undesignated Wolfcamp	28,851
Hagstrom #1	1983S	1992W	8	Beard	01-23-78	7200	High Hope Atoka, East	43,981
Federal U #1	1980S	1980W	9	Socony & Mobil	02-14-65	8200	D & A	---
Hanlad #1	1980N	660W	17	Beard	07-08-78	7220	High Hope Atoka, East High Hope Abo, East	30,724 17,184
McCaw #1	1980N	1980E	18	Beard	06-13-78	7140	High Hope Atoka, East	115,246
Niles KA #1	660S	1980W	24	Yates	10-20-78	8186	Undesignated Wolfcamp	59,426
Federal GR #1	2050N	660E	25	Yates	10-31-76	8200	Eagle Creek Strawn Eagle Creek Permo-Penn	54,736 2,342
Cass North #1	660S	1980E	29	Pubco	02-11-72	8900	P & A	---
Mesa Federal #1	1980S	1980W	30	Estroil	08-28-74	7700	D & A	---
Catclaw ST #1	1980N	1980E	31	Mesa	11-16-78	7675	Gopher Abo	22,850
Marathon ST #1	660N	660E	33	Carper	02-15-64	7020	P & A	---
State DF #1	660N	660W	35	Yates	10-15-63	8269	Undesignated Abo	55,860
Pubco No. ST #1	1980S	1650E	36	Yates	05-16-80	8370	Eagle Creek Permo-Penn	530

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WELLS PENETRATING CISCO PORTION OF PERMO-PENN
Eddy County, New Mexico
1-1-81

TOWNSHIP 17S RANGE 25E

Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Eagle Federal #1	1980N	1980E	8	Pubco	03-08-72	7840	P & A	---
Sasha CA Fed #1	330S	1750E	9	Yates	07-31-73	7950	P & A	---
Artesia Airport CF #2	1650S	860E	10	Yates	10-12-74	8080	D & A	---
Artesia Airport CF #1	330S	990W	11	Yates	11-02-71	8099	Eagle Creek Atoka	471,878
Jackson AT #9	660S	660W	13	Yates	[illegible]-30-79	8400	Eagle Creek Atoka-Morrow, East	108,453
Achen-Frey DM #3	660S	1980W	13	Yates	05-10-74	8430	Eagle Creek San Andres	6,697 BO
Federal BZ #12	1980S	1980W	21	Yates	09-12-75	8180	Eagle Creek Strawn	24,905
							Eagle Creek Permo-Penn	1,267
Jackson Estate BY #9	1980S	990W	22	Yates	02-09-80	8295	Eagle Creek Atoka-Morrow, East	36,742
Mitchell IN #2	2030S	660E	23	Yates	08-09-77	9500	Eagle Creek Atoka-Morrow, East	70,510
Jackson GM #1	660S	1650W	24	Yates	08-27-76	8383	Eagle Creek Atoka-Morrow, East	829,029
City of Artesia EQ #1	1650S	1980E	24	Yates	08-16-75	8406	Eagle Creek Atoka-Morrow, East	28,011
							Eagle Creek Permo-Penn	55,974
Jackson EM #1	660S	1980E	25	Yates	06-15-75	8530	Eagle Creek Atoka-Morrow, East	5,225,365
Flint #1	1980S	660W	25	Western	02-04-74	8507	Eagle Creek Permo-Penn	347,524
Flint #2	660S	2310W	25	Western	06-13-75	10243	Eagle Creek Atoka-Morrow, East	170,976*
							Eagle Creek Permo-Penn	199,378
Gossett EU #1	1650S	1980W	26	Yates	09-18-75	8420	Eagle Creek Strawn	251,851
							Eagle Creek Permo-Penn	209,181
Ingram Jackson BY #7	1980N	1980E	26	Yates	01-19-79	8430	Eagle Creek Atoka-Morrow, East	48,935
Morley EW #1	660S	660E	27	Yates	01-15-76	8443	Eagle Creek Permo Penn	175,000
Federal BZ #16	1980N	660E	28	Yates	09-29-76	8302	Eagle Creek San Andres	7,704 BO

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WELLS PENETRATING CISCO PORTION OF PERMO-PENN
Eddy County, New Mexico
1-1-81

TOWNSHIP 17S RANGE 25E

Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Gable FV #1	1980N	660E	29	Yates	03-24-76	8190	Eagle Creek Permo-Penn	67,314
Federal CR #1	660S	660W	29	Yates	07-31-73	8340	Richard Knob Atoka-Morrow	85,563
							Eagle Creek Strawn	4,018
							Eagle Creek Permo-Penn	144,538
Federal EF #2	1980S	660W	31	Yates	03-07-80	8440	Richard Knob Atoka-Morrow	2,744
							Eagle Creek Permo-Penn	3,230
State CY #1	1980S	1980W	32	Yates	11-26-73	8330	Richard Knob Atoka-Morrow	56,663
							Eagle Creek Strawn	29.310
							Eagle Creek Permo-Penn	131,358
Federal GC #1	660S	660E	32	Yates	06-07-76	8400	Richard Knob Atoka-Morrow	53,785
							Eagle Creek Strawn	33,955
							Eagle Creek Permo-Penn	95,579
Federal CR #4	1980S	1980W	33	Yates	12-26-78	8476	Richard Knob Atoka-Morrow	86,793
Sowers FE #1	1980N	660W	34	Yates	11-14-75	8515	Eagle Creek Permo-Penn	175,891
Manseau EK #1	660N	1980E	35	Yates	05-21-75	8455	Eagle Creek Strawn	179,660
							Eagle Creek Permo-Penn	110,664
Powell DG #1	660S	1980E	35	Yates	06-14-74	8700	Atoka Morrow, West	45,490
							Eagle Creek Permo-Penn	175,839
Arco EC ST #1	660N	2310E	36	Yates	03-20-75	8678	Eagle Creek Atoka-Morrow, Eas	4,668,718
							Eagle Creek Strawn	46,723
							Eagle Creek Permo-Penn	73,798
Arco EC ST #2	198LS	1100E	36	Yates	10-16-75	8590	Eagle Creek Strawn	321,680

* NO 1980 PRODUCTION

WELLS PENETRATING CISCO PORTION OF PERMO-PENN
Eddy County, New Mexico
1-1-81

TOWNSHIP 17 S, RANGE 26 E

Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Haldeman DA #1	660 S	2040 W	3	Yates	12-29-73	8420	P & A	---
Bowman NA #1	1980 S	1980 W	4	Yates	03-29-80	8200	Wildcat Canyon	146 BO
State CK #1	660 N	2180 W	4	Yates	06-03-66	8150	POW Morrow	856,242
SNY #1	1650 N	2310 W	5	Hondo	07-03-75	8053	D & A	---
Coll LD #1	660 S	660 E	9	Yates	06-14-80	8480	P & A	---
Bolton CU #1	660 N	2180 E	9	Yates	08-02-73	9040	D & A	---
Haines #1	760 S	1980 E	11	Coquina	01-29-74	8800	Undesignated Morrow	29,594*
Holt DL #1	1980 N	1980 W	12	Yates	05-19-74	8960	D & A	---
Holden DE #1	1980 S	1980 E	12	Yates	11-13-71	9000	Riverside Atoka	248,915
Haldeman OU #1	1980 S	1980 W	14	Yates	12-13-80	8734	P & A	---
Blaine #1	660 N	1980 E	14	Coquina	04-09-74	8803	D & A	---
Hunter FL #1	1980 N	1940 W	15	Yates	02-26-76	8597	Kennedy Farms Morrow	110,485
Caffal FD #1	660 S	1980 E	15	Yates	12-15-75	8670	Kennedy Farms Atoka Kennedy Farms Upper Penn	22,353* 87,068
Armstrong KS ST #1	1980 S	560 E	16	Yates	03-06-79	8580	Kennedy Farms Morrow	802,688
John ST #1	2180 S	2180 E	16	Coquina	05-15-74	8669	D & A	---
Hombaker HW #1	510 S	1680 E	20	Arco	06-20-66	8755	D & A	---
Siegenthaler IS #1	1980 S	660 E	21	Yates	11-07-77	8670	Kennedy Farms Morrow Kennedy Farms Atoka	879,061 37,384
Siegenthaler IS #2	1460 S	1980 W	21	Yates	02-14-78	8627	Kennedy Farms Upper Penn	20,255
Tom Brown GO #1	835 N	1980 W	22	Yates	12-10-76	8725	Kennedy Farms Morrow	1,168,104

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Eddy County, New Mexico
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TOWNSHIP 17S RANGE 26E

Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Tidwell ED #1	990 S	660 E	22	Yates	01-19-75	8830	Kennedy Farms Morrow Kennedy Farms Atoka	1,153,888 39,592*
KD #1	660 S	1980 E	23	Antweil	12-20-78	8880	D & A	---
Berry EE #1	990 S	990 W	23	Yates	02-21-75	8807	Kennedy Farms Morrow	1,109,752
Sweet Yates FM #1	1980 N	1980 E	25	Yates	02-17-76	8997	Kennedy Farms Atoka	616,312
Hnulik EJ #1	1315 N	660 W	26	Yates	06-11-75	8850	Kennedy Farms Morrow Kennedy Farms Atoka	1,522,461 17,139*
Glenn Farmer #1	1980 S	1980 W	26	Sun Texas	06-24-77	8881	Kennedy Farms Morrow	43,616
JH Ansley #1	660 N	660 E	27	Sun Texas	11-24-74	8806	Kennedy Farms Morrow	1,228,506
Big Buck Pounds #1	1980 S	660 E	27	Hanson	05-22-74	8821	Kennedy Farms Morrow	399,106
Johnson JT	2016 N	660 E	28	Yates	07-25-78	8732	Kennedy Farms Upper Penn	91,170
Martin #1	1980 S	660 W	29	Maddox	02-10-77	8600	P & A	---
Nellor EO #1	1980 N	660 W	30	Yates	01-15-76	8477	D & A	---
Caskey EV #1	660 S	1400 W	30	Yates	11-19-75	8570	Eagle Creek Atoka-Morrow, East Eagle Creek Strawn	52,438 165,851
Goat Roper LP #1	1130 S	1300 E	30	Yates	02-08-80	8610	Eagle Creek Atoka-Morrow, East	120,204
Haldeman EN #1	1980 N	660 W	31	Yates	07-12-75	8595	Eagle Creek Atoka-Morrow, East	1,865,969
Patterson EL #1	880 S	660 W	31	Yates	08-15-75	8640	Eagle Creek Strawn	637,043
Patterson EL #2	660 S	2310 W	31	Yates	12-28-78	8942	Eagle Creek Atoka-Morrow, East	802,012
Kennedy JQ #1	2510 N	660 E	33	Yates	05-22-78	8732	Kennedy Farms Morrow Kennedy Farms Upper Penn	8,897 156,399
Kennedy Farms #1	1980 N	2310 W	34	Hanson	07-11-73	8860	Kennedy Farms Morrow	193,262

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WELLS PENETRATING CISCO PORTION OF PERMO-PENN
Eddy County, New Mexico
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TOWNSHIP 17S RANGE 26E

Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Clyde Guy #1	1980 S	660 E	34	Hanson	06-29-74	8975	D & A	---
Marjorie Naylor	990 S	1650 E	35	Fasken	03-14-75	9056	D & A	---
Blevins IK #1	960 N	690 W	35	Yates	09-13-77	8925	Kennedy Farms Morrow	253,003
Bradshaw IY #1	660 S	660 W	35	Yates	01-25-78	8992	D & A	---
Big Boggy ST #1X	990 S	2080 E	36	HEYCO	01-27-77	9185	D & A	---

* NO 1980 PRODUCTION

WELLS PENETRATING CISCO PORTION OF PERMO-PENN
Eddy County, New Mexico
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TOWNSHIP 18S RANGE 24E

Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Federal CH #2	1980N	1980W	1	Yates	10-26-73	8376	TA	---
Spearman KQ #1	1980S	1980W	13	Yates	03-05-80	8800	Richard Knob Atoka-Morrow	62,707
Cities JG ST #1	660S	660E	13	Yates	10-28-78	8900	Undesignated Mississippian	43,844
							Penasco Draw Permo-Penn	11,755
Anderson ST CS #1-Y	1980N	1800E	14	Yates	03-15-68	7160	Penasco Draw Permo-Penn	206,550
Federal J #1	660S	660W	21	Midwest	09-11-70	8750	P & A	---
State HZ #1	1980N	1980E	22	Yates	05-03-77	8536	Undesignated Cisco	NCL
Weed ST #1	1980N	1880W	24	Mesa	08-06-78	8524	D & A	---
Lincoln ST #1	2030N	660E	24	Mesa	03-17-78	8636	Penasco Draw Morrow	395,543
State JM #1	660N	660E	25	Yates	10-29-78	9016	Penasco Draw Morrow	2,141
							Penasco Draw Permo-Penn	119,995
Cass ST #1	1980S	1980W	25	Pubco	05-26-72	8770	D & A	---
Four Mile ST #1	660S	1980E	26	Mesa	12-09-79	8744	Undesignated Group 3	1,235 BO
Federal AA #1	660S	660E	27	Yates	08-28-61	8673	Undesignated Group 1	530 BO
Maralo ST #1	660N	1980W	28	Estroil	09-15-75	8540	P & A	---
State 32 #1	1980S	660E	32	Maddox	04-01-78	8565	Antelope Sink Morrow	61,178*
State GP #1	1980N	1980E	33	Amoco	02-11-79	8880	D & A	---
Eddy 35 #1	1980N	1980E	35	Gulf	11-07-79	8974	Undesignated Group 1	2,593 BO
Rio ST #1	1980S	1980W	36	Mesa	03-13-79	8935	Penasco Draw Morrow	399,590
Rio ST #2	1980S	1980E	36	Mesa	06-09-79	8955	Penasco Draw Morrow	1,538,808

* NO 1980 PRODUCTION

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Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Superior Fed. #1	1980N	1980E	1	Coquina	06-26-73	8700	Atoka Morrow, West	1,151,339
Superior Fed. #2	1980S	1980W	1	Coquina	12-06-73	8677	Atoka Morrow, West	114,054*
Johnson #1	2080S	660E	2	Superior	09-06-73	8650	Atoka Morrow, West	792,432
Murphy NW #1	1980S	1980W	3	Yates	11-10-80	8630	Richard Knob Atoka-Morrow	NOL
Morris MC #1	1980N	1980E	3	Yates	10-26-79	8630	Eagle Creek Permo-Penn	78,103
Griffin JJ #1	1650N	1980W	4	Yates	02-28-78	8500	Eagle Creek Permo-Penn	239,587
Pipkin HE #1	660S	660W	4	Yates	02-17-77	8560	Eagle Creek Permo-Penn	73,408
Grynberg A Fed. #1	660N	1980E	5	Gulf	10-21-77	8400	Richard Knob Atoka-Morrow Eagle Creek Permo-Penn	108,919 14,490
Federal AB #2	660S	1980E	5	Yates	10-14-77	8555	Richard Knob Atoka-Morrow Eagle Creek Permo-Penn	475,907 115,552
Federal EF #1	660S	1980E	6	Yates	04-23-75	8413	Richard Knob Atoka-Morrow Eagle Creek Permo-Penn	63,673 89,086
Federal CX #1	1980N	660E	7	Yates	09-22-73	8625	Eagle Creek Permo-Penn	194,259
Federal CX #2	1980S	660W	7	Yates	07-12-77	8417	Eagle Creek Permo-Penn	7,943
Federal CX #3	1980S	2310W	7	Yates	02-16-79	8750	Eagle Creek Permo-Penn	34,881
Federal CZ #1	660N	1980E	8	Yates	12-29-73	8671	Richard Knob Atoka-Morrow Eagle Creek Permo-Penn	308,377 272,752
Yates Fed B #7	660S	1980E	9	Amoco	05-04-78	8700	D & A	---
Johnson #1	1980N	660E	10	Amoco	01-28-78	8700	Atoka Morrow, West	91,358
Clancy #1	660S	1980E	11	Coquina	03-23-73	8700	Atoka Cisco, West	32,664*
Hoffman #1	660N	1980E	11	Coquina	08-18-73	8635	P & A	---
Hare #1	660S	660E	12	Coquina	04-12-74	8871	Atoka Morrow, West	104,322
Pennzoil 13 Fed. #1	660S	1980E	13	Fasken	07-08-71	8920	Atoka Morrow, West	137,538

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Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Vandiver #1	1980N	1980W	13	Pennzoil	09-08-69	8859	Atoka Morrow, West	44,143*
Vandiver #2	1980N	660E	13	Brunson	05-26-73	8912	Atoka Morrow, West	469,510*
Five Mile Unit #1	1980N	660E	14	Coquina	12-05-72	8790	Atoka Cisco, West	64,125*
Upham KN #1	1980S	1980W	14	Yates	02-03-79	8880	Atoka Morrow, West	144,057
Four Dinkus GV #1	660S	1980E	16	Yates	02-11-77	8810	D & A	---
Four Dinkus IE ST #1	1980S	1980E	17	Yates	06-07-77	8700	D & A	---
Eddy GX ST #1	860S	2310E	18	Gulf	04-08-78	8680	Penasco Draw Permo-Penn	172,924
Gulf KC ST #1	660N	1980W	18	Yates	11-26-78	8800	Richard Knob Atoka-Morrow	813,113
Eddy GK ST #1	1980S	660E	19	Gulf	09-16-77	8825	Penasco Draw Morrow	707,827
Eddy GK ST #2	2310N	1980W	19	Gulf	11-25-77	8708	Penasco Draw Morrow	765,552
Penasco #1	660S	1980E	20	Antweil	03-30-77	8830	Penasco Draw Morrow	4,526,487
La Cama #1	1980N	1980W	20	Yates	09-11-77	8700	Penasco Draw Permo-Penn	463,762
Federal AB #5	1980S	660W	21	Yates	03-11-78	8894	Penasco Draw Atoka Undesignated Upper Penn Penasco Draw Permo-Penn	3,253 1,623* 13,871
No. Penasco MG #1	660S	660E	23	Yates	01-19-80	9040	P & A	---
Brown-Yates #1	1650S	990E	24	Fasken	12-20-70	9000	Atoka Morrow, West	10,308,027
Linck #1	1980S	1980W	24	Read & Bates	11-03-71	9050	D & A	---
Kincaid BI #2	600N	620E	25	Yates	10-16-72	9029	D & A	---
Yates AS #2	2310S	990W	25	Yates	03-03-67	5917	Penasco Draw SA Yeso	41,130 BO
Hornbaker BA #2	1980N	660E	25	Yates	03-15-72	9150	Penasco Draw SA Yeso	11,263 BO
Federal AY #2	1490N	1650W	25	Yates	03-24-71	9060	Penasco Draw SA Yeso	29,017 BO
Scout EH #2	1980S	660E	27	Yates	07-11-75	9090	Penasco Draw Atoka	34,871*
Scout EH #4	1980S	660W	27	Yates	08-19-79	9063	Penasco Draw Morrow	41,404

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Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Dinkus #1	1980S	1980W	28	Antweil	08-13-76	9034	Undesignated Morrow Undesignated Atoka	7,457* 119,595
Rio #1	1980N	1980E	29	Antweil	06-02-77	8868	Penasco Draw Morrow	469,821
Federal AB #4	660N	1980E	30	Yates	02-11-78	8800	Penasco Draw Morrow	1,610,439
Penasco ST #1	1980S	1980E	30	Mesa	06-06-78	8850	Penasco Draw Permo-Penn	69,351
Penasco IW #1	1980S	1980E	31	Yates	07-04-77	8973	Penasco Draw SA Yeso	5,515 BO
Lone Tree #1	660N	1980W	32	Bennett	08-10-77	8915	Penasco Draw Morrow	131,554
State BI #1	1980N	1980W	33	Scoggins	08-06-67	10130	P & A	---
Scout EH Fed. #3	660N	1980E	34	Yates	12-08-73	9150	Penasco Draw SA Yeso	1,890 BO
Rio Penasco JX #1	660S	1980W	35	Yates	08-16-78	9265	Boyd Morrow	1,124,423
Gushwa DR #1	1980N	660W	35	Yates	11-05-73	9220	Penasco Draw SA Yeso	14,531 BO
Gushwa DR #3	1980N	1980W	35	Yates	09-23-80	9160	Boyd Morrow	NOL
Eddy ST AC #1	1980S	660W	36	Gulf	12-31-58	9283	P & A	---
Kincaid Q #1	990S	1980E	36	Monsanto	04-30-65	9303	D & A	---

* NO 1980 PRODUCTION

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TOWNSHIP 19S RANGE 23E

Well	Location N-S	Location E-W	Location Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Red Tank #1	1980N	1980E	2	Green	08-25-72	8200	P & A	---
South Hope ST #1	990S	1980E	5	Pubco	04-18-72	7792	P & A	---
Frank State #1	2130S	660E	7	Mesa	01-18-79	7700	Runyan Ranch Morrow Runyan Ranch Abo	23,234 SI
Gardner State #1	1980S	1980W	8	Mesa	10-09-78	7785	Runyan Ranch Morrow	714,223
Tres Amigos	1980S	660W	9	McClellan	02-02-80	7921	Runyan Ranch Abo	6,651
Good Hope Unit #1	460S	810E	9	Sweeny	02-16-64	8122	P & A	---
Tres Ranchos Unit #1	660S	660E	10	Magnolia	08-21-56	10034	TA	---
Runyan Fed. #2	1980N	660E	18	Mesa	06-22-79	7796	Runyan Ranch Morrow	40,944
Siegrest ST #1	1980N	990E	25	Mesa	01-13-80	8660	Wildcat Wolfcamp	NOL
Siegrest Draw Unit #1	1980N	1980W	28	Tom Brown	06-18-63	8695	P & A	---
Siegrest Draw Unit #2	1650S	1650E	34	Tom Brown	03-12-64	8700	P & A	---
W. Antelope Sink Unit #1	1980S	660E	35	Tom Brown	02-12-64	8790	P & A	---

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Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Federal CW #1	720S	1830W	1	Yates	09-28-73	9321	Undesignated GP 2 Fenasco Draw SA Yeso	362* BO 18,439 BO
SRC KZ ST #2	660N	1980E	1	Yates	09-14-79	9140	Fenasco Draw SA Yeso	6,083 BO
SRC KZ ST #6	660N	1980W	1	Yates	03-05-80	9200	Fenasco Draw Permo-Penn	92,154
Irish Hills KW #2	1980N	1980E	2	Yates	06-04-80	9190	Fenasco Draw Permo-Penn	NOL
State IL #1	1980N	1980E	3	Amoco	06-04-80	8967	Boyd Morrow	NOL
Sullivan Fed #1	660S	660W	5	Superior	11-29-70	8615	Wildcat Morrow	NOL
State DQ #1	2310N	860W	9	Yates	08-18-74	8830	D & A	---
Davis NC #1	1980S	660E	11	Yates	11-14-80	9300	Boyd Morrow	NOL
Allison CQ Fed #2	1980S	660W	12	Yates	06-09-79	9260	Boyd Morrow	787,741
Irish Hills JE ST #1	1980N	1980E	12	Yates	12-03-78	9093	Boyd Morrow	988,744
Allison CQ Fed #5	660N	1980W	13	Yates	01-25-80	9320	Boyd Morrow	8,981
Molly #1	990S	990E	13	Hanks	08-22-76	8020	Dagger Draw U-P, North	2,594 BO
Allison CQ Fed #3	660S	2310W	15	Yates	12-08-77	8931	Wildcat Wolfcamp	NOL
Antelope Sink Unit #1	1890N	2070E	18	Sun	07-08-63	8685	Antelope Sink Upper Penn	1,760,758
Yates Fed A #1	660N	660E	21	Amoco	03-08-78	8905	D & A	---
Allison Fed CQ #1	660S	660E	22	Yates	01-05-70	9200	Hoag Tank Morrow Undesignated Abo	27,842 11,544*
Roden GD Fed #1	1980S	660E	23	Yates	01-22-71	9152	Hoag Tank Morrow Hoag Tank Strawn	198,805 170,012
Cone Fed #1	660N	660E	24	Arco	07-13-62	7950	Dagger Draw Upper Penn, North	4,168*

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Well	Location N-S	Location E-W	Location Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Oakason NV #1	660S	2310E	27	Yates	08-23-80	9260	Hoag Tank Morrow	NCL
CC Tank Unit #1	1980N	1980W	28	Yates	04-26-76	8947	Hoag Strawn, West	5,691
Amoco Fed QT #1	1980N	1980W	29	Yates	12-31-80	8850	Siegrest Draw Atoka	NCL
Siegrest JS ST #1	660N	1980W	30	Yates	05-31-78	9360	Siegrest Draw Morrow	451,837
Dee ST #1	1980S	1980E	36	Conoco	09-18-76	9360	Cemetery Morrow	2,784,963
State CO #1	1980S	1980W	36	Yates	06-27-73	9400	P & A	---
State CO #2	1850N	1980E	36	Yates	01-01-78	9427	Cemetary Atoka, North	113,098

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TOWNSHIP 19S RANGE 25E

Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
BH Matlock #1	660S	1980W	1	Pan Am	01-30-59	9400	D & A	---
Alley #1	2080N	860W	1	Amoco	04-25-80	9362	Boyd Morrow	76,682
Rio Penasco KD #1	660S	1980W	2	Yates	04-06-80	9260	Boyd Morrow	857,227
Rio Penasco KD #2	1680N	1980W	2	Yates	07-10-80	9300	Boyd Morrow	351,867
Federal AK #1	1980S	660E	3	Yates	04-20-60	6100	Penasco Wolfcamp	32,977 BO
Arco 3 Federal #1	1980N	1699W	3	Fasken	05-06-71	9222	D & A	---
Arco 4 Matlock #1	1980S	1980E	4	Fasken	05-10-72	9235	Undesignated Canyon	1,600 BO
Mobil CI Federal #11	1980S	1980E	6	Yates	06-17-80	9360	Penasco Draw Morrow	27,726
Trudy #1	1980S	1980E	7	Conoco	07-03-75	9095	Boyd Morrow	37,046
Johnson BE #1	330N	330E	8	Yates	05-05-67	9222	Boyd Morrow Penasco Draw SA Yeso	343,642 4,374*BO
John 9 Federal #1	1980S	1980W	9	Fasken	06-10-72	9320	Boyd Morrow	2,109,711
Arco 9 Morrison #1	660N	1980E	9	Fasken	12-10-71	9250	Boyd Morrow Boyd Cisco	1,671,083 150,902
Arco 10 Federal #1	1980S	1980E	10	Fasken	09-23-70	9292	Boyd Morrow	522,548*
Arco 10 Federal #2	1980N	1980E	10	Fasken	07-12-72	9293	Boyd Morrow	2,622,187
Rio Penasco MF Federal #1	1980N	1980W	11	Yates	12-05-79	9363	Boyd Morrow	335,297
Federal 11 #1	1980S	1980W	11	Cotton	08-18-79	9300	Boyd Morrow	13,835
Cotton MX Federal #1	810N	2180W	14	Yates	05-16-80	9480	Boyd Morrow	4,065

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Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Boyd BN #1	1980N	660E	15	Yates	07-16-68	9420	Boyd Morrow	412,642
Osage-Boyd #1	1980N	660W	15	Hondo	09-29-74	9428	D & A	---
Kincaid ST #1	2080N	1780W	16	Hanks	06-07-77	9354	Dagger Draw U-P, North	12,594*BO
Boyd X #1	990N	990E	16	Coquina	03-11-74	9370	Boyd Morrow	552,871
Barbara Federal #3	1980N	1980W	17	Conoco	10-09-73	7905	Dagger Draw U-P, North	199,910 BO
Julie #1	1980N	990E	17	Conoco	07-20-76	8052	Dagger Draw U-P, North	65,425 BO
Barbara Federal #7	1980S	1980E	17	Conoco	11-18-76	8054	Dagger Draw U-P, North	31,182 BO
Barbara Federal #4	1980S	660W	17	Conoco	12-12-75	8070	Dagger Draw U-P, North	201,837 BO
Barbara Federal #5	1980N	1980W	18	Hanks	04-12-76	9183	Dagger Draw U-P, North	14,831*BO
Barbara Federal #1	1980N	660E	18	Conoco	05-22-71	9040	Dagger Draw U-P, North	262,063 BO
Barbara Federal #6	1980S	1980E	18	Conoco	06-20-76	8170	Dagger Draw U-P, North	204,524 BO
Barbara Federal #2	1980S	1980W	18	Conoco	08-17-72	7954	Dagger Draw U-P, North	93,533 BO
Ross EG Federal #1	1980S	1980W	20	Yates	04-30-75	9450	Undesignated Mississippian Undesignated Morrow	36,989 52,624*
Osage #1	1980N	1980E	21	Coquina	07-12-73	9410	D & A	---
B & B #1	1980N	1980E	22	Antweil	04-01-78	9484	D & A	---
Parino Com. #1	1980S	660E	23	Amoco	11-07-79	9660	D & A	---
Aikman #1	660S	1980W	27	Coquina	01-10-74	9544	D & A	---
Ross IZ #1	1980N	1980W	28	Yates	03-11-78	9460	Cemetery Morrow Cemetery Atoka, North	232* 56,685

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Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
State K 6096 A #1	660S	1980W	28	Getty	02-21-75	9410	Cemetery Morrow	1,349,125
Dagger Draw #2	1969S	629E	30	Hanks	10-09-58	368	Dagger Draw U-P, North	52,882*BO
Dagger Draw #1	660N	660W	30	Conoco	05-07-70	7860	Dagger Draw U-P, North	53,748 BO
Foster Federal #1	600S	1980W	31	Monsanto	07-01-76	9420	Cemetery Morrow	1,955,038
Kathy Eyre Federal #1	660N	1980W	31	Conoco	09-15-64	9300	Dagger Draw U-P, North	23,107*BO
Albert ST #1	1980N	1980W	32	Monsanto	08-23-77	9628	D & A	---
Albert Federal #1	660S	1980E	32	Monsanto	11-05-76	9566	Cemetery Morrow	345,959
State K 6096 B #1	1650N	1980E	32	Getty	10-23-75	9450	D & A	---
State B #1	660N	1980E	33	Newbourne	01-15-74	9451	Cemetery Atoka, North	364,511
Pan Canadian	1980N	1980W	34	Coquina	10-25-73	9640	Cemetery Morrow Cemetery Atoka, North	2,463,278 28,567*
Irami Federal Com. #1	660S	1980W	34	Huber	03-14-74	9600	D & A	---
Lakewood Unit #1	1980S	660E	34	Stanolind	09-25-52	10486	D & A	---
Gulf Federal #1	1980N	1980W	35	Hilliard	01-30-74	9835	Cemetery Morrow	187,673

* NO 1980 PRODUCTION

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TOWNSHIP 20S RANGE 21E

Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Government AJ #1	2310N	1980W	8	Cities	08-04-79	7968	Undesignated Morrow	NOL
Deer Canyon Unit #1	2180N	660W	14	Hilliard	10-21-73	8767	D & A	---
Wildernhel #1	1720S	920W	24	Wilson	08-23-79	8700	D & A	---
Big Sky #1	1980S	1980E	29	Wilson	03-13-73	7915	D & A	---
Crooked Canyon Fed B #1	1980N	990E	35	Exxon	12-27-80	8200	D & A	---

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TOWNSHIP 20S RANGE 23E

Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Kewanee ST #1	660 N	660 W	2	Sun	10-25-63	8780	Cass Ranch Morrow	234,087*
Langley Fed #1	990 N	1980 W	4	Beard Oil	07-25-78	8430	D & A	---
Kevin Wildernhel Fed #1	506 N	1980 W	6	Wilson	07-05-79	8660	D & A	---
CC Tank Unit 1 #3	1650 S	1980 E	12	Y-tes	07-30-76	9080	D & A	---
Buzzard Fed #1	2310 S	1980 W	17	Mesa	05-14-80	8690	D & A	---
Long Draw Unit #1	1880 S	860 E	25	Pan Am.	04-28-64	9396	D & A	---
NW Indian Basin #1-Y	2030 S	1980 W	28	C. Dean	08-21-73	8930	Indian Basin Morrow, NW	149,042

* NO 1980 PRODUCTION

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Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Lloyd Foster AN #1	660N	660W	1	Yates	02-04-65	8240	Dagger Draw Wolfcamp	217,698
Foster FF #1	1930S	1980E	1	Yates	12-19-75	9485	Cemetery Morrow	28,216
Cass Ranch Unit #1	1930N	1980W	3	LaRue	06-11-53	9950	Dagger Draw Atoka	243,783
Gulf Federal #1	1930N	1980W	6	Allied	11-21-70	9175	D & A	---
CC Tank Unit #4	1830S	1980E	8	Yates	02-21-69	9275	Dagger Draw Morrow, West	26,663*
Nix IT Com #1	650S	990E	13	Yates	01-30-78	9500	D & A	---
State D #1	660S	1980W	16	Mark	06-26-75	9100	D & A	---
Foster #1	2130S	1980E	21	Newbourne	03-07-75	9200	Foster Ranch Morrow	122,829
Monsanto Federal #1	660N	660W	21	Carper	05-16-60	9290	D & A	---
Foster Ranch #1	1650S	2220W	22	Hillard	03-14-68	9960	D & A	---
Penny Federal #1	660S	1980W	23	Conoco	04-17-71	7936	Dagger Draw U-P, South	5,643 BO
Len Mayer #1	660N	1980W	24	Monsanto	06-24-77	9550	Cemetery Morrow	232,946
Federal Hobbs	660S	660E	24	Western	11-29-49	11580	P & A	---
Charolette McKay Fed #1	1980N	660E	25	Sun Oil	12-13-79	9690	Undesignated Atoka	13,575
R. S. Federal #1	660N	1980W	25	Coquina	06-14-75	9810	D & A	---
Robin Federal #1	1980N	1980W	26	Conoco	03-11-71	7820	Dagger Draw U-P, South	12,590 BO
Vickie Federal #1	1980N	1980E	26	Conoco	07-01-71	7820	Dagger Draw U-P, South	10,790 BO
Huber 29 Federal #1	2080S	1980E	29	Tesoro	09-10-73	9462	D & A	---
Long Box Unit #1	1980N	660E	30	Inexco	07-30-78	9375	Wildcat Atoka	NOL
State AX #1	660S	660E	32	Bell	01-25-64	9253	D & A	---

WELLS PENETRATING CISCO PORTION OF PERMO-PENN
Eddy County, New Mexico
1-1-81

TOWNSHIP 20S RANGE 24E

Well	Location N-S	Location E-W	Location Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
State C #1	1980S	1980W	32	Mark Prod.	01-17-75	9225	D & A	---
Smith Federal #1	1650S	1650E	34	Standard of TX	09-15-68	7845	D & A	---
Preston Federal #1	1900S	850W	35	Conoco	11-23-70	7800	Dagger Draw U-P, South	914 BO
Indian Hills ST #1	1650N	1980E	36	Texas O & G	03-19-78	9640	Cemetery Morrow	1,059,063
Indian Hills ST #2	660S	660E	36	Texas O & G	10-07-78	9947	Cemetery Morrow	34,207

* NO 1980 PRODUCTION

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Eddy County, New Mexico
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TOWNSHIP 20½S RANGE 21E

Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth		Field	Production (Mcf) To 1-1-81
El Paso #1	940S	1980E	35	Yates	01-31-74	8920	P & A		---

TOWNSHIP 20½S RANGE 23E

Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth		Field	Production (Mcf) To 1-1-81
Federal 34 #1	990S	990E	34	tandard TX	10-09-65	7736	D & A		---

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Eddy County, New Mexico
1-1-81

TOWNSHIP 21S RANGE 21E

Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Armstrong Fed. #1	1780N	1730E	9	Wilson	04-23-73	8300	P & A	---
El Paso GS #1	1930S	2080E	11	Yates	11-27-76	8448	Box Canyon Permo-Penn	91,916*
Little Box Canyon Unit #4	1980N	1950E	12	Cities	11-02-77	8320	D & A	---
Little Box Canyon Unit #2	660S	1980E	12	Cities	08-12-77	8370	Little Box Canyon Morrow	181,400
Box Canyon Unit #2	2080N	1980W	13	Yates	01-13-77	8595	Little Box Canyon Morrow	1,410,376
Box Canyon GJ #1	2130S	1650E	13	Yates	07-30-76	8585	Little Box Canyon Morrow Box Canyon Permo-Penn	163,105* 2,231
Box Canyon #3	1980S	1980E	14	Yates	06-02-77	8450	Box Canyon Permo-Penn	440,316
Huber IA #2	660S	1220E	15	Yates	07-18-77	8050	Box Canyon Strawn Box Canyon Permo-Penn	65,159 18,535
Huber IA #1	2310N	1980E	15	Yates	11-21-77	8125	D & A	---
Texas Hill KM #1	1836N	915E	21	Yates	08-30-77	7385	D & A	---
Box Canyon #4 A	660N	1980E	23	Yates	12-23-77	8400	Box Canyon Permo-Penn	1,229,185
Harvey JI Federal #1	1780S	1980E	23	Yates	05-04-78	8365	Undesignated Cisco	NOL
Federal 28 #1	1980N	1980E	28	Pennzoil	08-14-69	9370	P & A	---
Cities JH ST #1	2205N	660W	36	Yates	03-18-78	8895	Box Canyon Permo-Penn	110,142

* NO 1980 PRODUCTION

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Eddy County, New Mexico
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TOWNSHIP 21S RANGE 22E

Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
NW Indian Basin #1	2310S	2450W	2	Moralo	09-16-79	9302	Undesignated Morrow	4,931
Federal HQ #1	990S	1980W	5	Yates	04-14-77	8679	Little Box Canyon Atoka Undesignated Canyon	12,348 12,766
Little Box Canyon #3B	660N	1980E	7	Cities	09-20-77	8390	Undesignated Cisco	174,668
Little Box Canyon #1	1650S	1980E	7	Cities	07-04-75	8350	Little Box Canyon Morrow Box Canyon Permo-Penn	409,254* 44,068
Stinking Draw #1	1363S	695E	10	Yates	03-30-78	9464	D & A	---
Searle ML Fed #1	1980S	2030W	11	Yates	06-30-80	9330	D & A	---
NW Indian Basin #1	1885S	2060W	12	Yates	12-23-76	9353	D & A	---
Stinking Draw Fed #1	1980N	660W	13	Durham	01-27-80	9710	D & A	---
Hilliard LE Fed #1	330N	2310W	14	Yates	05-26-79	9350	Indian Basin Morrow, West	869,829
Hilliard BF Fed #1X	1650N	630E	14	Yates	05-27-67	9350	Indian Basin Morrow, West	2,310,608
Burro Hills Unit #1	660S	1980E	16	Magnolia	08-04-48	11312	D & A	---
Loafer Draw B #1	1980N	860W	17	Cities	12-15-75	8591	D & A	---
Loafer Draw A #1	1980S	1980E	17	Cities	11-19-73	8873	TA	---
WIB Unit #1	2080N	860W	23	Gt. Western	05-02-73	9463	D & A	---
Majors Fed #2-Y	2080S	810E	23	Inexco	06-20-78	9950	Indian Basin Morrow, West	197,728
Arroyo Fed #2	660N	2280W	24	Pet. Dev.	05-11-79	9300	Indian Basin Morrow, West	62,394

WELLS PENETRATING CISCO PORTION OF PERMO-PENN
Eddy County, New Mexico
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TOWNSHIP 21S RANGE 22E

Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Loafer Draw A #1	1650S	1650E	24	Kerr-McGee	05-09-66	7805	D & A	---
Majors Fed #1	1980S	1980W	25	Inexco	11-23-74	9100	D & A	---
Arroyo Fed #1	1980S	1980W	26	Inexco	05-17-77	9630	Loafer Draw Morrow Loafer Draw Strawn	304,768* 22,692
Mahun Fed #1	2250S	786E	27	Pet. Dev.	11-19-77	9550	Undesignated Wolfcamp	2,407*
Cleveland Reese A #1	1880N	1980E	33	Gt. Western	01-20-74	9392	D & A	---
Cleveland Reese #1-Y	570S	1982W	33	Gt. Western	09-19-72	9742	Rocky Arroyo Morrow	230,573*
Cleveland Reese B #1	1980S	660W	34	Gt. Western	03-12-74	9505	D & A	---
Little Indian Basin ES #1	660S	1980E	36	Yates	10-13-75	9521	D & A	---

*NO 1980 PRODUCTION

WELLS PENETRATING CISCO PORTION OF PERMO-Penn
Eddy County, New Mexico
1-1-81

TOWNSHIP 22S RANGE 21E

Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Brainerd Fed. IO #1	660N	1980E	1	Yates	11-09-77	9089	Box Canyon Permo-Penn	61,797
Continental Fed. #1	660S	660E	1	Brainerd	06-20-53	10596	D & A	---
HW Bass Fed. #1	470S	850E	5	Continental	07-10-51	5889	D & A	---
Box Canyon Unit #1	560N	660W	12	Marathon	08-29-63	9435	D & A	---

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Eddy County, New Mexico
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TOWNSHIP 22S RANGE 22E

Well	Location N-S	Location E-W	Sec.	Operator	Spud Date	Total Depth	Field	Production (Mcf) To 1-1-81
Cawley Draw #1	1980S	1980E	3	Inman	04-24-67	9515	P & A	---
Rocky Arroyo D #2	1980S	660W	4	El Paso	02-25-74	9325	Rocky Arroyo Canyon	122,842
Cawley Draw #1	837N	2157E	4	Gt. Western	03-18-73	9456	Rocky Arroyo Morrow	281,988
Rocky Arroyo D #1	660S	2180E	5	El Paso	11-02-73	9157	Rocky Arroyo Morrow	240,502
Rocky Arroyo E #1	1980N	2130E	7	El Paso	02-27-73	9258	Rocky Arroyo Wolfcamp	264,618
Rocky Arroyo #1	1980S	1980E	8	El Paso	08-27-71	9380	Rocky Arroyo Morrow Rocky Arroyo Wolfcamp	170,697* 386,016
Rocky Arroyo C #1	1980N	1980W	8	El Paso	10-06-73	9225	Rocky Arroyo Morrow Rocky Arroyo Canyon	27,566* 149,306
Rocky Arroyo A #1	1980N	660W	9	El Paso	12-28-71	9160	D & A	---
Flanigan Fed. #1	2080S	1980W	9	Summit	04-07-76	6200	D & A	---
LA Federal #1	1980S	660E	11	Inexco	10-04-78	9760	D & A	---
LA Federal #2	660N	1980W	12	Inexco	03-26-79	9650	D & A	---

* NO 1980 PRODUCTION

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WELLS COMPLETED IN DESIGNATED PERMO-PENN INTERVAL

EDDY COUNTY, NEW MEXICO

JANUARY 1, 1981

Well	Location	Operator	Field	Spud Date	Completion Interval	Total Depth	Date of 1st Prod.	1980 Gas Rate Mcf/D	1980 Oil Rate BOPD	Cum Gas to 1-1-81 (Mcf)	Cum Oil to 1-1-81 (BBLS)
Anderson ST CS #1Y	14-18S-24E	Yates	Penasco Draw P-P	03-15-68	6351-6388	7160	03-09-77	274	0.7	206550	675
Antelope Sink Unit #1	18-19S-24E	Sun	Antelope Sink U-P	07-08-63	6148-6366	8685	12-27-68	31	0.1	1760758	4273
Arco EC State #1	36-17S-25E	Yates	Eagle Creek P-P	03-20-75	6534-6692	8678	04-02-75	193	0.9	73798	348
Arco 9 Morrison #1	9-19S-25E	Fasken	Boyd Cisco	12-10-71	7138-7200	9250	05-15-72	6	0.0	150902	674
Box Canyon #3	14-21S-21E	Yates	Box Canyon P-P	06-02-77	6008-6034	8450	03-08-78	276	0.2	440316	1071
Box Canyon #4A	23-21S-21E	Yates	Box Canyon P-P	12-23-77	5886-6020	8400	03-16-78	761	0.9	1229185	2559
Box Canyon GJ #1	13-21-21E	Yates	Box Canyon P-P	07-30-76	5754-6480	8585	08-15-73	14	0.1	2931	477
Brainerd IO	1-22S-21E	Yates	Box Canyon P-P	11-09-77	6212-6230	9089	03-07-78	49	0.0	61797	75
Cities JG State #1	13-18S-24E	Yates	Penasco Draw P-P	10-28-78	6564-6619	8900	08-08-79	44	0.1	11755	39
Cities JH ST #1	36-21S-21E	Yates	Box Canyon P-P	03-18-78	5851-6173	8895	06-06-79	155	0.1	110142	140
City of Artesia EQ #1	24-17S-25E	Yates	Eagle Creek P-P	08-16-75	6530-6600	8406	01-21-77	40	0.1	55974	117
Eddy GX ST #1	18-18S-25E	Gulf	Penasco Draw P-P	04-08-78	6772-6818	8680	10-12-78	223	1.5	172924	1456
El Paso GS #1	11-21S-21E	Yates	Box Canyon P-P	11-27-76	6080-6090	8448	05-23-77	last prod 10/79		91916	495
Federal AB #2	5-18S-25E	Yates	Eagle Creek P-P	10-14-77	6447-6632	8555	04-05-78	147	0.4	115552	527

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WELLS COMPLETED IN DESIGNATED PERMO-PENN INTERVAL

Well	Location	Operator	Field	Spud Date	Completion Interval	Total Depth	Date of 1st Prod.	1980 Gas Rate Mcf/D	1980 Oil Rate BOPD	Cum Gas to 1-1-81 (Mcf)	Cum Oil to 1-1-81 (BBLS)
Federal AB #5	21-18S-25E	Yates	Penasco Draw P-P	03-11-78	6528-6568	8894	06-05-79	21	0.0	13871	3
Federal BZ #12	21-17S-25E	Yates	Eagle Creek P-P	09-12-75	6823-6836	8180	03-05-77	2	0.0	1267	1
Federal CX #1	7-18S-25E	Yates	Eagle Creek P-P	09-22-73	6545-6768	8625	03-01-77	156	2.1	194259	3865
Federal CX #2	7-18S-25E	Yates	Eagle Creek P-P	07-12-77	6492-6664	8417	08-30-79	13	0.5	7943	345
Federal CX #3	7-18S-25E	Yates	Eagle Creek P-P	02-16-79	6562-6578	8750	10-10-80	465	1.6	34881	121
Federal CZ #1	8-18S-25E	Yates	Eagle Creek P-P	12-29-73	6554-6576	8671	03-01-77	195	0.6	272752	1032
Federal EF #1	6-18S-25E	Yates	Eagle Creek P-P	04-23-75	6412-6568	8413	03-04-77	44	0.1	89086	194
Federal EF #2	31-17S-25E	Yates	Eagle Creek P-P	03-07-80	6306-6495	8440	10-15-80	43	0.2	3230	11
Federal GC #1	32-17S-25E	Yates	Eagle Creek P-P	06-07-76	6276-6280	8400	05-28-77	107	1.2	95579	420
Federal GR #1	25-17S-24E	Yates	Eagle Creek P-P	10-31-76	6214-6226	8200	01-24-79	20	0.1	2342	25
Flint #1	25-17S-25E	Western	Eagle Creek P-P	02-04-74	6480-6534	8507	05-17-74	30	0.0	347524	681
Flint #2	25-17S-25E	Western	Eagle Creek P-P	06-13-75	6512-6567	10243	08-26-77	128	0.6	199378	990
Gable FV #1	29-17S-25E	Yates	Eagle Creek P-P	03-24-76	6485-6663	8190	03-05-77	43	0.3	67314	377
Gossett EU #1	26-17S-25E	Yates	Eagle Creek P-P	09-18-75	6624-6644	8420	01-24-77	111	0.2	209181	783
Griffin JJ #1	4-18S-25E	Yates	Eagle Creek P-P	02-28-78	6526-6624	8500	01-24-79	298	1.2	239587	996
Grynberg A Fed #1	5-18S-25E	Gulf	Eagle Creek P-P	10-21-77	6485-6600	8400	11-12-80	483	1.1	14490	33
Huber IA #2	15-21S-21E	Yates	Box Canyon P-P	07-18-77	5977-5982	8050	08-10-78	20	0.3	18535	232
Irish Hills KW #2	2-19S-24E	Yates	Penasco Draw P-P	06-04-80	6548-6635	9190	03-26-81	---	---	-----	---

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WELLS COMPLETED IN DESIGNATED PERMO-PENN INTERVAL

Well	Location	Operator	Field	Spud Date	Completion Interval	Total Depth	Date of 1st Prod.	1980 Gas Rate Mcf/D	1980 Oil Rate BOPD	Cum Gas to 1-1-81 (Mcf)	Cum Oil to 1-1-81 (BBLS)
Johnson JT #1	28-17S-26E	Yates	Kennedy Farms U-P	07-25-78	7105-7124	8732	10-26-79	176	6.2	91170	2420
Kennedy JQ #1	33-17S-26E	Yates	Kennedy Farms U-P	05-22-78	7220-7246	8732	09-07-79	68	0.5	156339	610
La Cama #1	20-18S-25E	Yates	Penasco Draw P-P	09-11-77	6919-6954	8700	02-04-78	344	1.3	463762	2378
Little Box Canyon #1	7-21S-22E	Cities	Box Canyon P-P	07-04-75	5864-6089	8350	06-22-79	83	0.1	44068	60
Little Box Canyon #3B	7-21S-22E	Cities	Eddy Und. Cisco	09-20-77	5875-6061	8390	03-13-78	136	0.4	174668	554
Manseau EK #1	35-17S-25E	Yates	Eagle Creek P-P	05-21-75	6618-6636	8455	01-28-77	1	0.0	110664	445
Morley EW #1	27-17S-25E	Yates	Eagle Creek P-P	01-15-76	6561-6645	8443	02-15-77	96	0.2	175000	265
Morris MC #1	3-18S-25E	Yates	Eagle Creek P-P	10-26-79	6544-6600	8630	03-28-80	237	0.8	78103	259
Penasco ST #1	30-18S-25E	Mesa	Penasco Draw P-P	06-06-78	6498-6664	8850	04-30-80	116	0.8	69351	299
Pipkin HE #1	4-18S-25E	Yates	Eagle Creek P-P	02-17-77	6618-6674	8560	07-14-78	76	0.5	73408	469
Powell DG #1	35-17S-25E	Yates	Eagle Creek P-P	06-14-74	6539-6683	8700	02-15-77	116	0.1	175839	464
Pubco NO ST #1	36-17S-24E	Yates	Eagle Creek P-P	05-16-80	7355-7367	8370	10-15-80	33	0.0	530	---
Rocky Arroyo #1	8-22S-22E	El Paso	Rocky Arroyo WC	08-27-71	6563-6600	9380	11-05-73	159	0.3	386016	236
Rocky Arroyo E #1	7-22S-22E	El Paso	Rocky Arroyo WC	02-27-73	6227-6320	9258	08-14-74	83	0.2	264618	313

WELLS COMPLETED IN DESIGNATED PERMO-PENN INTERVAL

Well	Location	Operator	Field	Spud Date	Completion Interval	Total Depth	Date of 1st Prod.	1980 Gas Rate Mcf/D	1980 Oil Rate BOPD	Cum Gas to 1-1-81 (Mcf)	Cum Oil to 1-1-81 (BBLS)
Siegenthaler IS #2	21-17S-26E	Yates	Kennedy Farms U-P	02-14-78	7690-7696	8627	05-17-78	24	0.1	20255	77
Sowers FB *	34-17S-25E	Yates	Eagle Creek P-P	11-14-75	6773-6777	8515	02-03-77	108	0.5	175891	819
State CY #1	32-17S-25E	Yates	Eagle Creek P-P	11-26-73	6380-6437	8330	03-05-77	130	1.2	131358	1817
State JM #1	25-18S-24E	Yates	Penasco Draw P-P	10-29-78	6520-6592	9016	04-15-80	471	1.1	119995	293

*P-P Permo Penn

*U-P Upper Penn

*WC Wolfcamp

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WELLS PRODUCING FROM DESIGNATED PERMO-PENN INTERVAL THAT WERE SPUDDED OR RECOMPLETED AFTER July 16, 1979

Well	Location	Spud Date	Date Completed In Permo-Penn
Federal EF #2	31-17S-25E	03-07-80	05-07-80
Grynberg A Fed. #1	5-18S-25E	10-21-77	10-30-80
Irish Hills KW #2	2-19S-24E	06-04-80	07-04-80
Johnson JT #1	28-17S-26E	07-25-78	10-07-79
Kennedy JQ #1	33-17S-26E	05-22-78	09-10-79
Morris MC #1	3-18S-25E	10-26-79	02-07-80
Pubco NO ST #1	36-17S-24E	05-16-80	07-29-80
State JM #1	25-18S-24E	10-29-78	04-15-80

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CALCULATED PERMEABILITIES FROM DRILL STEM TESTS (DST)

Well	Location	Date of DST	DST Interval	Feet of Pay	Calculated Permeability (md)	Years To Reach Pseudo-Steady State	
Box Canyon #4A	23-21S-21E	02-04-78	5876-6051	40	0.021	4.5	25 MCFD
Cities JG ST. #1	13-18S-24E	11-14-78	6544-6865	45	0.069	1.8	159
Cities JH ST. #1	36-21S-21E	04-07-78	5900-6100	18	0.005	21.2	56
City of Artesia EQ #1	24-17S-25E	08-31-75	6435-6650	45	0.066	1.9	63
Federal BZ #12	21-17S-25E	09-28-75	6380-6600	30	0.005	12.5	27
Griffin JJ Com #1	4-18S-25E	03-26-78	6560-6643	24	0.009	13.3	170
Irish Hills KW ST. #2	2-19S-24E	07-07-80	6532-6640	58	0.003	32.9	70
La Cama	20-18S-25E	10-09-77	6812-7000	38	0.091	2.2	136
Murphy NW Fed. #1	3-18S-25E	11-29-80	6540-6661	50	0.035	2.8	221
Powell DG #1	35-17S-25E	07-03-74	6445-6653	40	0.009	14.1	48
AVERAGE					0.031 md	10.7 years	105 MCF

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Summary of Core Analysis Report
Murphy NW Federal #1

		Routine Analysis (200 psi overburden)			3300 psi Overburden
		Full Diameter Core			Core Plug
Sample Number	Depth (Test)	Perm (md) Maximum	Perm (md) 90 Deg	Perm (md) Horizontal	Perm (md) Horizontal
1	6551-52	0.02	<0.01	0.015	<0.001
2	6552-53	0.03	0.03	-----	-----
3	6553-54	0.07	0.04	-----	-----
4	6554-55	<0.01	<0.01	0.017	<0.001
5	6555-56	0.03	<0.01	-----	-----
6	6556-57	0.06	0.06	-----	-----
7	6557-58	0.06	0.03	-----	-----
8	6558-59	0.03	<0.01	-----	-----
9	6559-60	0.03	0.03	-----	-----
10	6560-61	<0.01	<0.01	-----	-----
11	6561-62	778.	6.2	0.017	<0.001
12	6562-63	1.0	0.23	0.586	0.007
13	6563-64	0.07	0.04	0.016	<0.001
14	6564-65	0.04	0.02	-----	-----
15	6565-66	0.12	0.07	0.013	<0.001
16	6566-67	0.05	0.03	-----	-----
17	6567-68	0.05	0.03	0.137	0.029
18	6568-69	0.04	0.04	-----	-----
19	6569-70	0.02	<0.01	-----	-----
20	6570-71	<0.01	<0.01	-----	-----
21	6571-72	0.03	<0.01	-----	-----
22	6572-73	0.13	<0.01	0.014	0.001
23	6573-74	0.02	0.02	0.016	<0.001
24	6574-75	<0.01	<0.01	-----	-----
25	6575-76	0.03	<0.01	-----	-----
26	6576-77	<0.01	<0.01	-----	-----
27	6577-78	0.03	0.03	-----	-----
28	6578-79	0.03	<0.01	-----	-----
29	6579-80	0.02	0.02	0.019	<0.001
30	6580-81	<0.01	<0.01	0.032	<0.001
31	6581-82	0.02	<0.01	-----	-----
32	6582-83	0.02	<0.01	-----	-----
33	6583-84	0.02	0.02	-----	-----
34	6584-85	0.07	0.04	-----	-----
35	6585-86	0.40	<0.01	0.034	0.003
36	6586-87	<0.01	----	-----	-----
37	6587-88	<0.01	----	0.039	0.005
38	6588-89	2.1	<0.01	0.037	<0.001
39	6589-90	0.05	0.03	-----	-----
40	6590-91	0.02	0.02	-----	-----
41	6591-92	0.05	0.05	-----	-----
42	6592-93	0.06	0.03	-----	-----
43	6593-94	0.03	<0.01	-----	-----
44	6594-95	0.07	0.04	-----	-----
45	6595-96	0.04	<0.01	-----	-----
	6596-98	LOST CORE			

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Summary of Core Analysis Report
Murphy NW Federal #1

		Routine Analysis (200 psi Overburden)			3300 psi Overburden
		Full Diameter Core			Core Plug
Sample Number	Depth (Test)	Perm (md) Maximum	Perm (md) 90 Deg	Perm (md) Horizontal	Perm (md) Horizontal
46	6598-99	0.08	0.03	-----	-----
47	6599-00	0.05	0.03	-----	-----
48	6600-01	0.05	0.03	-----	-----
49	6601-02	0.08	0.03	0.067	0.021
50	6602-03	0.04	0.04	0.082	0.013
51	6603-04	0.05	0.03	-----	-----
52	6604-05	0.12	0.03	-----	-----
53	6605-06	0.23	0.04	-----	-----
54	6606-07	0.02	0.02	-----	-----
55	6607-08	0.02	<0.01	-----	-----
56	6608-09	<0.01	<0.01	-----	-----
57	6609-10	0.03	<0.01	-----	-----
58	6610-11	0.02	0.02	-----	-----
59	6611-12	0.03	0.03	-----	-----
60	6612-13	0.50	0.20	-----	-----
61	6613-14	0.02	0.02	-----	-----
62	6614-15	0.08	0.04	-----	-----
63	6615-16	0.64	0.06	-----	-----
64	6616-17	0.09	0.05	-----	-----
65	6617-18	0.20	0.03	-----	-----
66	6618-19	<0.01	----	-----	-----
67	6619-20	<0.01	----	-----	-----
68	6620-21	<0.01	----	-----	-----
69	6621-22	0.40	0.09	----	-----
70	6622-23	0.03	0.03	-----	-----
71	6623-24	0.04	<0.01	-----	-----
72	6624-25	0.05	0.05	-----	
	6625-61	LOST CORE			

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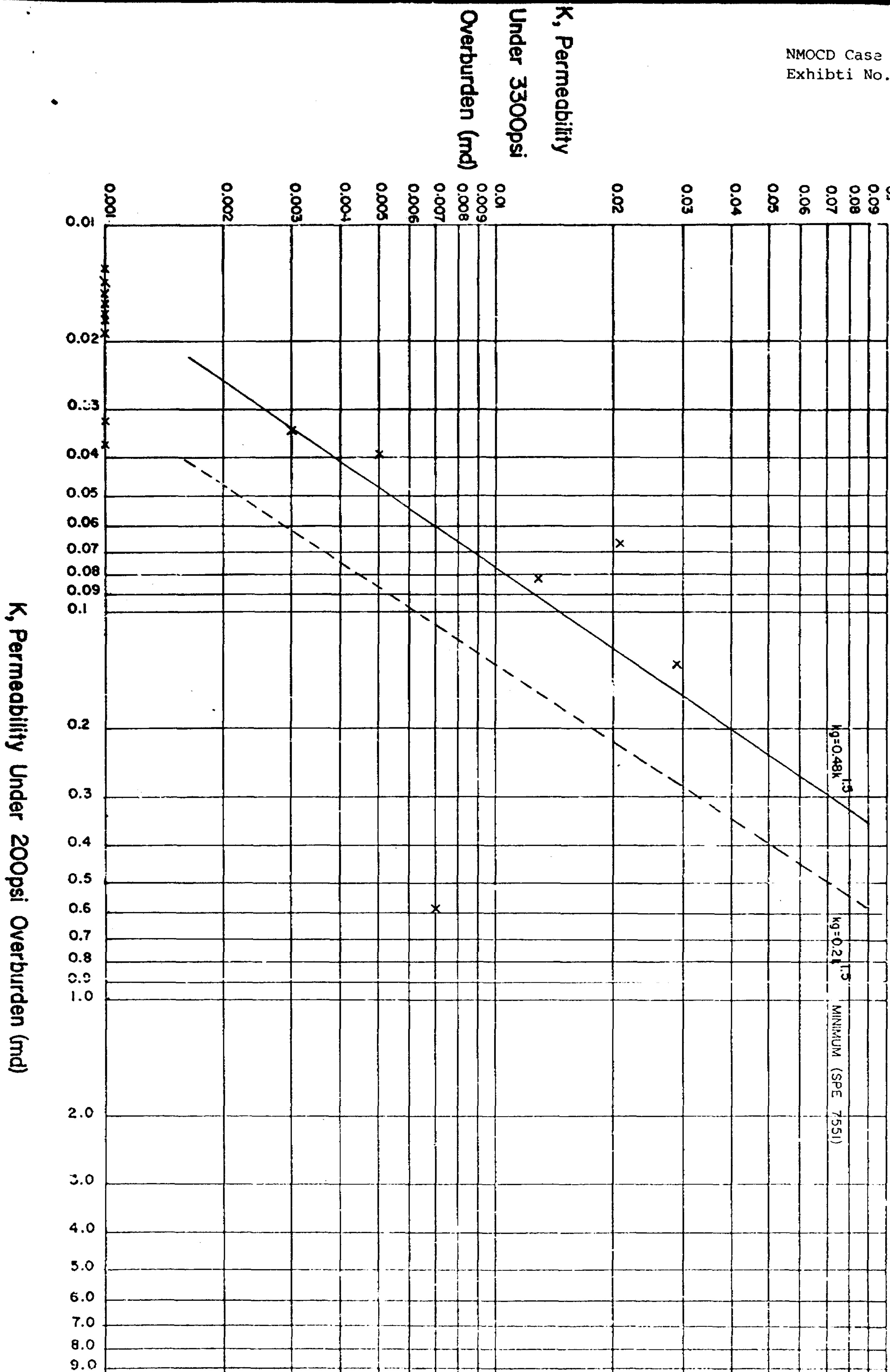

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Core From Murphy NW Federal #1

Permeability of Pay Section

Core Sample Number	Core Depth (Feet)	Correlative Log Depth (Feet)	Maximum Routine Perm (md)	Perm under 3300 psi Overburden (md)
10	6560	6562	0.01	0.001
11	6561	6563	0.017*	0.001
12	6262	6564	1.0	0.480
13	6563	6565	0.07	0.009
14	6564	6566	0.04	0.004
15	6565	6567	0.12	0.020
23	6573	6575	0.02	0.001
24	6574	6576	0.01	0.001
30	6580	6582	0.01	0.001
31	6581	6583	0.02	0.001
32	6582	6584	0.02	0.001
33	6583	6585	0.02	0.001
34	6584	6586	0.07	0.009
35	6585	6587	0.40	0.121
36	6586	6588	0.01	0.001
37	6587	6589	0.01	0.001
38	6588	6590	0.037*	0.003
39	6589	6591	0.05	0.005
47	6599	6601	0.05	0.005
48	6600	6602	0.05	0.005
49	6601	6603	0.08	0.011
50	6602	6604	0.04	0.004
51	6603	6605	0.05	0.005
52	6604	6606	0.12	0.020
53	6605	6607	0.23	0.053
54	6606	6608	0.02	0.001
55	6607	6609	0.02	0.001
62	6614	6616	0.08	0.011
63	6615	6617	0.64	0.246
64	6616	6618	0.09	0.013
65	6617	6619	0.20	0.043
AVERAGE (31 Feet)			0.116	0.035

* Plug permeability

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PRODUCTION RATES FOR TWO-YEAR OLD WELLS

Well	Producing Rate Two Years After Initial Production Gas (Mcf/D)	Oil (BOPD)
Anderson ST CS #1Y	SI	SI
Antelope Sink Unit #1	458	0.4
Arco EC ST #1	*	*
Arco 9 Morrison #1	SI	SI
Box Canyon #3	159	0.0
Box Canyon #4A	655	1.2
Box Canyon GJ #1	9	0.0
Brainerd IO #1	46	0.2
Cities JG ST #1	*	*
Cities JH ST #1	96	0.0
City of Artesia EQ #1	55	0.5
Eddy GX ST #1	227	1.7
El Paso GS #1	69	0.2
Federal AB #2	263	0.2
Federal AB #5	10	0.0
Federal BZ #12	2	0.0
Federal CX #1	278	4.1
Federal CX #2	*	*
Federal CX #3	*	*
Federal CZ #1	117	0.9
Federal EF #1	71	0.3
Federal EF #2	*	*
Federal GC #1	93	0.2
Federal GR #1	7	0.0
Flint #1	164	0.7
Flint #2	193	0.9
Gable FV #1	51	0.5
Gossett EU #1	223	0.6
Griffin JJ #1	288	1.2
Grynberg A Fed. #1	*	*
Huber IA #2	20	0.5
Irish Hills KW #2	*	*
Johnson JT #1	*	*
Kennedy JQ #1	*	*
La Cama #1	337	1.7
Little Box Canyon #1	*	*
Little Box Canyon #3B	121	0.6
Manseau [illegible]K #1	1	0.0
Morley [illegible]	124	0.3
Morris MC #1	*	*
Penasco ST #1	*	*
Pipkin HE #1	79	0.5
Powell DG #1	175	0.5
Pubco NO ST #1	*	*
Rocky Arroyo #1	84	0.0
Rocky Arroyo E #1	125	0.0
Siegenthaler IS #2	28	0.2
Sowers FB #1	150	0.7
State CY #1	133	1.1
State JM #1	*	*
AVERAGE	144	0.6
AVERAGE against atmospheric pressure	146	

*Well has produced for less than two years

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SUMMARY OF ENGINEERING DATA

Item	Maximum Value	Results for Permo-Penn Formation
1. Permeability	0.1 Millidarcy	0.031 md from 10 DST's 0.035 md from one core
2. Stabilized Gas Flow Rate	188 Mcf/D	146 Mcf/D for stimulated wells, less before stimulation.
3. Stabilized Oil Flow Rate	5 BOPD	Maximum of 4.1 BOPD Average near 0.6 BOPD for stimulated wells.

DOCKET MAILED

Date 8/28/81
9/14/81
10/9/81

~~Cont'd~~ 10-21-

CASE 7352: YATES PETROLEUM CORPORATION FOR DESIGNATION OF A TIGHT FORMATION, EDDY COUNTY, NEW MEXICO

Cont to 9/23