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1 1 2 STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT 3 OIL CONSERVATION DIVISION STATE LAND OFFICE BLDG. 4 SANTA FE, NEW MEXICO 21 October 1981 5 EXAMINER HEARING 6 7 IN THE MATTER OF: 8 Application of Yates Petroleum Corporation for designation of a CASE 9 tight formation, Eddy County, New 7352 Nexico. 10 11 12 13 BEFORE: Richard L. Stamets 14 15 TRANSCRIPT OF HEARING 16 17 APPEARANCES 18 W. Perry Pearce, Esq. For the Oil Conservation 19 Legal Counsel to the Division Division: State Land Office Bldg. 20 Santa Fe, New Mexico 87501 21 22 For the Applicant: Chad Dickerson, Esq. LOSEE, CARSON, & DICKERSON 23 P. O. Drawer 239 Artesia, New Maxico 88210 24 25

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4 1 MR. STAMETS: We will call next Case 2 7352. 3 MR. PEARCE: Application of Yates Petro-4 leum Corporation for a designation of a tight formation, 5 Eddy County, New Mexico. 6 MR. DICKERSON: Chad Dickerson, of 7 Artesia, New Mexico, Mr. Examiner, appearing on behalf of the 8 applicant, and we have two witnesses. 9 10 (Witnesses sworn.) 11 12 MR. DICKERSON: We call Mr. Ray Beck at 13 this time. 14 15 RAY BECK 16 being called as a witness and being duly sworn upon his oath, 17 testified as follows, to-wit: 18 19 DIRECT EXAMINATION 20 21 BY MR. DICKERSON: Will you state your ram's, your occupa-22 <u>Q</u>. tion, and by whom you're employe ; please? 23 Ray Beck, petroleum geologist, Yates 24 Α. Petroleum Corporation, Artesia, New Mexico. 25

and the second second

1 5 2 Mr. Beck, would you briefly summarize Ω 3 your educational and work experience background as it relates to this application? 5 I have a Bachelor of Science degree and A. 6 a Master of Science degree in geology from Texas Tech Univer-7 sity. 8 I worked for Shell in Texas for nine 9 years and I worked for Yates Petroleum for ten years in 10 southeast New Mexico. 11 And are you familiar with the subject Q 12 lands in question? 13 A. Yes. 14 And have you prepared certain exhibits a 15 upon which you intend to rely today? 16 I have. A 17 Would you briefly describe this formation Q 18 for which tight formation designation is sought, Mr. Beck, 19 by geological parameters? And briefly state the purpose of 20 this application on behalf of Yates Petroleum Corporation? 21 As to the application, Yates Petroleum à. 22 Corporation seeks tight formation designation for a portion 23 of the Permo-Penn underlying lands in western Eddy County, 24 New Mexico, which are described in Exhibit Number One and 25 shown in map form in Exhibits Numbers Two and Three.

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The description of the formation by	
geological parameters is as follows: The formation sought to	
be covered by this application is that stratigraphic interval	
batween 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 de-	
scribes the lands which overlie the Parmo-Penn interval for	
which tight formation designation is sought in this applica-	
tion.	

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1 7 2 And that's approximately 318,000 acres Q. 3 in Eddy County, New Mexico, is that correct? 4 That is correct. L 5 And what is reflected by Exhibit Number Q 6 Two? 7 Exhibit Number Two is a map of one inch A. 8 equal 5000 feet scale, which shows the lands described in 9 Exhibit Number One. 10 The subject area stretches over a por-11 tion of western Eddy County, New Mexico from the Pecos River 12 east of the City of Artesia to the Huapache Monocline some 13 forty miles to the southwest. 14 Also shown by circled well spots are all 15 wells within the outline which have penetrated the above de-16 fined Permo-Penn formation and/or lower horizons. 17 Red colored well spots are wells which 18 are currently producing gas from the above defined Permo-Penn 19 interval. 20 Deposits of the subject Permo-Penn inter-21 val are a complex of three major environments of deposition 22 or facies, shelf, bank, and basin facies. 23 The shelf facies, lying in bands to the 24 west or northwest, is comprised of interbedded limestones, 25 shales, siltstones, and sandstones,

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2	Terrigenous clastics, that is shales,	
3	siltstones, and sandstones, increase, and marine limestones	
4	and shales decrease, traversing from east to west or southeast	
5	to northwest; that is, in a shelfward direction.	
6	Deposits of the shelf facies are effectively	
7	non-porous and impermaable, and constitute an up-dip mega-seal	
8	to the bank facies.	
9	The bank facies is composed mostly of	
10	marine limestones with a few intercalated marines shales.	
11	These marine limestones are made up of bioherms and their	
12	associated debris aprons interfingered with colite bars.	
13	The porosity that is present is a result	
14	of preservation of primary porosity, principally of bryozoan	
15	material and creation of secondary porosity by leaching of	
16	colitic grainstones and former aragonitic shell material.	
17	Most of the gas production that has been	
18	established in the subject Permo-Penn interval has been from	
19	deposits of the bank facies.	
20	The basin facies consists mainly of thin-	
21	bedded, fine-grained sandstones, siltstones, and shales, which	
22	were transported to the relatively desper basin from the bank	
23	and shelf areas during periods of lowar sea level.	
24	Main conduits for transport to the basin	
25	were through passes between segments of the bank facies.	

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1	9	
2	Scattered within the overall basin facies	
3	are isolated limestone or carbonate build-ups, termed isolated	
4	mounds. In some of the isolated mounds porosity has been	
5	developed and/or preserved, but many are effectively non-porous	
6	and impermeable.	
-1	Some of the isolated mounds have produced	
8	gas. Wells in the basin facies which have encountered mounds	
9	are indicated by the letter "N" close by the well spot.	
10	About one-third of the subject Permo-	
11	Penn interval in the upper part, has been termed the Antelopa	
12	Sink Zone, named for an interval in the Sun, formerly Tom	
13	Brown, No. 1 Antelope Sink Unit, in Section 18, 19 South,	
14		
15	24 East. This well is shown on two cross sections, Exhibits	
16	Six and Eight.	
17	The geographical limits of shelf, bank,	
18	and basin shown on Exhibit Two are for the Antelope Sink 20ne	
19	alone.	
20	Lower zones of the subject Permo-Penn	
21	interval are not shown, but their facies trends are essentially	
22	parallel to those shown on Exhibit Number Two.	
	Exhibit Number Two also shows the traces	
23	of the cross sections intorduced in later exhibits.	
24	Q Mr. Beck, please refer to Exhibit Number	
25	Three and describe what it shows,	

1 10 2 λ Exhibit Number Three is identical to 3 Exhibit Number Two from the standpoint of scale, outline of 4 lands, well spots, and colored well spots. 5 The purpose of this exhibit is to illu-6 strate the structural attitude of the Permo-Penn formation in 7 the subject area. 8 Mapping was done on the top of the Ante-9 lope Sink Zone in the shelf and bank areas, and on top of the 10 Canyon Series in the basinal areas. 11 As the cross sections will show, the 12 Antelope Sink Zone is essentially parallel with the Third 13 Sister Cycle above. 14 Dashed contours are 100 feet contour in-15 tervals on top of the Antelope Sink zone. Solid contours 16 are 100 foot contour intervals on the top of the Canyon Series. 17 These contours indicate that over most 18 of the outlined area the Permo-Penn interval dips to the east, 19 southeast, at approximately 100 feet per mile; however, in 20 the southwestern part of the outlines area, near the Huapache 21 Monocline, the Permo-Penn interval dips east to northeasterly 22 at 200 to 300 feet per mile and structure is complicated by 23 faulting. 24 Structural relief on the top of the sub-25 ject Permo-Penn is approximately 3300 feet in the outlined

1 11 2 area. Ground level elevations rise approximately 1500 feet 3 from wells near the Pecos River in Township 17 South, Range 4 26 East, to wells near the Huapache Monocline in Township 21 5 South, 21 East. 6 The drill depth to the top of the Third 7 Sister Cycle in the highest well, the Pennsoil No. 1 United 8 Federal, in Section 28 of 21 South, 21 East, is 4927 feet. 9 And the drill depth to the top of the Third Sister in the 10 lowest well, the HEYCO No. 1 Big Boggy State, in Section 36 11 of 17 South, 26 East, is 6717 feet. 12 The average depth to the top of the sub-13 ject Permo-Penn formation is thus 5822 feet, and there's a 14 correction from that in the statement we sent in to the OCD 15 and the USGS. There's a typographical error there of it 16 says 5827, but it's really 5822. 17 And that mistake is not material, Mr. Q. 18 Beck, is it --19 à. NO. 20 -- for the purposes of this application? Q 21 No, sir, it's just a typographical error Á. 22 Refer to Exhibit Number Four and describe Q 23 what it shows. 24 Exhibit Number Four illustrates the Λ. 25 stratigraphic column present in western Eddy County, New

12 1 2 Mexico. This geologic section was compiled from 3 New Mexico Oil Conservation Division reference cross sections 4 and other industry accepted correlations. 5 The main purpose of this exhibit is to 6 show the Permo-Penn stratigraphic interval sought to be 7 covered by this application in relation to geologic time and 8 9 other stratigraphic horizons. Refer to Exhibit Number Five and describe 10 ۵ 11 what it reflects. 12 Exhibit Number Five is a northwest to A. 13 southeast stratigraphic cross section, A-A', hung on the Third Sister Cycle of the Wolfcamp Series. 14 This cross section is transverse to the 15 three major facies trends of shelf, bank, and basin. 16 Other pertinent correlations shown are 17 18 the top of the Antelope Sink Zone of the shelf and bank facies, top of the Pennsylvanian, by correlating with the 19 20 New Mexico Oil Conservation Division reference cross sections, 21 and the top of the Canyon Series. 22 Drill stem test, core, and completion 23 data are shown on the cross section. Well No. 6 was cored in the Permo-Penn 24 25 and the core analysis report is given at a later exhibit.

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1 13 2 Wells 2, 3, and 5 are currently producing 3 Permo-Penn gas and have been assigned to the Eagle Creek Permo-Penn Gas Field by the New Mexico Oil Conservation Divi-5 sion. 6 Wells 4 and 6 should produce Permo-Fenn 7 gas but they have not yet been completed in that interval. 8 Note that Well 8 produced gas from an 9 isolated mound. This well was assigned to the Atoka Cisco 10 West Gas Field, and produced 64,125 Mcf of gas and 146 bar-11 rels of condensate before abandonment in 1980. 12 Mr. Beck, please go to Exhibit Number Q 13 Six and describe what it shows. 14 Exhibit Number Six is a northwest/southλ 13 east stratigraphic cross section, B-B', which is again hung 16 on the Third Sister Cycle and is transverse to the three 17 major facies of shelf, bank, and basin. 18 I might just add here oif -- off the 19 written thing that we handed in, that we're moving from 20 north essentially to south on these three transverse cross 21 sections. 22 A key correlation well, the Sun, Tom 23 Brown, No, 1 Antelope Sink Unit, is Well 3. Tops pertinent 24 to this application are picked in this well as follows: 25 Third Sister, 5860; Antelope Sink Zone, 6080; top of the

1 14 2 bank facies, 6140; top of the Pennsylvanian, by correlation 3 with the New Maxico Oil Conservation Division reference cross sections, 6190; base of the bank facies, 6449, on the written 4 transcript we sent earlier it was 6420. That's a mistake. 5 It should be 6449. And the Canyon Series is 7060. 6 7 Note that the perforated interval strad-8 dles the systemic boundary between the Permian and the Penn-9 sylvanian. 10 And Antelope Sink Unit No. 1 has been 11 assigned to the Antelope Sink Upper Penn Gas Field. 12 Well 4 should also produce Permo-Penn 13 gas but it has not yet been completed in that zone. 14 Refer to Exhibit Number Seven, Mr. Beck, Ω 15 and describe what it shows. 16 Exhibit Number Seven is another northwest A. to southeast stratigraphic cross section, C-C', which is also 17 18 hung on the Third Sister Cycle. 19 Wells 4 and 6 are producing gas from the 20 Permo-Penn formation and have been assigned to the Box Canyon 21 Permo-Penn Gas Field. 22 Now refer to Exhibit Number Eight, please, 0. 23 and describe what it shows, 24 Exhibit Number Eight is a southwest to Ā. 25 northeast stratigraphic cross section, D-D', which is hung on

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1 15 2 the Third Sister Cyale. This longitudinal, or strike, cross section is more or less parallel to the major facies of shelf, 3 4 bank, and basin. 5 The purpose of this cross section is to 6 tie the three previous transverse cross sections. 7 It may be noted, that the main gas productive 8 Antelope Sink Ione bank facies correlate very well, on the 9 left, from the Box Canyon Permo-Penn Gas Field to Antelope 10 Sink Upper Penn Gas Field to the Penasco Draw Permo-Penn Gas 11 Field to the Eagle Creek Permo-Penn Gas Field. 12 Mr. Beck, were Exhibits One through Q. 13 Eight prepared by you or under your direction and supervision? 14 L Yes, they were. 15 MR. DICKERSON: Mr. Examiner, at this 16 time Applicant would move admission of Exhibits One through 17 Eight. 18 MR. STAMETS - These exhibits will be 19 admitted. 20 MR. DICKERSON: And that concludes our 21 direct testimony from this witness. 22 23 CROSS EXAMINATION 24 BY MR. STAMETS: 25 Hr. Beck, you've presented quite a number Q.

1 16 2 of logs here. I want to discuss just briefly what produces 3 in this interval, or what may produce. 4 As you were going through here you named 5 off certain wells and indicated that a zone might be productive 6 later on which wasn't completed there now. 7 It would appear to me as though in your 8 discussion primarily you are looking at the bank facies or 9 these mounds as being the producing intervals throughout this 10 section. 11 A Correct. 12 Are any of the other zones outside the Q. 13 banks or mounds apt to be productive? 14 In this -- in this geographical area A. 15 they're all -- they're either completed from the bank facies 16 or from the isolated mounds. There is nothing producing, or 17 ther.' no sand intervals to be produced -- that are producing. 18 These are all carbonates. 19 What we tried to do here is include the 20 bank and the isolated mounds together because they're both 21 carbonates, they're both tight, as will be presented by the 22 following witness from the engineering data. We just tried 23 to pick something that could be correlated throughout this 24 geographical area and to include all the carbonates that 25 produce in this thing in that envelope between the Third Sister

1 17 2 as we picked it on the Tom Brown Antelope Sink Well and the 3 Canyon. 4 Really, so far all that's been produced 5 is the bank facies and a few of the isolated mounds, and most 6 of the isolated mounds are really either tight or haven't ---7 or are limited. 8 The engineering witness who we will hear ۵ 9 shortly, will be making his determinations a to productivity, 10 permeability, from the same bank and mound sections. 11 Yes, sir. He has got every well listed A. 12 that has penetrated the Permo-Penn at least as far as the 13 Canyon, and all the wells that are currently producing, has 14 the data on all of those, and he can show from that. 15 We were just trying to establish here 16 the geological parameters of the formations we're wishing to 17 be designated as tight formation, and also the geographical 18 area, 19 But you would not expect to be making £. 20 a well in the first 100 feet of the section anywhere. 21 No, sir, it's all tight Wolfcamp beds, Å. 22 and I can think of nothing in the geographical area in this 23 envelope that's not -- that would not be tight. 24 \mathbf{O} Okay 25 MR. . AMETS: Any other questions of

1 18 2 this witness? He may be excused. 3 MR. DICKERSON: Call Mr. David Boneau 4 at this time. 5 6 DAVID F. BONEAU 7 being called as a witness and being duly sworn upon his oath, 8 testified as follows, to-wit: 9 10 DIRECT EXAMINATION 11 BY MR. DICKERSON: 12 Will you state your name, your occupation, C. 13 and by whom you're employed? 14 I'm David Boneau. I'm a reservoir en-A 15 gineering supervisor for Yates Petroleum Corporation in 16 Artesia, New Mexico. 17 Mr. Boneau, have you -- would you briefly Q. 18 summarize your educational and work experience for the Exa-19 miner? 20 Yes, I have a Bachelor of Science de-A 21 gree in physics from the University of Notre Dame in 1962 22 and a PhD in physics from Iowa State University in 1969. 23 For Evelve years after I worked for 24 Phillips Petroleum Company in Bartlesville, Oklahona, and 25 in Odossa, Yoxas. In Odessa I was reservoir engineer for the

1 19 2 Goldsmith District and in Bartlesville I served in various 3 responsibilities, including reservoir enginerring supervisor for the Phillips R & D Department. Mr. Boneau, as part of your responsibi-5 Q. 6 lities, have you made an examination and a study of the wells 7 in question upon which you intend to testify today? R Yes, sir. λ 9 And are you familiar with this applica-Q. 10 tion? 11 Yes, sir. A. 12 MR. DICKERSON: Mr. Examiner, is this 13 witness considered qualified? 14 MR. STAMETS: He is. 15 Mr. Boneau, would you briefly state what Q. 16 you intend to show by the exhibits upon which you will testify? 17 Yes. The data that I'm going to present A. 18 will show that the Permo-Penn interval defined by the previous 19 witness meets the guidelines set forth by the Federal Energy 20 Regulatory Commission for designation as a tight sand formation 21 under Section 107 of the Natural Gas Policy Act. 22 These guidelines require, first, an estimated in situ gas permaability throughout the pay section of 23 24 less than 0.1 millidarcy. 25 The stabilized production rate against

1 20 2 atmospheric pressure of wells completed for production in 3 this formation without stimulation is not expected to exceed 188,000 cubic feet for production from the average depth of 5 5822 feet. 6 And thirdly, no well drilled into this 7 proposed tight formation is expected to produce without 8 stimulation more than five barrels of crude oil per day. 9 Mr. Boneau, would you refer to Exhibit α 10 Number Two, previously introduced, and describe what is perti-11 nent on that exhibit insofar as your testimony is concerned? 12 Okay. Exhibit Two is the map presented A. 13 by the previous witness on which is outlined the area for 14 which the tight gas designation is sought. 15 The red dots show the location of the 16 50 wells that are completed in the decignated Permo-Penn in-17 terval, as of January 1, 1981. 18 Triangles indicate wells where drill stem 19 test data was used to calculate in situ permeability of the 20 pay section. There are ten triangles and we'll discuss those 21 permeability calculations in detail later on. 22 And there's one square which indicates 23 the location of the well where core data is available. 24 Mr. Boneau, at this time please refer Ũ. 25 the Examiner to your Exhibit Number Nine and describe what is

21 1 reflected in it. 2 Exhibit Number Nine is a 29 -- 26 page 3 A. list of all wells within the boundary of the proposed area 4 that were drilled deep enough to penetrate the designated 5 6 Permo-Penn interval. 7 Information on these 333 wells includes well name, location, operator, spud date, total depth, field, 8 9 and production up to January 1, 1981. The list is current to the start of 1981. That was our cutoff. 10 11 Most of these wells were drilled as Morrow prospects to depths near 9000 feet. 12 13 There are 119 Morrow producers in the 14 proposed area. These Morrow wells have produced a total of 82.2 billion standard cubic feet for an average of 691 million 15 16 standard cubic feet per well. The Morrow is the principal 17 gas producing interval in this area. Many of the deep wells in Exhibit Number 18 19 Nine will be completed in the designated Permo-Penn formation 20 at some point in the future if the Permo-Penn gas can be 21 produced economically. 22 In addition, exploratory drilling for 23 Morrow gas will be stimulated somewhat when the tight gas 24 sand designation makes the Permo-Penn interval a more attractive 25 salvage zone.

1 22 2 That's enough about Exhibit Nine, I 3 think. 4 Refer to Exhibit Number Ten and describe Q 5 what it shows. 6 · A Exhibit Number Ten is a list of the 50 7 wells completed in the designated Permo-Penn interval as of 8 January 1, 1981. Most of the engineering data on the subject 9 formation will come from the wells in Exhibit Number Ten. 10 Although the average depth to the top 11 of the designated Permo-Penn interval is 5922 feet -- 5822 12 feet, thank you -- production from 49 of the 50 wells comes 13 from below the 5822 feet. The average depth to the top of 14 the pay zone in these 50 wells is 6490 feet. 15 These wells have produced a total of 16 9.01 billion standard cubic feet for an average of 180 million 17 standard cubic feet per well. 13 MR. STAMERS: Nould you give me the 19 average depth for the completion interval on those again, 20 pleaso? 21 Suraly. The average depth to the top <u>}</u>. 22 of the pay zone, the top perforation in the 50 wells, is 23 6490 feet, 24 MR. SCANEFFS: Okay, and then the avorage 25

1 23 2 A. The average production is 180 million 3 standard cubic feet per well. MR. STAMETS t 4 Thank you. 5 A Surely. 6 a Mr. Boneau, please refer to Exhibit Number Eleven and describe what it represents. 7 8 Exhibit Eleven is a list of wells that Ä. were spudded or completed in the designated Permo-Penn inter-9 10 val after July 15th, 1979. 11 These eight wells are the only ones out of the 50 wells in Exhibit Number Ten that would be eligible 12 for tight gas prices, according to my understanding of the 13 rules, should the present application for tight gas designa-14 15 tion be approved. 16 Approximately five additional wells have come on line in 1931, and according to my understanding, again, 17 18 these would also be eligible if the tight formation designa-19 tion is approved. 20 All production from the other 42 active 21 wells will never be eligible for tight gas prices under cur-22 rent regulations. 23 MR. STAMWIS: Mr. Boneau, to your know-24 ledge, were any of these wells on Exhibit Eleven, plus the 25 five that you discussed, defiled specifically for the Permo-

1 24 2 Penn or were those all deeper wells? 3 My memory says that they were all drilled A. 4 initially to the Morrow. They were all drilled deeper. 5 MR. STAMETS: Okay, thank you. 6 ÷., I have reason to believe that's correct, 7 since Mr. Beck is over here modding. 5 So our point in Exhibit Eleven is that 9 our application mainly seeks a long-term opportunity to produce 10 gas from the designated Permo-Penn formation by recompleting 11 wells originally drilled to deeper horizons, and recompleting 12 them in the future, for the most part. 13 a Now, Mr. Boneau, would you kindly analyze 14 your engineering data available? 15 Do you really want to use all this A_ 16 stuff? 17 As far as it pertains to this application. Q. 18 How about I try to show it in a list. Å. 19 Okay. Ω 20 MR. DICKERSON: Mr. Examiner, please 21 note that the written information furnished as the statement 22 of the meaning and purpose of each exhibit does analyze these 23 formulas and so forth in considerably more detail than Mr. 24 Boneau will now go into 25 MR, STAMETS: Well, and I would point

1 25 2 out for the record, too, that this application has been care-3 fully examined by Mike Stogner, who is an engineer on the staff of the Division, and any problems therewith have pro-5 bably been ferreted out by this time and will show up in the 6 cross examination, if any. 7 Okay. So I'd like to say with the fore-A. 8 going as kind of a background, and the engineering data part 9 of it, we will try to demonstrate that three criteria are 10 met; first, that the average permeability in the natural state 11 is less than, or equal to, 0.1 millidarcy; that the stabilized 12 flow rate before stimulation is less than 183 Mcf per day; 13 and third, that no well produces more than five barrels of 14 oil per day. 15 The estimated average in situ gas perme-16 ability throughout the pay section was calculated by two 17 standard methods that are widely accepted in the industry. 18 These methods include, first, permeabi-19 lity calculation from pressure build-up data taken during 20 drill stem tests; and second, laboratory measurements on a 21 ccred section of the designated Permo-Penn interval from one 22 well, a single well, 23 First the going to talk about permaabi-24 lity calculated from dalli ster test data. This kind of 25 data will give a good representation of the in situ perma-

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26 1 ability, since the drill stem test is performed while the 2 3 well was still being drilled; the formation has been altered relatively little from its natural condition. If there is 4 5 some formation damage due to the drilling mud, most of this 6 damage is removed during the preflow phase of the drill stem 7 test. In contrast, pressure data taken after 8 the well is acidized or fractured will give higher values for 9 10 the permeability because the formation has been etched and 11 broken by the treatments. 12 Okay. 13 Mr. Boneau, refer to Exhibit Number a 14 Twelve, please, and describe what it shows. 15 Exhibit Number Twelve shows data from Α. 16 the drill stem test at ten wells within the proposed area. 17 The locations of these wells are indicated by triangles on 18 Exhibit Number Two. Of the ten wells only Murphy NW Federal 19 20 No. 1 is not presently completed in the desginated Permo-21 This well was cored and drill stem tested Penn formation. 22 in the Permo-Penn interval, but it is now a completed Morrow 23 producer. The values of permeability paleulated 24 from the drill stem tests, which are the second column from 25

1 27 2 the right on Exhibit Evelve, range from 0.003 millidarcy for the Irish Hills "KW" State No. 2, up to 0.091 millidarcy for 3 4 La Cama No. 1. 5 The average permeability for the ten 6 wells was determined to be 0.031 millidarcy. 7 The last column in Exhibit Number Twelve, the one that's labeled "Years to Reach Pseudo-Steady State", 8 9 gives the approximate time required for a pressure disturbance 10 at the wellbore to reach the outer boundary of the reservoir 11 feeding the well. 12 Said another way, gas near the outer 13 boundary of a reservoir begins to move towards the wellbore 14 at the time indicated in the righthand column in Exhibit Num-15 ber Twelve. 16 Flush production of gas relatively near 17 the well occurs until the whole reservoir is feeding the 18 well. Then the pressure begins to drop with time uniformly 19 throughout the reservoir and the flow rate becomes stabilized 20 The calculated time to reach stabilized 21 flow ranges from 1.8 years for Well Cities "JG" State No. 1, 22 up to 33 years for Trish Hills "KN" State No. 2. 23 The average time was determined to be 24 10.7 years to reach this statilized flow. 25 The idea of using a time to reach stebi-

1 28 lized flow was introduced here because it follows naturally 2 from the calculation of the formation permeability from the S drill stem test data. 4 I intend to discuss the stabilized flow 5 6 idea in more detail after all the data on permeability has 7 been presented. 2 Q Mr. Boneau, refer to Exhibit Number Thir teen and describe what it shows. 9 10 A Okay. The second procedure for obtaining 11 in situ permeability is to measure the permeability of actual 12 cored sections of the Permo-Penn rock in a laboratory. 13 The only core data available comes from 14 the Murphy "NN" Federal No. 1 Well, which was the well marked 15 with a square in Exhibit Number Two. 16 A log of the Permo-Penn interval in the 17 Murphy Well is -- appears in Exhibit Five as Well No. 6. 18 Exhibit Thirteen, then, shows the perm-19 eability measured by CORE Laboratories for the 72 feet of 20 core recovered from this well. Special tests were run on 21 16 samples from the Murphy core to evaluate the effect of 22 overburden pressure on the core samples in order to determine 23 a representative value for the in situ reservoir permeability 24 Routine core analyses are normally run 25 with a confining or overburden pressure of only 200 psi. The

1 29 2 overburden pressure within the Permo-Penn formation is really 3 about 3300 psi, and special core tests were required in order 4 to correct the results of routine core analyses for the 5 effect of the actual overburden pressure. 6 The results of these special tests, per-7 formed at an overburden pressure of 3300 psi, are listed in 8 the last two columns of Exhibit Number Thirteen. 9 So Exhibit Number Thirteen shows both 10 the routine core data and the special core data on the Murphy 11 cores. 12 Refer, Mr. Boneau, to Exhibit Number \vec{U} 13 Fourteen and describe what it shows. 14 Exhibit Number Fourteen shows the correλ 15 lation that was developed between the routine permeability 16 at 200 psi overburden pressure and the in situ permeability 17 at the actual overburden pressure of 3300 psi. 18 Data from the petroleum literature was 19 used to help define this relationship, since there are rela-20 tively few data points available from the Murphy core. And 21 an awful lot of the data points appear in the lower lefthand 22 corner at very low permeabilities, and there aren't very 23 many data points in the body of the figure, and I thought 24 that the Amoco experience in the laboratory would help define 25 that relationship.

1 30 2 So the dashed line in Exhibit Fourteen 3 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 5 on Exhibit Fourteen as SPE 75-51. 7 And this Amoco work was reported in the 8 Journal of Petroleum Technology in September of 1980. 0 The solid line in Exhibit Fourteen was 10 drawn parallel to the dashed line in order to better fit the 11 actual points for the Murphy core. This solid line was used 12 to convert the routine permeability values into in situ per-13 meabilities values at 3300 psi overburden pressure. 14 What is shown by Exhibit Number Fifteen? Q. 15 Exhibit Number Fifteen tabulates the A. 16 permeabilities of the core material from the Permo-Penn pay 17 section in the Murphy "NW" Federal No. 1. Those sections of 18 the interval that the electric log condemned as nonproductive 19 are omitted. 20 The average routine permeability for the 21 Murphy Well is 0.116 millidarcy, indicated at the bottom of 22 the fourth column. 23 It happens that the in situ permeability 24 corrected for overburden pressure takes from ours date, which 25 is the number at the bolton of the fifth column in Luchibit

31 1 Fifteen, both came out to be 0.035 millidarcy for the Murphy 2 "NW" Federal No. 1, and I don't believe it, but that's the 3 way it turned out. 4 The Murphy Well can be considered a 5 typical well, since its in situ permeability of 0.035 milli-6 7 darcy is very close to the average 0.031 millidarcy for the ten wells that we talked about drill stem test data in Exhibit 8 9 Number Twelve. So as a summary of the permeability data 10 we have two types of data, the average in situ permeability 11 from drill stem test data, 0.031 millidarcy; the average in 12 situ permeability from the available core data, 0.035 milli-13 14 darcy. 15 Both types of engineering data indicate 16 that the permeability of the designated Permo-Penn pay section 17 is comfortably below the 0.1 millidarcy. What is shown by Exhibit Number Sixteen? 18 Q. 19 Okay. The second criteria relates to the A. gas flow rates and then the third criteria is the oil flow 20 21 rates. 22 The data on the flow rates before stimulation are not available for the vast majority of the wells 23 that produce in the designated Darmo-Pero formation. The 24 natural flow rates are so low that they are routinaly weither 25

1 32 measured nor recorded. The normal completion procedure has 2 been to perforate and treat the well immediately. 3 In the absence of data on natural flow rates, we propose to use production data for the stimulated 5 wells at a time in their life when the production rates are 6 7 approaching stabilized rates. Exhibit Twelve showed that the time to reach the stabilized rate varied from 1.8 to 33 years and 9 averaged 10.7 years. Thus, actual flow rates measured two 10 11 years into the lives of the Permo-Penn wells will be either 12 near stabilized rates or still considerably higher than the 13 stabilized rates. 14 Exhibit Sixteen shows actual production 15 rates for the 24th calendar month in the producing lives of 16 the wells that are producing from the designated Permo-Penn 17 formation. 18 Only 34 of the 50 wells have been pro-10 ducing for two years or longer, and the average rate of gas 20 production for the 32 wells is 144,000 cubic feet per day at 21 the bottom of the first set of figures in Exhibit Sixteen. 22 And the average rate of oil production, 23 which is at the bottom of the last set of figures in Exhibit 24 Sixteen, is 0.6 barrals of all ear day. 25 The gas rates vary from one to 655,000

1 **3**3 2 cubic feet per day, and only two walls produced over 300,000 3 cubic feet per day. 4 The oil lates vary from zero to 4.1 bar-5 rels of oil per day after two years. Only one well produced 6 over two barrels of oil per day, and no well produced as much 7 as five barrels of oil per day in the 24th month after it 8 began production. 9 The FERC guidelines require that the gas 10 flow rate be measured against atmospheric pressure. The 11 average flow rate of 144,000 cubic feet per day calculated 12 above for stimulated wells, was measured against pipeline 13 pressures of 150 to 300 psi. 14 The corresponding flow rate at one atmos-15 phere is given by the equation -- I guess I'm stuck with 16 reading the equation -- the flow rate at one atmosphere is the flow rate, the actual flow rate, times the quantity p^2 minus 17 P^2 at 1 atmosphere over the quantity P_{\perp}^2 winus P_{\perp}^2 actual 18 19 conditions. 20 Now, you just -- why don't we -- can we 21 just go back and skip this? 22 MR. STAMETS: Is that shown somewhere? 23 Zeah, this shows on the paper. <u>.</u> 24 MR. STATESTS: what page is that on, ir. 25 bonaad
 M Bottom of page server. MR, STAMERS: Okay. MNY don't we just go back to saying that alculated for stimulated wells measured against pipeline sures of 150 to 300 psi. When we calculate the stabilized rate for production against atmospheric pressure the 144
MR. STAMENS: Okay. A. Why don't we just go back to saying that alculated for stimulated wells measured against pipeline sures of 150 to 300 psi. When we calculate the stabilized
A. Why don't we just go back to saying that alculated for stimulated wells measured against pipeline sures of 150 to 300 psi. When we calculate the stabilized
alculated for stimulated wells measured against pipeline sures of 150 to 300 psi. When we calculate the stabilized
sures of 150 to 300 psi. When we calculate the stabilized
rate for production against atmospheric pressure the 144
per day becomes 146 Mcf per day in making that correction.
So the rates in Exhibit Sixteen are maxi-
values, I believe, since all the data applies to stimulate
s and since many of the wells have not yet actually stab-
ed. Thus, the average gas production rate is about 146,00
c feet per day, or less, and the maximum of oil production
is about 4.1 barrels of oil per day, or less, under
ilized non-stimulated conditions.
Q Mr. Boneau, what is known regarding the
niques for protection of the fresh water zones in the land
aestion?
A Okay. All the wells proposed for tight
designation, all of this area, lies within the Roswell
sian Water Basin, at established by the New Mexico State
ager. This Roswell Actesian Mater Basin is a main source
resh water to Chaves County and northern Eddy County.
Perulation governing the drilling of
and gas walls within the sesia are enforced by the New

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1	35
2	Mexico Oil Conservation Division in order to protect the
3	fresh water formations.
4	These regulations require that a water
5	protection string be set and cemented through the fresh water
6	bearing strata.
7	The base of the Artesian aquifer lies
8	at a depth of about 1900 feet at the north end of the proposed
9	area and at a depth of about 1400 feet at the south end.
10	In a typical casing program conductor
11	pipe is set at a depth of 300 to 400 feet and cement is cir-
12	culated to surface in order to protect the shallow fresh water.
13	Then an intermediate string of casing
14	is set about 100 feet below the base of the Artesian aquifar
15	at a depth of 1100 to 1500 feet. Cement is circulated to
16	surface behind the intermediate string to protect the Artesian
17	aquifer.
18	The production casing is then set at the
19	total depth of the well, which is usually in the Morrow form-
20	ation, and cemented with 400 to 1000 sacks of cement. This
21	provides a cement shield approximately 1000 feet above the
22	top of the Permo-Penn designated formation.
23	The application to drill and the casing
24	program for each individual woll must be approved by the New
25	Mozico Gil Conservation Division, and by the United States

36 1 2 Geological Survey for wells on Voderal Lenda. 3 What is shown by your Exhibit Number 0 Seventeen? 4 Exhibit Seventeen summarizes the engineer-5 A. ing data that has been presented on the designated Permo-Penn 6 7 formation. The average in situ reservoir permeability 8 determined by two standard methods, averages less than thr 9 10 allowed 0.1 millidarcy. The average stabilized flow rate for gas 11 12 is below the maximum allowed daily rate of 188,000 cubic feet 13 per day. 14 And lastly, no well produces as much as 15 five barrels of oil per day under stabilized conditions. 16 Mr. Boncau, were Exhibits Numbers Nine Q 17 through Seventeen either prepared by you or under your direction 18 and supervision? 19 Yes, sir. à. MR. DICKURSON: Mr. Examiner, at this 20 time Applicant moves admission of Exhibits Mine through Seven 21 22 teen. 23 MR, STAVETS: They are accepted. 24 un preunaton: And thmt concludes of a 25 direct testimony.

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37 1 λ Woll, may 7 say one more thing? 2 Yes, go abead. Do you have anything a 3 else you would like to add, Mr. Boneau? Mike Stogner called me on Monday about--5 asking about more detailed data on the drill stem test, and 6 7 yesterday I prepared quickly some of the data, most of the data, all the data, on four of those ten drill stem tests, 8 and if that question comes up we can talk about it to that 9 extent, or at least I responded to that telephone call to that 10 11 extent. 12 MR. DICKERSON: That concludes our direct 13 testimony, Mr. Examiner. 14 15 CROSS EXAMINATION 16 BY MR. STAMETS: 17 Referring to Exhibit Sixteen, and also Ō. 18 Exhibit Twelve, you gave us some information on what you 19 feel a reasonable figure should be for the unstimulated 20 production rates. 21 Why didn't you show the rates for those 22 DST's on Exhibit Twelve? It would seem like that would give 23 us unstimulated production mathematical and unstimulated pro-24 duction rates, 25 That's a good question and I just happen Α.

1. N. S.

1 38 2 to have in my pocket a list of those can drill scen test rates. 3 Q. Good. I will write those figures down 4 on my copy of this exhibit. I may wind up asking you to do 5 the same later. 6 MR. DICKERSON: We'll be glad to submit 7 those. 8 A. The reason that they're not there was 9 that I had the feeling that the 50 wells, that I didn't want 10 to use too small a sample for the average. 11 ₽. Right. 12 A And so I went for something that would . 13 big numbers, and got 34 wells, finally. Okay. 14 That's no excuse for not giving you ten 15 for you to do whatever you want with them, and I apologize 16 for that. 17 Oh, hell, I don't -- let's see if I have 18 them in the same order that you have them. 19 The first one is 25 Mcf --20 And that's the Box Canyon Well. Q. 21 À. Box Canyon. 22 All right. Q. 23 č. Citics "JG", 189. Divios "JH", 56. 24 City of Accosia, 800 Ledexal "22" 12, 29, Crittin "30", 190. 25 Izish Mills "KK" do. 2, T dave 70 whitten down. I remember

3 🖓 1 it was 69.2, I think, actually, but 70 to firms. La Cara, 2 136. Murphy "NW", 221. And Powell "DG", 48 3 ... Have you averaged those? Q. 5 A, The average is 105. And that's below the magic 188. 6 Q. 7 It's below the 138. It's below the 144 λ, that we get by using actual production at pseudo-steady state 8 9 conditions. 10 Q. Have you compared those figures with the 11 ones that you derived on Exhibit Sixteen for the wells that 12 are producing? 13 No, but I'm willing to do it with you A. 14 now, if you'd like. 15 Let's just take a look at some there. Q 16 Box Canyon 4-A, you've got 655 on Sixteen. 17 As compared to 25. Box Canyon 4-A reλ. 18 sponded to its stimulation. So, that's the highest production 19 rate there. That's right. 20 And Cities "JG" has produced for less Q 21 than two years --22 A. Less than two years. 23 Q -- and there are so "figures. 24 "THE IS OF COMPACED BO SG. Α. 25 othy of Astrola, 56, is below the drill

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40 1 stem test value, 83. Federal "NA" to 2 compared to it was 2 29, and the Griffin "JJ", 288, responded somewhat to stimula-3 tion. Is that right? My eyes don't track 0 5 straight across that page. 6 Yes, that's correct. Thank you. 7 Irish Hills "KW" has been on line a very 8 A relatively short time and there's no value. La Cama now pro-9 duces 337, or its production rate after two years was 337, 10 11 compared to 136 on the drill stem test. 12 Murphy is the well that's a Morrow pro-13 ducer, has not yet been completed in the designated Permo-14 Penn formation. 15 And the Powell "DG" produces 175 com-16 pared to 48 on the drill stem tast. 17 So the actual production is, after stim-18 ulation, and let's see if there's really -- really what kind 19 of correlation would we develop. La Cama, that should stabilize in about 20 21 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 22 23 the same. 为在"十百日·王帝和杨元明",赵元的制作"月四代"中国"月四"年7月,2405年。 24 25 pared to 18, but it should take 1' years to stabilize, co.

1 41 2 it's reasonable that 175 is still above 48. 3 City of Artesia, that stabilizes in two 4 years, is 55 instead of 83, which is a reasonable comparison, 5 so maybe we could make it sound like there was a reasonable 6 comparison. 7 When you averaged the rates on Exhibit a 8 Sixteen did you include those wells that had produced less 9 than two years in your ---10 3 Oh, no, no, no. 11 The average down there is the sum of the 12 numbers divided by 34. 13 Okay, and 34 of those wells had produced Ŷ. 14 for two years. 15 Right. Α. 16 And the other with asterisks didn't, but 2 17 they didn't enter into the calculation. 18 1 But they did not enter into the calcula-19 tion one way or the other. 20 And of those wells, only one is shut-in, Q. 21 so that really has no significant effect on the final outcome 22 of what you've calculated there. 23 Let an slate that some precisely. The A 24 average 144 is the sum of them must builded by 34. 34 25 is the number of entries, number of numerical entries in the

42 1 column. So there are -- there are 34 numbers, 14 asterisks, 2 and 2 SI's. The SI's and the asterisks did not enter in the 3 calculation. I'm sorry to confuse you. 5 Nell, that's all right. That's easy to 6 Q 7 do in these cases. Certainly Exhibit Twelve intends to, if 8 not confirm Exhibit Sixteen, but would tend to indicate, if 9 anything, Exhibit Sixteen may be overly generous in this cal-10 culation of production against atmospheric pressure. 11 I agree. We -- I told the people that 12 A. worked on this with me that we were going to make every doubt 13 in the -- on the side of being generous, and we, I think, we 14 15 did that. 16 I tried consciously to do that. 17 Now I presume somewhere are the formulas Q. and factors used in calculating permeability shown on Exhibit 18 19 Twelve. 20 They -- they are in these pages that I A. prepared in response to Mike's telephone call, and I have 21 two copies of information on four of the wells. That, I 22 think, is representative of the whole thing and it's just as 23 24 many as I could get together in an organized fashion in one 25 day.

6 1 43 2 Q. There is no problem, though, with sub-3 mitting this information on all of these wells subsequent to the hearing. 5. If you want that information, you'll get L 6 that information, I assure you. 7 Okay. Could you give one copy of what Û. 8 you have to Mike and let him take a quick look at it and see 9 if he has any problems with the data on it? 10 A. I do have the original on it, an original 11 and two copies, and I'm going to keep the originals. 12 The reason for the scarcity of -- of 13 copies is that one of the exhibits for each well is a log and 14 it was hand-clored in and the hand-coloring is kind of a 15 limiting factor in getting very many copies made. 16 But you do have the formula on the Q 17 front, plus the calculated deliverability -- or --18 A. Okay, can I try to explain what's there? 19 Q. Yeah, you may. 20 A. There's a summary page on the front with 21 the formulas and the numbers built into the calculations. 22 There's a Horner plot with a dashed line 23 drawn through what we took as the straight line portion. 24 There's a gas analysis for the gas from 25 the well, which was used to determine properties like 2, the

44 1 deviation factor, and the viscosity of the gas. 2 Then there are three pages that are 3 copied from the Halliburton drill stem test report, which --4 the first is like a summary of the drill stem test; then there's 5 the pressure build-up data; and then there's a sheet where 6 Halliburton has listed what it -- the steps it took during 7 the drill stem tests and the rates that it measured. 8 Then there's a log of the region around 9 the drill stem test interval, with the area showing gas effect 10 11 outlined in red, and the height of the pay section when the 12 drill stem tesc was taken from that log. 13 And on the front page at the bottom we put references of where we got the equations and where we got 14 the charts for the Z factors and the viscosities, and such. 15 We did not include actual copies of those correlations, 16 17 MR. STAMETS: Mike will just --18 MR. STOGNER: This is what I want. 19 MR. STAMETS: This is what you want. 20 Okay, so if they can submit that on all the wells, if we have 21 any problems with it, we can correspond and try to get a reso-22 lution of them, 23 MR. STOGNER: This will answer a lot of 24 my questions. 25 On one of the wells I found what I would | Α.

1 45 2 consider a mistake and it lowered the actual measured perma-3 ability, I think, from .003 to .002, or something, but you 4 may notice that I've noted that for your information on this 5 form. 6 MR. DICKERSON: Should we submit those 7 as numbered exhibits? 8 MR. STAMETS: Why don't you just submit 9 that as supplemental information to the Exhibit Number Twelve? 10 MR. DICKERSON: Okay. 11 MR. STAMETS: And you can just label each 12 one with the well name so it's obvious which they belong to, 13 and then if upon review of this data we have any questions, 14 we may have to seek further clarification. 15 But it does appear that you have here 16 submitted the type of information that we're looking for on 17 these wells, which will allow us to make the proper evaluation. 18 Have you got any questions? 19 MR. STOGNER: Yes, I do have a question. 20 MR. STAMETS: Okay. 21 22 QUESTIONS BY MR. STOGNER: 23 On our Murphy "NW" Federal No. 1, where $\boldsymbol{\rho}$ 24 the core was taken, do you feel this was drilled into one of 25 the isolated mounds?

1 46 2 Λ. No. No, it's in the bank, I believe, 3 isn't it? 4 Up here, just barely inside this bank, 5 basin, but it was not a mound up here. 6 MR. STAMETS: That's No. 6 on A-A'. Okay. 7 Q. Well, do you feel this is representative 8 to the mounds that are in this tight sand area, this core 9 sample? 10 A, I feel it's as representative of those 11 as any one core is going to be representative of anything. 12 The overburden pressure was calculated Q. 13 to be 3300 psi. I guess it was a gradient of .5085 psi per 14 foot and you used the average top of the formation at 6490. 15 Is this again representative of the area, and how did you . 16 calculate that? 17 The Murphy core was taken before I worked A. 18 for Yates Petroleum. I attempted to track down who used 19 3300 psi as the overburden, as the representative overburden 20 pressure, and it's -- that would be representative of the 21 Murphy rather than the whole thing, since it's talking about 22 the murphy. 23 The two people involved both said that 24 the other person was responsible, so I did my own calculation 25 based on what I saw in the literature, and I have trouble re-

47 1 producing that right at the moment, but I got like it ought 2 to be 4900, which would make the permeability even lower, and 3 so I don't think ---4 Something like .6 psi per foot gradient? 5 Q Okay, what I read up on it, you know, and 6 X. I make no bones on doing this, but I -- I locked into this 7 8 question and what I found was that people use 1 psi per foot 9 minus the reservoir pressure. 10 And I found that used in other tight gas sand hearings and in petroleum literature, and that gives, 11 12 like you say, about .6 psi per foot. 13 Anyway, we'd say that the 3300 is an 14 order of magnitude number that somebody picked as representa-15 tive. 16 MR. STOGNER: That's all the questions 17 I have. 18 And that's all I can support it with. A. 19 20 RECROSS EXAMINATION 21 BY MR. STAMETS: 22 One of Mr. Stogner's questions stimulated Q. 23 one more. 24 Are any of the tests shown on Exhibit 25 Twelve in a mound?

1 48 2 λ I don't think so. Ray? 3 MR. BECK: There's one right there. No. There's one right there, the well in 2, 19, 24. 4 5 λ. Irish Hills. MR. STAMETS: That would be the Irish 6 7 Hills. 8 Yeah, I thought of that question this morning and I didn't have a chance to look it up, but--9 10 MR. BECK: La Cama. 11 A. So apparently the answer is La Cama and 12 Irish Hills. 13 MR. BECK: No, no, Irish Hills isn't 14 in a mound. It's just La Cama. 15 Is that the agreed answer, that one of Å. 16 them is in a mound, and that's La Cama? 17 MR. BECK: The only triangle that's in 18 a mound is the La Cama Well in 20 of 18, 25. 19 MR. STAMETS: And that was 136, again 20 below the magic 188 figure. 21 Mr. Back, did you -- since you're up and 22 about, did you recommend a type log for this area? 23 MR. BECK: Well, sir, we reproduced 24 the logs on the cross sections at 2-1/2 inches equal 100 25 feet, so people could see and actually calculate the porosity

1 49 2 off of the compensated neutron - formation density logs, 3 which most of the logs are, there are some sonic logs, but they all constitute logs which can be referred to, and it gives 5 you nine, nineteen, twenty-eight -- about thirty wells which 6 you could look at, which would constitute type logs. 7 NR. STAMETS: Okay, for purposes of this 8 order, we can select one of these wells as the type log in 9 determining the top and bottom of the formation. 10 MR. BECK: Oh, the type log, the one 11 that I was referring to most as the type log, is the Well 12 No. 3 of cross section B-B', Exhibit Number Six. 13 The name of the well is the Tom -- now 14 it's Sun, formerly the Tom Brown, No. 1 Antelope Sink Well, 15 in Section 18 of 19, 24. 16 And in my testimony I gave the tops of 17 the Third Sister, the top and the bottom, and other pertinent 18 correlations, like Antelope Sink Zone, top of the bank facies 19 the bottom of the bank facies. 20 And that would constitute my type log. 21 MR. STAMETS: Okay. Mike has one more 22 guestion. 23 24 25

50 1 2 QUESTIONS BY MR. STOGNER: Dr. Boneau, on page five of your testi-3 Q. mony, the drainage area was assumed to equal 320-acre pro-4 ration unit, do you feel this is a representative of the ac-5 tual radius of drainage? In this formation? 6 7 It was taken as 320 acres because that's A. the proration unit size. But some of the Cisco wells have a 8 good chance of draining that and some of them have a -- will 9 probably drain half or two-thirds, or something, of that. 10 It's as reasonable a number as I could 11 pick. I cannot stand here and defend that all of them are 12 going to drain 320 acres, no. 13 14 MR. STOGNER: Thank you, Dr. Boneau. 15 That's all I have. 16 MR. STAMETS: Any other questions of 17 this witness? He may be excused. Anything further in this case? 18 19 If there is nothing further, this case 20 will be taken under advisement, subject to submittal of the 21 supplemental data. 22 And the hearing is adjourned. 23 24 (Hearing concluded.) 25

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

DCT - 5 1981

CASE NO. 7352

RECEIVED

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 Fetroleum 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, Hr. 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 <u>doctor of science degree in physics from</u> 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 Cil Conservation Division of New Mexico.

1 1 2 STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT 3 OIL CONSERVATION DIVISION STATE LAND OFFICE BLDG. 4 SANTA FE, NEW MEXICO 21 October 1981 5 EXAMINER HEARING 6 7 IN THE MATTER OF: Application of Yates Petroleum 8 Corporation for designation of a CASE 7352 tight formation, Eddy County, New 9 Mexico. 10 11 12 13 BEFORE: Richard L. Stamets 14 15 TRANSCRIPT OF HEARING 16 17 APPEARANCES 18 For the Oil Conservation W. Perry Pearce, Esq. 19 Legal Counsel to the Division Division: State Land Office Bldg. 20 Santa Fe, New Mexico 87501 21 22 For the Applicant: Chad Dickerson, Esq. LOSEE, CA CON, & DICKERSON 23 P. O. Drawer 239 Artesia, New Mexico 88210 24 25

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4 1 MR. STAMETS: We will call next Case 2 7352. 3 4 MR. PEARCE: Application of Yates Petroleum Corporation for a designation of a tight formation, 5 Eddy County, New Mexico. 6 7 MR. DICKERSON: Chad Dickerson, of Artesia, New Mexico, Mr. Examiner, appearing on behalf of the 8 applicant, and we have two witnesses. 9 10 11 (Witnesses sworn.) 12 13 MR. DICKERSON: We call Mr. Ray Beck at 14 this time. 15 16 RAY BECK being called as a witness and being duly sworn upon his oath, 17 18 testified as follows, to-wit: 19 20 DIRECT EXAMINATION 21 BY MR. DICKERSON: 22 Will you state your name, your occupa-Q. 23 tion, and by whom you're employed, please? 24 Ray Beck, petroleum geologist, Yates A. 25 Petroleum Corporation, Artesia, New Mexico.

1 5 2 Mr. Beck, would you briefly summarize Q. 3 your educational and work experience background as it relates to this application? I have a Bachelor of Science degree and A. a Master of Science degree in geology from Texas Tech Univer-7 sity. I worked for Shell in Texas for nine years and I worked for Yates Petroleum for ten years in 10 southeast New Mexico. 11 And are you familiar with the subject Q. 12 lands in question? 13 A. Yes. 14 And have you prepared certain exhibits 0. 15 upon which you intend to rely today? 16 I have. A. 17 Would you briefly describe this formation a 18 for which tight formation designation is sought, Mr. Beck, 19 by geological parameters? And briefly state the purpose of 20 this application on behalf of Yates Petroleum Corporation? 21 As to the application, Yates Petroleum A. 22 Corporation seeks tight formation designation for a portion 23 of the Permo-Penn underlying lands in western Eddy County, 24 New Mexico, which are described in Exhibit Number One and 25 shown in map form in Exhibits Numbers Two and Three.

1 6 2 The description of the formation by 3 geological parameters is as follows: The formation sought to 4 be covered by this application is that stratigraphic interval 5 between the top of a marker named the Third Sister Cycle of 6 the Wolfcamp series of the Permian system, and the top of the 7 Canyon series of the Pennsylvanian system. 8 Correlations of the Third Sister Cycle 9 and the Canyon Series are shown on a network of four cross 10 sections spread over the subject area, Exhibits Five through 11 Eight. 12 Positions of the Third Sister and Canyon 13 geologic column are illustrated in Exhibit Number Four. 14 The Third Sister Cycle to Canyon Series 15 varies from approximately 1000 to 1400 feet in thickness. 16 Mr. Book, please refer specifically to Q. 17 Exhibit Number One and describe for the Examiner what this 18 exhibit reflects. 19 MR. STAMETS: If -- I don't believe I've 20 said the witness is qualified, but he is. 21 What is Exhibit Number One, Mr. Beck? 0. 22 Exhibit Number One is a list which dc-Α. 23 scribes the lands which overlie the Permo-Penn interval for 24 which tight formation designation is sought in this applica-25 tion.

1 7 2 Q. And that's approximately 318,000 acres 3 in Eddy County, New Mexico, is that correct? 4 A. That is correct. 5 Q. And what is reflected by Exhibit Number 6 Two? 7 Exhibit Number Two is a map of one inch A. 8 equal 5000 feet scale, which shows the lands described in 9 Exhibit Number One. 10 The subject area stretches over a por-11 tion of western Eddy County, New Mexico from the Pecos River 12 east of the City of Artesia to the Huapache Monocline some 13 forty miles to the southwest. 14 Also shown by circled well spots are all 15 wells within the outline which have penetrated the above de-16 fined Permo-Penn formation and/or lower horizons. 17 Red colored well spots are wells which 18 are currently producing gas from the above defined Permo-Penn 19 interval. 20 Deposits of the subject Permo-Penn inter-21 val are a complex of three major environments of deposition 22 or facies, shelf, bank, and basin facies. 23 The shelf facies, lying in bands to the 24 west or northwest, is comprised of interbedded limestones, 25 shales, siltstones, and sandstones.

1	8	
2	Terrigenous clastics, that is shales,	
3	siltstones, and sandstones, increase, and marine limestones	
4	and shales decrease, traversing from east to west or southeast	
5	to northwest; that is, in a shelfward direction.	
6	Deposits of the shelf facies are effective	ly
7	non-porous and impermeable, and constitute an up-dip mega-seal	
8	to the bank facies.	1
9	The bank facies is composed mostly of	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
10	marine limestones with a few intercalated marines shales.	÷
11	These marine limestones are made up of bioherms and their	
12	associated debris aprons interfingered with oolite bars.	
13	The porosity that is present is a result	
14	of preservation of primary porosity, principally of bryozoan	
15	material and creation of secondary porosity by leaching of	
16	oolitic grainstones and former aragonitic shell material.	
17	Most of the gas production that has been	
18	established in the subject Permo-Penn interval has been from	
19	deposits of the bank facies.	
20	The basin facies consists mainly of thin-	
21	bedded, fine-grained sandstones, siltstones, and shales, which	
22	were transported to the relatively deeper basin from the bank	
23	and shelf areas during periods of lower sea level.	
24	Main conduits for transport to the basin	
25	were through passes between segments of the bank facies.	

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1	9
2	Scattered within the overall basin facies
3	are isolated limestone or carbonate build-ups, termed isolated
.4	mounds. In some of the isolated mounds perosity has been
5	developed and/or preserved, but many are effectively non-porous
6	and impermeable.
7	Some of the isolated mounds have produced
8	gas. Wells in the basin facies which have encountered mounds
9	are indicated by the letter "M" close by the well spot.
10	About one-third of the subject Permo-
11	Penn interval in the upper part, has been termed the Antelope
12	Sink Zone, named for an interval in the Sun, formerly Tom
13	Brown, No. 1 Antelope Sink Unit, in Section 18, 19 South,
14	24 East. This well is shown on two cross sections, Exhibits
15	Six and Eight.
16	The geographical limits of shelf, bank,
17	and basin shown on Exhibit Two are for the Antelope Sink Zone
18	alone.
19	Lower zones of the subject Permo-Penn
20	interval are not shown, but their facies trends are essentially
21	parallel to those shown on Exhibit Number Two.
22	Exhibit Number Two also shows the traces
23	of the cross sections intorduced in later exhibits.
24	Q. Mr. Beck, please refer to Exhibit Number
25	Three and describe what it shows.

1 10 2 Α. Exhibit Number Three is identical to 3 Exhibit Number Two from the standpoint of scale, outline of lands, well spots, and colored well spots. 5 The purpose of this exhibit is to illu-6 strate the structural attitude of the Permo-Penn formation in 7 the subject area. Mapping was done on the top of the Ante-9 lope Sink Zone in the shelf and bank areas, and on top of the 10 Canyon Series in the basinal areas. 11 As the cross sections will show, the 12 Antelope Sink Zone is essentially parallel with the Third 13 Sister Cycle above. 14 Dashed contours are 100 feet contour in-15 tervals on top of the Antelope Sink zone. Solid contours 16 are 100 foot contour intervals on the top of the Canyon Series. 17 These contours indicate that over most 18 of the outlined area the Permo-Penn interval dips to the east, 19 southeast, at approximately 100 feet per mile; however, in 20 the southwestern part of the outlines area, near the Huapache 21 Monocline, the Permo-Penn interval dips east to northeasterly 22 at 200 to 300 feet per mile and structure is complicated by 23 faulting. 24 Structural relief on the top of the sub-25 ject Permo-Penn is approximately 3300 feet in the outlined

the Beach

1 11 2 area. Ground level elevations rise approximately 1500 feet 3 from wells near the Pecos River in Township 17 South, Range 26 East, to wells near the Huapache Monocline in Township 21 5 South, 21 East. 6 The drill depth to the top of the Third 7 Sister Cycle in the highest well, the Pennzoil No. 1 United 8 Federal, in Section 28 of 21 South, 21 East, is 4927 feet. 9 And the drill depth to the top of the Third Sister in the 10 lowest well, the HEYCO No. 1 Big Boggy State, in Section 36 11 of 17 South, 26 East, is 6717 feet. 12 The average depth to the top of the sub-13 ject Permo-Penn formation is thus 5822 feet, and there's a 14 correction from that in the statement we sent in to the OCD 15 and the USGS. There's a typographical error there of it 16 says 5827, but it's really 5822. 17 And that mistake is not material, Mr. Q. 18 Beck, is it --19 No. A. 20 -- for the purposes of this application? Q. 21 No, sir, it's just a typographical error A. 22 Refer to Exhibit Number Four and describe Q. 23 what it shows. 24 Exhibit Number Four illustrates the A. 25 stratigraphic column present in western Eddy County, New

12 1 2 Mexico. 3 This geologic section was compiled from New Mexico Oil Conservation Division reference cross sections 5 and other industry accepted correlations. The main purpose of this exhibit is to 6 7 show the Permo-Penn stratigraphic interval sought to be 8 covered by this application in relation to geologic time and 9 other stratigraphic horizons. Refer to Exhibit Number Five and describe 10 Q 11 what it reflects. 12 Exhibit Number Five is a northwest to Α. 13 southeast stratigraphic cross section, A-A', hung on the 14 Third Sister Cycle of the Wolfcamp Series. 15 This cross section is transverse to the three major facies trends of shelf, bank, and basin. 16 17 Other pertinent correlations shown are 18 the top of the Antelope Sink Zone of the shelf and bank 19 facies, top of the Pennsylvanian, by correlating with the 20 New Mexico Oil Conservation Division reference cross sections, 21 and the top of the Canyon Series. 22 Drill stem test, core, and completion 23 data are shown on the cross section. 24 Well No. 6 was cored in the Permo-Penn 25 and the core analysic report is given at a later exhibit.

1 13 2 Wells 2, 3, and 5 are currently producing Permo-Penn gas and have been assigned to the Eagle Creek 3 Permo-Penn Gas Field by the New Mexico Oil Conservation Divi-4 5 sion. Wells 4 and 6 should produce Permo-Penn 6 gas but they have not yet been completed in that interval. 7 Note that Well 8 produced gas from an 8 isolated mound. This well was assigned to the Atoka Cisco 9 West Gas Field, and produced 64,125 Mcf of gas and 146 bar-10 11 rels of condensate before abandonment in 1980. Mr. Beck, please go to Exhibit Number 12 0. 13 Six and describe what it shows. 14 Exhibit Number Six is a northwest/south-A. 15 east stratigraphic cross section, B-B', which is again hung 16 on the Third Sister Cycle and is transverse to the three 17 major facies of shelf, bank, and basin. I might just add here off -- off the 18 19 written thing that we handed in, that we're moving from 20 north essentially to south on these three transverse cross 21 sections. 22 A key correlation well, the Sun, Tom Brown, No. 1 Antelope Sink Unit, is Well 3. Tops pertinent 23 24 to this application are picked in this well as follows: 25 Third Sister, 5860; Antelope Sink Zone, 6080; top of the

1 14 bank facies, 6140; top of the Pennsylvanian, by correlation 2 with the New Mexico Oil Conservation Division reference cross 3 sections, 6190; base of the bank facies, 6449, on the written transcript we sent earlier it was 6420. That's a mistake. 5 It should be 6449. And the Canyon Series is 7060. 6 7 Note that the perforated interval straddles the systemic boundary between the Permian and the Penn-8 9 sylvanian. 10 And Antelope Sink Unit No. 1 has been assigned to the Antelope Sink Upper Penn Gas Field. 11 12 Well 4 should also produce Permo-Penn gas but it has not yet been completed in that zone. 13 14 Refer to Exhibit Number Seven, Mr. Beck, Q. 15 and describe what it shows. Exhibit Number Seven is another northwest 10 A. 17 to southeast stratigraphic cross section, C-C', which is also 18 hung on the Third Sister Cycle. 19 Wells 4 and 6 are producing gas from the 20 Permo-Penn formation and have been assigned to the Box Canyon 21 Permo-Penn Gas Field. 22 Now refer to Exhibit Number Eight, please, 0. 23 and describe what it shows. 24 A. Exhibit Number Eight is a southwest to 25 northeast stratigraphic cross section, D-D', which is hung on

1 15 2 the Third Sister Cycle. This longitudinal, or strike, cross 3 section is more or less parallel to the major facies of shelf, 4 bank, and basin. 5 The purpose of this cross section is to 6 tie the three previous transverse cross sections. 7 It may be noted that the main gas productive 2 Antelope Sink Zone bank facies correlate very well, on the 9 left, from the Box Canyon Permo-Penn Gas Field to Antelope 10 Sink Upper Penn Gas Field to the Penasco Draw Permo-Penn Gas 11 Field to the Eagle Creek Permo-Penn Gas Field. 12 Mr. Beck, were Exhibits One through Q 13 Eight prepared by you or under your direction and supervision? 14 Yes, they were. A. 15 MR. DICKERSON: Mr. Examiner, at this 16 time Applicant would move admission of Exhibits One through 17 Eight. 18 MR. STAMETS: These exhibits will be 19 admitted. 20 MR. DICKERSON: And that concludes our 21 direct testimony from this witness. 22 23 CROSS EXAMINATION 24 BY MR. STAMETS: 25 Mr. Beck, you've presented quite a number Q.

1 16 2 of logs here. I want to discuss just briefly what produces 3 in this interval, or what may produce. As you were going through here you named 5 off certain wells and indicated that a zone might be productive 6 later on which wasn't completed there now. 7 It would appear to me as though in your 8 discussion primarily you are looking at the bank facies or 9 these mounds as being the producing intervals throughout this 10 section. 11 A. Correct. 12 Are any of the other zones outside the 0 13 banks or mounds apt to be productive? 14 In this -- in this geographical area A. 15 they're all -- they're either completed from the bank facies 16 or from the isolated mounds. There is nothing producing, or 17 there's no sand intervals to be produced -- that are producing. 18 These are all carbonates. 19 What we tried to do here is include the 20 bank and the isolated mounds together because they're both 21 carbonates, they're both tight, as will be presented by the 22 following witness from the engineering data. We just tried 23 to pick something that could be correlated throughout this 24 geographical area and to include all the carbonates that 25 produce in this thing in that envelope between the Third Sister

1	17
2	a: we picked it on the Tom Brown Antelope Sink Well and the
3	Canyon.
4	Really, so far all that's been produced
5	is the bank facies and a few of the isolated mounds, and most
6	of the isolated mounds are really either tight or haven't
7	or are limited.
8	Q. The engineering witness who we will hear
9	shortly, will be making his determinations as to productivity,
10	permeability, from the same bank and mound sections.
11	A. Yes, sir. He has got every well listed
12	that has penetrated the Permo-Penn at least as far as the
13	Canyon, and all the wells that are currently producing, has
14	the data on all of those, and he can show from that.
15	We were just trying to establish here
16	the geological parameters of the formations we're wishing to
17	be designated as tight formation, and also the geographical
18	area.
19	Q But you would not expect to be making
20	a well in the first 100 feet of the section anywhere.
21	A. No, sir, it's all tight Wolfcamp beds,
22	and I can think of nothing in the geographical area in this
23	envelope that's not that would not be tight.
24	Q. Okay.
25	MR. STAMETS: Any other questions of

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1 18 2 this witness? He may be excused. 3 MR. DICKERSON: Call Mr. David Boneau at this time. 5 6 DAVID F. BONEAU 7 being called as a witness and being duly sworn upon his oath, 8 testified as follows, to-wit: 9 10 DIRECT EXAMINATION 11 BY MR. DICKERSON: 12 Will you state your name, your occupation, Q. 13 and by whom you're employed? 14 I'm David Boneau. I'm a reservoir en-A. 15 gineering supervisor for Yates Petroleum Corporation in 16 Artesia, New Mexico. 17 Mr. Boneau, have you -- would you briefly a 18 summarize your educational and work experience for the Exa-19 miner? 20 I have a BAchelor of Science de-Yes. A. 21 gree in physics from the University of Notre Dame in 1962 22 and a PhD in physics from Iowa State University in 1969. 23 For twelve years after I worked for 24 Phillips Petroleum Company in Bartlesville, Oklahoma, and 25 in Odessa, Texas. In Odessa I was reservoir engineer for the

1 20 2 atmospheric pressure of wells completed to: production in 3 this formation without stimulation is not expected to exceed 188,000 cubic feet for production from the average depth of 5 5822 feet. 6 And thirdly, no well drilled into this 7 proposed tight formation is expected to produce without 8 stimulation more than five barrels of crude oil per day. 9 Mr. Boneau, would you refer to Exhibit Q. 10 Number Two, previously introduced, and describe what is perti-11 nent on that exhibit insofar as your testimony is concerned? 12 Okay. Exhibit Two is the map presented A. 13 by the previous witness on which is outlined the area for 14 which the tight gas designation is sought. 15 The red dots show the location of the 16 50 wells that are completed in the designated Permo-Penn in-17 terval, as of January 1, 1981. 18 Triangles indicate wells where drill stem 19 test data was used to calculate in situ permeability of the 20 pay section. There are ten triangles and we'll discuss those 21 permeability calculations in detail later on. 22 And there's one square which indicates 23 the location of the well where core data is available. 24 Mr. Boneau, at this time please refer 0. 25 the Examiner to your Exhibit Number Nine and describe what is

1 19 2 Goldsmith District and in Bartlesville I served in various 3 responsibilities, including reservoir enginerring supervisor 4 for the Phillips R & D Department. 5 Q. Mr. Boneau, as part of your responsibi-6 lities, have you made an examination and a study of the wells 7 in question upon which you intend to testify today? 8 A. Yes, sir. 9 Q. And are you familiar with this applica-10 tion? 11 Yes, sir. A. 12 MR. DICKERSON: Mr. Examiner, is this 13 witness considered qualified? 14 MR. STAMETS: He is. 15 Mr. Boneau, would you briefly state what Q. 16 you intend to show by the exhibits upon which you will testify? 17 Yes. The data that I'm going to present A. 18 will show that the Permo-Penn interval defined by the previous 19 witness meets the guidelines set forth by the Federal Energy 20 Regulatory Commission for designation as a tight sand formation 21 under Section 107 of the Natural Gas Policy Act. 22 These guidelines require, first, an esti-23 mated in situ gas permeability throughout the pay section of 24 less than 0.1 millidarcy. 25 The stabilized production rate against

1 21 2 reflected in it. 3 Exhibit Number Nine is a 29 -- 26 page A. 4 list of all wells within the boundary of the proposed area 5 that were drilled deep enough to penetrate the designated 6 Permo-Penn interval. 7 Information on these 333 wells includes 8 well name, location, operator, spud date, total depth, field, 9 and production up to January 1, 1981. The list is current 10 to the start of 1981. That was our cutoff. 11 Most of these wells were drilled as 12 Morrow prospects to depths near 9000 feet. 13 There are 119 Morrow producers in the 14 proposed area. These Morrow wells have produced a total of 15 82.2 billion standard cubic feet for an average of 691 million 16 standard cubic feet per well. The Morrow is the principal 17 gas producing interval in this area. 18 Many of the deep wells in Exhibit Number 19 Nine will be completed in the designated Permo-Penn formation 20 at some point in the future if the Permo-Penn gas can be 21 produced economically. 22 In addition, exploratory drilling for 23 Morrow gas will be stimulated somewhat when the tight gas 24 sand designation makes the Permo-Penn interval a more attractive 25 salvage zone.

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2	That's enough about Exhibit Nine, I
3	think.
4	Q Refer to Exhibit Number Ten and describe
5	what it shows.
6	A. Exhibit Number Ten is a list of the 50
7	wells completed in the designated Permo-Penn interval as of
8	January 1, 1981. Most of the engineering data on the subject
9	formation will come from the wells in Exhibit Number Ten.
10	Although the average depth to the top
11	of the designated Permo-Penn interval is 5922 feet 5822
12	feet, thank you production from 49 of the 50 wells comes
13	from below the 5822 feet. The average depth to the top of
14	the pay zone in these 50 wells is 6490 feet.
15	These wells have produced a total of
16	9.01 billion standard cubic feet for an average of 180 million
17	standard cubic feet per well.
18	MR. STAMETS: Would you give me the
19	average depth for the completion interval on those again,
20	please?
21	A. Surely. The average depth to the top
22	of the pay zone, the top perforation in the 50 wells, is
23	6490 feet.
24	MR. STAMETS: Okay, and then the average
25	production?

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1 23 2 A. The average production is 180 million 3 standard cubic feet per well. MR. STAMETS: Thank you. 5 A. Surely. 6 Q. Mr. Boneau, please refer to Exhibit Num-7 ber Eleven and describe what it represents. 8 A. Exhibit Eleven is a list of wells that were spudded or completed in the designated Permo-Penn inter-9 10 val after July 15th, 1979. 11 These eight wells are the only ones out of the 50 wells in Exhibit Number Ten that would be eligible 12 for tight gas prices, according to my understanding of the 13 rules, should the present application for tight gas designa-14 15 tion be approved. 16 Approximately five additional wells have come on line in 1981, and according to my understanding, again 17 18 these would also be eligible if the tight formation designa-19 tion is approved. 20 All production from the other 42 active 21 wells will never be eligible for tight gas prices under cur-22 rent regulations. 23 MR. STAMETS: Mr. Boneau, to your know-24 ledge, were any of these wells on Exhibit Eleven, plus the 25 five that you discussed, drilled specifically for the Permo-

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1 24 2 Penn or were those all deeper wells? 3 My memory says that they were all drilled A. 4 initially to the Morrow. They were all drilled deeper. 5 MR. STAMETS: Okay, thank you. 6 I have reason to believe that's correct, A. 7 since Mr. Beck is over here nodding. 8 So our point in Exhibit Eleven is that 9 our application mainly seeks a long-term opportunity to produce 10 gas from the designated Permo-Penn formation by recompleting 11 wells originally drilled to deeper horizons, and recompleting 12 them in the future, for the most part. 13 Now, Mr. Boneau, would you kindly analyze Q. 14 your engineering data available? 15 Do you really want to use all this A. 16 stuff? 17 As far as it pertains to this application. Q. 18 How about I try to show it in a list. A. 19 Okay. Q. 20 MR. DICKERSON: Mr. Examiner, please 21 note that the written information furnished as the statement 22 of the meaning and purpose of each exhibit does analyze these 23 formulas and so forth in considerably more detail than Mr. 24 Boneau will now go into. 25 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 fore-

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going 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.

15 The estimated average in situ gas perme-16 ability throughout the pay section was calculated by two 17 standard methods that are widely accepted in the industry. 18 These methods include, first, permeabi-19 lity calculation from pressure build-up data taken during 20 drill stem tests; and second, laboratory measurements on a 21 cored section of the designated Permo-Penn interval from one 22 well, a single well. 23 First I'm going to talk about permeabi-

24 lity calculated from drill stem test data. This kind of
25 data will give a good representation of the in situ perme-

1 26 ability, since the drill stem test is performed while the 2 well was still being drilled; the formation has been altered 3 relatively little from its natural condition. If there is 4 5 some formation damage due to the drilling mud, most of this 6 damage is removed during the preflow phase of the drill stem 7 test. In contrast, pressure data taken after 9 the well is acidized or fractured will give higher values for 10 the permeability because the formation has been etched and 11 broken by the treatments. 12 Okay. 13 Mr. Boneau, refer to Exhibit Number Q. 14 Twelve, please, and describe what it shows. 15 Exhibit Number Twelve shows data from A. 16 the drill stem test at ten wells within the proposed area. 17 The locations of these wells are indicated by triangles on 18 Exhibit Number Two. 19 Of the ten wells only Murphy NW Federal 20 No. 1 is not presently completed in the desginated Permo-21 Penn formation. This well was cored and drill stem tested 22 in the Permo-Penn interval, but it is now a completed Morrow 23 producer. 24 The values of permeability calculated 25 from the drill stem tests, which are the second column from

1 27 2 the right on Exhibit Twelve, range from 0.003 millidarcy for the Irish Hills "KW" State No. 2, up to 0.091 millidarcy for 3 La Cama No. 1. The average permeability for the ten 5 wells was determined to be 0.031 millidarcy. 7 The last column in Exhibit Number Twelve, 8 the one that's labeled "Years to Reach Pseudo-Steady State", 9 gives the approximate time required for a pressure disturbance 10 at the wellbore to reach the outer boundary of the reservoir 11 feeding the well. 12 Said another way, gas near the outer 13 boundary of a reservoir begins to move towards the wellbore 14 at the time indicated in the righthand column in Exhibit Num-15 ber Twelve. 16 Flush production of gas relatively near 17 the well occurs until the whole reservoir is feeding the 18 well. Then the pressure begins to drop with time uniformly 19 throughout the reservoir and the flow rate becomes stabilized. 20 The calculated time to reach stabilized 21 flow ranges from 1.8 years for Well Cities "JG" State No. 1, 22 up to 33 years for Irish Hills "KW" State No. 2. 23 The average time was determined to be 24 10.7 years to reach this stabilized flow. 25 The idea of using a time to reach stabi-

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2	overburden pressure within the Permo-Penn formation is really
3	about 3300 psi, and special core tests were required in order
4	to correct the results of routine core analyses for the
5	effect of the actual overburden pressure.
6	The results of these special tests, per-
7	formed at an overburden pressure of 3300 psi, are listed in
8	the last two columns of Exhibit Number Thirteen.
9	o Exhibit Number Thirteen shows both
10	the routine core data and the special core data on the Murphy
11	cores.
12	Q Refer, Mr. Boneau, to Exhibit Number
13	Fourteen and describe what it shows.
14	A Exhibit Number Fourteen shows the corre-
15	lation that was developed between the routine permeability
16	at 200 psi overburden pressure and the in situ permeability
17	at the actual overburden pressure of 3300 psi.
18	Data from the petroleum literature was
19	used to help define this relationship, since there are rela-
20	tively few data points available from the Murphy core. And
21	an awful lot of the data points appear in the lower lefthand
22	corner at very low permeabilities, and there aren't very
23	many data points in the body of the figure, and I thought
24	that the Amoco experience in the laboratory would help define
25	that relationship.

28 1 lized flow was introduced here because it follows naturally 2 3 from the calculation of the formation permeability from the drill stem test data. 5 I intend to discuss the stabilized flow 6 idea in more detail after all the data on permeability has 7 been presented. Mr. Boneau, refer to Exhibit Number Thir-8 0. 9 teen and describe what it shows. 10 Okay. The second procedure for obtaining A. in situ permeability is to measure the permeability of actual 11 cored sections of the Permo-Penn rock in a laboratory. 12 13 The only core data available comes from 14 the Murphy "NW" Federal No. 1 Well, which was the well marked 15 with a square in Exhibit Number Two. 16 A log of the Permo-Penn interval in the 17 Murphy Well is -- appears in Exhibit Five as Well No. 6. 18 Exhibit Thirteen, then, shows the perm-19 eability measured by CORE Laboratories for the 72 feet of 20 core recovered from this well. Special tests were run on 21 16 samples from the Murphy core to evaluate the effect of 22 overburden pressure on the core samples in order to determine a representative value for the in situ reservoir permeability 23 Routine core analyses are normally run 24 25 with a confining or overburden pressure of only 200 psi. The

1 30 2 So the dashed line in Exhibit Fourteen 3 is a correlation developed by a Mr. Jones and Mr. Owens of Amoco Production Company for rocks where overburden pressure 4 5 has a minimum effect on permeability, and the reference is 6 on Exhibit Fourteen as SPE 75-51. 7 And this Amoco work was reported in the 8 Journal of Petroleum Technology in September of 1980. 9 The solid line in Exhibit Fourteen was 10 drawn parallel to the dashed line in order to better fit the 11 actual points for the Murphy core. This solid line was used 12 to convert the routine permeability values into in situ per-13 meabilities values at 3300 psi overburden pressure. 14 What is shown by Exhibit Number Fifteen? Q 15 A. Exhibit Number Fifteen tabulates the 16 permeabilities of the core material from the Permo-Penn pay 17 section in the Murphy "NW" Federal No. 1. Those sections of 18 the interval that the electric log condemned as nonproductive 19 are omitted. 20 The average routine permeability for the 21 Murphy Well is 0.116 millidarcy, indicated at the bottom of 22 the fourth column. 23 It happens that the in situ permeability 24 corrected for overburden pressure taken from core data, which 25 is the number at the bottom of the fifth column in Exhibit

1 31 Fifteen, both came out to be 0.035 millidarcy for the Murphy 2 "NW" Federal No. 1, and I don't believe it, but that's the 3 way it turned out. The Murphy Well can be considered a 5 typical well, since its in situ permeability of 0.035 milli-6 darcy is very close to the average 0.031 millidarcy for the 7 ten wells that we talked about drill stem test data in Exhibit 8 Number Twelve. 9 10 So as a summary of the permeability data, 11 we have two types of data, the average in situ permeability 12 from drill stem test data, 0.031 millidarcy; the average in situ permeability from the available core data, 0.035 milli-13 14 darcy. 15 Both types of engineering data indicate 16 that the permeability of the designated Permo-Penn pay section 17 is comfortably below the 0.1 millidarcy. 18 What is shown by Exhibit Number Sixteen? Q. 19 Okay. The second criteria relates to the A. 20 gas flow rates and then the third criteria is the oil flow 21 rates. 22 The data on the flow rates before stimu-23 lation are not available for the vast majority of the wells 24 that produce in the designated Permo-Penn formation. The 25 natural flow rates are so low that they are routinely neither

1 32 measured nor recorded. The normal completion procedure has 2 been to perforate and treat the well immediately. 3 In the absence of data on natural flow 4 rates, we propose to use production data for the stimulated 5 wells at a time in their life when the production rates are 6 approaching stabilized rates. 7 Exhibit Twelve showed that the time to 8 reach the stabilized rate varied from 1.8 to 33 years and 9 averaged 10.7 years. Thus, actual flow rates measured two 10 years into the lives of the Permo-Penn wells will be either 11 near stabilized rates or still considerably higher than the 12 13 stabilized rates. 14 Exhibit Sixteen shows actual production rates for the 24th calendar month in the producing lives of 15 the wells that are producing from the designated Permo-Penn 16 17 formation. 18 Only 34 of the 50 wells have been pro-19 ducing for two years or longer, and the average rate of gas 20 production for the 32 wells is 144,000 cubic feet per day at 21 the bottom of the first set of figures in Exhibit Sixteen. 22 And the average rate of oil production, 23 which is at the bottom of the last set of figures in Exhibit 24 Sixteen, is 0.6 barrels of oil per day. 25 The gas rates vary from one to 655,000

1 33 2 cubic feet per day, and only two wells produced over 300,000 cubic feet per day. 3 The oil rates vary from zero to 4.1 barrels of oil per day after two years. Only one well produced 5 over two barrels of oil per day, and no well produced as much 6 as five barrels of oil per day in the 24th month after it 7 began production. 8 9 The FERC guidelines require that the gas 10 flow rate be measured against atmospheric pressure. The 11 average flow rate of 144,000 cubic feet per day calculated 12 above for stimulated wells, was measured against pipeline 13 pressures of 150 to 300 psi. 14 The corresponding flow rate at one atmos-15 phere is given by the equation -- I guess I'm stuck with 16 reading the equation -- the flow rate at one atmosphere is the 17 flow rate, the actual flow rate, times the quantity p^2 minus ${\tt P}^2$ at 1 atmosphere over the quantity ${\tt P}^2$ minus ${\tt P}^2$ 18 actual 19 conditions. 20 Now, you just -- why don't we -- can we 21 just go back and skip this? 22 MR. STAMETS: Is that shown somewhere? 23 A. Yeah, it's shown on the paper. 24 MR. STAMETS: What page is that on, Mr. 25 Boneau?

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1	34
2	A. Bottom of page seven.
3	MR. STAMETS: Okay.
4	A. Why don't we just go back to saying that
5	we calculated for stimulated wells measured against pipeline
6	pressures of 150 to 300 psi. When we calculate the stabilized
7	flow rate for production against atmospheric pressure the 144
8	Mcf per day becomes 146 Mcf per day in making that correction.
9	So the rates in Exhibit Sixteen are maxi-
19	mum values, I believe, since all the data applies to stimulated
1.	wells and since many of the wells have not yet actually stab-
12	ilized. Thus, the average gas production rate is about 146,000
13	cubic feet per day, or less, and the maximum of oil production
14	rate is about 4.1 barrels of oil per day, or less, under
15	stabilized non-stimulated conditions.
16	Q. Mr. Boneau, what is known regarding the
17	techniques for protection of the fresh water zones in the land
18	in question?
19	A. Okay. All the wells proposed for tight
20	sand designation, all of this area, lies within the Roswell
21	Artesian Water Basin, as established by the New Mexico State
22	Engineer. This Roswell Artesian Water Basin is a main source
23	of fresh water to Chaves County and northern Eddy County.
24	Regulations governing the drilling of
25	oil and gas wells within the Basin are enforced by the New

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1	35
2	Mexico Oil Conservation Division in order to protect the
3	fresh water formations.
4	These regulations require that a water
5	protection string be set and cemented through the fresh water
6	bearing strata.
7	The base of the Artesian aquifer lies
8	at a depth of about 1000 feet at the north end of the proposed
9	area and at a depth of about 1400 feet at the south end.
10	In a typical casing program conductor
11	pipe is set at a depth of 300 to 400 feet and cement is cir-
12	culated to surface in arder to protect the shallow fresh water.
13	Then an intermediate string of casing
14	is set about 100 feet below the base of the Artesian aquifer
15	at a depth of 1100 to 1500 feet. Cement is circulated to
16	surface behind the intermediate string to protect the Artesian
17	aquifer.
18	The production casing is then set at the
19	total depth of the well, which is usually in the Morrow form-
20	ation, and cemented with 400 to 1000 sacks of cement. This
21	provides a cement shield approximately 1000 feet above the
22	top of the Permo-Penn designated formation.
23	The application to drill and the casing
24	program for each individual well must be approved by the New
25	Mexico Oil Conscrvation Division, and by the United States

1 36 2 Geological Survey for wells on Federal lands. 3 What is shown by your Exhibit Number 0. 4 Seventeen? 5 Exhibit Seventeen summarizes the engineer-A. 6 ing data that has been presented on the designated Permo-Penn 7 formation. 8 The average in situ reservoir permeability 9 determined by two standard methods, averages less than the 10 allowed 0.1 millidarcy. 11 The average stabilized flow rate for gas 12 is below the maximum allowed daily rate of 188,000 cubic feet 13 per day. 14 And lastly, no well produces as much as 15 five barrels of oil per day under stabilized conditions. 16 Mr. Boneau, were Exhibits Numbers Nine Q. 17 through Seventeen either prepared by you or under your direction 18 and supervision? 19 Yes, sir. A. 20 MR. DICKERSON: Mr. Examiner, at this 21 time Applicant moves admission of Exhibits Nine through Seven 22 teen. 23 MR. STAMETS: They are accepted. 24 MR. DICKERSON: And that concludes our 25 direct testimony.

1 37 A. Well, may I say one more thing? 2 Q. Yes, go ahead. Do you have anything 3 else you would like to add, Mr. Boneau? Mike Stogner called me on Monday about--A. 5 asking about more detailed data on the drill stem test, and 6 yesterday I prepared quickly some of the data, most of the 7 data, all the data, on four of those ten drill stem tests, 8 and if that question comes up we can talk about it to that 9 extent, or at least I responded to that telephone call to that 10 11 extent. 12 MR. DICKERSON: That concludes our direct 13 testimony, Mr. Examiner. 14 15 CROSS EXAMINATION 16 BY MR. STAMETS: 17 Referring to Exhibit Sixteen, and also Q. 18 Exhibit Twelve, you gave us some information on what you 19 feel a reasonable figure should be for the unstimulated 20 production rates. 21 Why didn't you show the rates for those 22 DST's on Exhibit Twelve? It would seem like that would give 23 us unstimulated production rates, actual unstimulated pro-24 duction rates. 25 That's a good question and I just happen Α.

1 38 2 to have in my pocket a list of those ten drill stem test rates 3 a Good. I will write those figures down on my copy of this exhibit. I may wind up asking you to do 5 the same later. 6 MR. PICKERSON: We'll be glad to submit 7 those. 8 The reason that they're not there was 9 that I had the feeling that the 50 wells, that I didn't want 10 to use too small a sample for the average. 11 0. Right. 12 A. And so I went for something that would --13 big numbers, and got 34 wells, finally. Okay. 14 That's no excuse for not giving you ten 15 for you to do whatever you want with them, and I apologize 16 for that. 17 Oh, hell, I don't -- let's see if I have 18 them in the same order that you have them. 19 The first one is 25 Mcf --... 20 Q And that's the Box Canyon Well. 21 Α. Box Canyon. 22 Q. All right. 23 Cities "JG", 189. Cities "JH", 56. Α. 24 City of Artesia, 83. Federal "BZ" 12, 29. Griffin "JJ", 190. 25 Irish Hills "KW" No. 2, I have 70 written down. I remember

1 39 it was 59.2, I think, actually, but 70 is fine. La Cama, 2 136. Murphy "NW", 221. And Powell "DG", 48. 3 Have you averaged those? 4 Q, 5 A. The average is 105. 6 And that's below the magic 188. 0. 7 A. It's below the 188. It's below the 144 8 that we get by using actual production at pseudo-steady state 9 conditions. 10 Q. Have you compared those tigures with the 11 ones that you derived on Exhibit Sixteen for the wells that 12 are producing? 13 A. No, but I'm willing to do it with you 14 now, if you'd like. 15 Let's just take a look at some there. Q 16 Box Canyon 4-A, you've got 655 on Sixteen. 17 As compared to 25. Box Canyon 4-A re-A. 18 sponded to its stimulation. So, that's the highest production 19 rate there. That's right. 20 And Cities "JG" has produced for less Q. 21 than two years --22 Less than two years. A. 23 -- and there are no figures. Q. 24 "JH" is 96 compared to 56. A. 25 City of Artesia, 55, is below the drill

40 1 2 stem test value, 83. Federal "BZ" is 2 compared to it was 3 29, and the Griffin "JJ", 288, responded somewhat to stimulation. 5 Q. Is that right? My eyes don't track 6 straight across that page. 7 Yes, that's correct. Thank you. 8 A. Irish Hills "KW" has been on line a very 9 relatively short time and there's no value. La Cama now pro-10 duces 337, or its production rate after two years was 337, 11 compared to 136 on the drill stem test. 12 Murphy is the well that's a Morrow pro-13 ducer, has not yet been completed in the designated Permo-14 Penn formation. 15 And the Powell "DG" produces 175 com-16 pared to 48 on the drill stem test. 17 So the actual production is, after stim-18 ulation, and let's see if there's really -- really what kind 19 of correlation would we develop. 20 La Cama, that should stabilize in about 21 two years. You'd think that those numbers would be roughly 22 the same, and it's up to you whether 136 and 337 are roughly 23 the same. 24 At the bottom, Powell "DG" is 175 com-25 pared to 48, but it should take 14 years to stabilize, so

1 41 2 it's reasonable that 175 is still above 48. 3 City of Artesia, that stabilizes in two years; is 55 instead of 83, which is a reasonable comparison, 4 5 so maybe we could make it sound like there was a reasonable 6 comparison. 7 Q When you averaged the rates on Exhibit 8 Sixteen did you include those wells that had produced less 9 than two years in your --10 A. Oh, no, no, no. 11 The average down there is the sum of the 12 numbers divided by 34. 13 Okay, and 34 of those wells had produced Q 14 for two years. 15 A. Right. 16 And the other with asterisks didn't, but Q. 17 they didn't enter into the calculation. 18 But they did not enter into the calcula-A. 19 tion one way or the other. 20 And of those wells, only one is shut-in, Q. 21 so that really has no significant effect on the final outcome 22 of what you've calculated there. 23 A. Let me state that more precisely. The 24 average 144 is the sum of those numbers divided by 34. 34 25 is the number of entries, number of numerical entries in the

42 1 column. So there are -- there are 34 numbers, 14 asterisks, 2 and 2 SI's. The SI's and the asterisks did not enter in the 3 calculation. 4 I'm sorry to confuse you. 5 Well, that's all right. That's easy to 6 Q. 7 do in these cases. 8 Certainly Exhibit Twelve intends to, if not confirm Exhibit Sixteen, but would tend to indicate, if 9 10 anything, Exhibit Sixteen may be overly generous in this cal-11 culation of production against atmospheric pressure. 12 A, I agree. We -- I told the people that 13 worked on this with me that we were going to make every doubt 14 in the -- on the side of being generous, and we, I think, we 15 did that. 16 I tried consciously to do that. 17 Now I presume somewhere are the formulas 0. 18 and factors used in calculating permeability shown on Exhibit 19 Twelve. 20 They -- they are in these pages that I A. 21 prepared in response to Mike's telephone call, and I have 22 two copies of information on four of the wells. That, I 23 think, is representative of the whole thing and it's just as 24 many as I could get together in an organized fashion in one 25 day.

1 43 2 Q There is no problem, though, with sub-3 mitting this information on all of these wells subsequent to 4 the hearing. 5 A. If you want that information, you'll get 6 that information, I assure you. 7 Okay. Could you give one copy of what Q. 8 you have to Mike and let him take a quick look at it and see 9 if he has any problems with the data on it? 10 I do have the original on it, an original A. 11 and two copies, and I'm going to keep the originals. 12 The reason for the scarcity of -- of 13 copies is that one of the exhibits for each well is a log and 14 it was hand-clored in and the hand-coloring is kind of a 15 limiting factor in getting very many copies made. 16 But you do have the formula on the 0 17 front, plus the calculated deliverability -- or --18 Okay, can I try to explain what's there? A. 19 Q. Yeah, you may. 20 There's a summary page on the front with A. 21 the formulas and the numbers built into the calculations. 22 There's a Horner plct with a dashed line 23 drawn through what we took as the straight line portion. 24 There's a gas analysis for the gas from 25 the well, which was used to determine properties like Z, the

1 44 deviation factor, and the viscosity of the gas. 2 3 Then there are three pages that are copied from the Halliburton drill stem test report, which --4 the first is like a summary of the drill stem test; then there's 5 the pressure build-up data; and then there's a sheet where 6 Halliburton has listed what it -- the steps it took during 7 the drill stem tests and the rates that it measured. 8 9 Then there's a log of the region around the drill stem test interval, with the area showing gas effect 10 outlined in red, and the height of the pay section when the 11 drill stem test was taken from that log. 12 13 And on the front page at the bottom we 14 put references of where we got the equations and where we got the charts for the Z factors and the viscosities, and such. 15 16 We did not include actual copies of those correlations. 17 MR. STAMETS: Mike will just --18 MR. STOGNER: This is what I want. 19 MR. STAMETS: This is what you want. 20 Okay, so if they can submit that on all the wells, if we have 21 any problems with it, we can correspond and try to get a reso-22 lution of them. 23 MR. STOCNER: This will answer a lot of 24 my questions. 25 À. On one of the wells I found what I would

45 1 consider a mistake and it lowered the actual measured perme-2 ability, I think, from .003 to .002, or something, but you 3 may notice that I've noted that for your information on this 5 form. 6 MR. DICKERSON: Should we submit those 7 as numbered exhibits? 8 MR. STAMETS: Why don't you just submit 9 that as supplemental information to the Exhibit Number Twelve? 10 MR. DICKERSON: Okay. 11 MR. STAMETS: And you can just label each 12 one with the well name so it's obvious which they belong to, 13 and then if upon review of this data we have any questions, 14 we may have to seek further clarification. 15 But it does appear that you have here 16 submitted the type of information that we're looking for on 17 these wells, which will allow us to make the proper evaluation. 18 Have you got any questions? 19 MR. STOGNER: Yes, I do have a question. 20 MR. STAMETS: Okay. 21 22 QUESTIONS BY MR. STOGNER: 23 On our Murphy "NW" Federal No. 1, where Q. 24 the core was taken, do you feel this was drilled into one of 25 the isolated mounds?

1 46 2 A. No. No, it's in the bank, I believe, 3 isn't it? Up here, just barely inside this bank, 5 basin, but it was not a mound up here. MR. STAMETS: That's No. 6 on A-A'. Okay. 7 Q. Well, do you feel this is representative 8 to the mounds that are in this tight sand area, this core 9 sample? 10 I feel it's as representative of those A. 11 as any one core is going to be representative of anything. 12 The overburden pressure was calculated Q. 13 to be 3300 psi. I guess it was a gradient of .5085 psi per 14 foot and you used the average top of the formation at 6490. 15 Is this again representative of the area, and how did you 16 calculate that? 17 The Murphy core was taken before I worked A. 18 for Yates Petroleum. I attempted to track down who used 19 3300 psi as the overburden, as the representative overburden 20 pressure, and it's -- that would be representative of the 21 Murphy rather than the whole thing, since it's talking about 22 the Murphy. 23 The two people involved both said that 24 the other person was responsible, so I did my own calculation 25 based on what I saw in the literature, and I have trouble re-

47 1 2 producing that right at the moment, but I got like it ought 3 to be 4900, which would make the permeability even lower, and so I don't think --4 5 Something like .6 psi per foot gradient? Q 6 A. Okay, what I read up on it, you know, and 7. 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 8 9 minus the reservoir pressure. 10 And I found that used in other tight gas 11 sand hearings and in petroleum literature, and that gives, 12 like you say, about .6 psi per foot. 13 Anyway, we'd say that the 3300 is an 14 order of magnitude number that somebody picked as representa-15 tive. 16 MR. STOGNER: That's all the questions 17 I have. 18 And that's all I can support it with. A. 19 20 RECROSS EXAMINATION 21 BY MR. STAMETS: 22 One of Mr. Stogner's questions stimulated Q. 23 one more. 24 Are any of the tests shown on Exhibit 25 Twelve in a mound?

1 48 2 I don't think so. Ray? A. 3 MR. BECK: There's one right there. No. There's one right there, the well in 2, 19, 24. 4 5 Irish Hills. A. 6 MR. STAMETS: That would be the Irish 7 Hills. 8 Yeah, I thought of that question this A. 9 morning and I didn't have a chance to look it up, but--10 MR. BECK: La Cama. 11 A. So apparently the answer is La Cama and 12 Irish Hills. 13 MR. BECK: No, no, Irish Hills isn't 14 in a mound. It's just La Cama. 15 A. Is that the agreed answer, that one of 16 them is in a mound, and that's La Cama? 17 MR. BECK: The only triangle that's in 18 a mound is the La Cama Well in 20 of 18, 25. 19 MR. STAMETS: And that was 136, again 20 below the magic 188 figure. 21 Mr. Beck, did you -- since you're up and 22 about, did you recommend a type log for this area? 23 MR. BECK: Well, sir, we reproduced 24 the logs on the cross sections at 2-1/2 inches equal 100 25 feet, so people could see and actually calculate the porosity

1 49 2 off of the compensated neutron - formation density logs, 3 which most of the logs are, there are some sonic logs, but they 4 all constitute logs which can be referred to, and it gives 5 you nine, nineteen, twenty-eight -- about thirty wells which 6 you could look at, which would constitute type logs. 7 MR. STAMETS: Okay, for purposes of this 8 order, we can select one of these wells as the type log in 9 determining the top and bottom of the formation. 10 MR. BECK: Oh, the type log, the one 11 that I was referring to most as the type log, is the Well 12 No. 3 of cross section B-B', Exhibit Number Six. 13 The name of the well is the Tom -- now 14 it's Sun, formarly the Tom Brown, No. 1 Antelope Sink Well, 15 in Section 18 of 19, 24. 16 And in my testimony I gave the tops of 17 the Third Sister, the top and the bottom. and other pertinent 18 correlations, like Antelope Sink Zone, top of the bank facies, 19 the bottom of the bank facies. 20 And that would constitute my type log. 21 MR. STAMETS: Okay. Mike has one more 22 question. 23 24 25

1 50 QUESTIONS BY MR. STOGNER: 2 Dr. Boneau, on page five of your testi-3 Q. mony, the drainage area was assumed to equal 320-acre proration unit, do you feel this is a representative of the ac-5 tual radius of drainage? In this formation? 6 A. 7 It was taken as 320 acres because that's the proration unit size. But some of the Cisco wells have a 8 good chance of draining that and some of them have a -- will 9 probably drain half or two-thirds, or something, of that. 10 11 It's as reasonable a number as I could pick. I cannot stand here and defend that all of them are 12 13 going to drain 320 acres, no. 14 MR. STOGNER: Thank you, Dr. Boneau. 15 That's all I have. 16 MR. STAMETS: Any other questions of 17 this witness? He may be excused. 18 Anything further in this case? 19 If there is nothing further, this case 20 will be taken under advisement, subject to submittal of the 21 supplemental data. 22 And the hearing is adjourned. 23 24 (Hearing concluded.) 25

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.

Succey W. Boyd CSR

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



ENERGY AND MINERALS DEPARTMENT OIL CONSERVATION DIVISION

June 2, 1982

POST OFFICE BOX 2088 ⁴ STATE LAND OFFICE BUILDING SANTA FE, NEW MEXICO 87501 (505) 827-2434

BRUCE KING GOVERHOR LARRY KEHOE SEDRETARY

> 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

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STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT **OIL CONSERVATION DIVISION**

BRUCE KING GOVERNOR LARRY KEHOE SECRETAF

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February 15, 1982

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

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

7352 Re: CASE NO. 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, Alma a. L. JOE D. RAMEY Director

JDR/fd

Copy of order also sent to:

Hobbs OCD Х 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

-41 6 3 196, OIL CONSERVATION DIVISION SANTA FE

MAR 0 0 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 Permu-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,

Gene F. Daniel
Deputy Minerals Manager
Dil & Gas



SANTA FE BEFORE THE OIL CONSERVATION DIVISION

OF THE STATE OF NEW MEXICO

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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.

WHEPERORE, Applicant prays that the Division enter its Order recommending to the Pederal Energy Regulatory Commission that, pursuant to Section 10° of the Natural Gas Policy Act of 1978, and 18 C.F.R. §271.701, the Permo-Ponn 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

had Dikenon By: Chad Dickerson

and a state

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. All Sections

LAND AND AND A REAL PROPERTY OF

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.

Township 20-1/3 South, Range 22 East, N.N.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

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. 7052 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. Stamsts.

NOW, on this <u>15th</u> 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 Petroleon Corporation, vequests 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 secondance with Section 107 of the Natural Gas Policy Act of 1978, and 18 C.F.R. Section 271.701, et seg. -2-CASE NO. 7352 Order No. R-6904

(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. -3-CASE NO. 7352 Order No. R-6904

(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 nonproductive; 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. -4-CASE NO. 7352 Order No. R-6904

(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.

-5-CASE NO. 7352 Order No. R-6904

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

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JOE D. RAMEY Director

SEAL

CASE NO. 7352 ORDER NO. R-6904

EXHIBIT "A"

Township 17 South, Range 24 Bast, N.M.P.M. All Sections Township 17 South, Range 25 Bast, 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 Bast, N.M.P.M. All Sections

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Township 20-1/2 South, Range 22 East, N.M.P.N. All Sections

Township 21 South, Range 21 East, N.M.P.M. All Sections

Township 21 South, Range 22 Bast, 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. LAW OFFICES

A.J. LOSEE JOEL M. CARSON CHAD DICKERSON DAVID R. VANDIVER LOSEE, CARSON & DICKERSON, P. A. 300 AMERICAN HOME BUILDING P. O. DRAWER 239 ARTESIA, NEW MEXICO 88210

AREA CODE 505 746-3508

October 2, 1981

OIL CONSERVATION DIVISION

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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.

henon Ga u Chad Dickerson

CD:pvm Enclosares



1 1 2 STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT 3 OIL CONSERVATION DIVISION STATE LAND OFFICE BLDG. 4 SANTA FE, NEW MEXICO 23 September 1981 5 EXAMINER HEARING 6 7 IN THE MATTER OF: E Application of Wates Petroleum Corporation for designation of a CASE 9 7352 tight formation, Eddy County, New Mexico. 10 11 12 13 BEFORE: Richard L. Stamets 1.1 14 15 TRANSCRIPT OF HEARING 16 17 APPEARANCES 18 W. Perry Pearce, Esq. For the Oil Conservation 19 Legal Counsel to the Division Division: State Land Office Bldg. 20 Santa Fe, New Mexico 87501 21 22 For the Applicant: 23 24 25

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2	MR. STAMETS: Call next Case 7352.
3	MR. PEARCE: Application of Yates Petro-
4	leum Corporation for designation of a tight formation, Eddy
5	County, New Mexico.
6	MR. STAMETS: At the request of the
7	applicant, this case will be continued until the October 21st.
8	Examiner Hearing.
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- • 10	(Hearing concluded.)
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CERTIFICATE

I, SALLY W. BOYD, C.S.R., DO MORPHY 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 DG to the best of my ability.

Sally W. Bayd CSR

I do here granter that the foregoing is a complete the proceedings in the Fite wher loading of Case No. 7352 19 8 α near 🐐 Examiner um Oil Conservation Division

SALLY W. BOYD, C.S.R. Rt. 1 Box 193-B Santa Fe, New Mexico 67501 Phone (505) 455-7409

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Sally Di Buyd CSR

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Oil Conservation Division

SALLY W. BOYD, C.S.R. Rt. 1 Box 193-B Santa Fe, New Mexico 87501 Phone (505) 455-7449

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LAW OFFICES 1981 RSO

A.J. LOSEE JOEL M. CARSON CHAD DICKERSON DAVID R. VANDIVER LOSEE, CARSON & DIONERSON, R A.B. JUN 300 AMERICAN HOME ONLOUNDERSON, R A.B. JUN P. O. DRAWER 239 ARTESIA, NEW MEXICO BB210 SAINTA FE

AREA CODE 505 746-3508

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.

Hickeron زمبيك

Chad Dickerson

CD:pvm Enclosures



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

CALE 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.

WHEREFORE, Applicant prays that the Division enter its Order recommending to the Federal Energy Logalatory Costission That, pursuant to section 107 of the Natural Gas Policy Act of 1973, and 18 C.F.E. \$271.701, the Fermo-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

Lad Dukenon By: 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. All Sections

Township 18 South, Range 24 East, N.M.P.M. All Sections

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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

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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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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-Peim 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 in situ 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 MCP 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 appli ation 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 1973, and 18 C.F.R. §271.701, the Permo-Pean 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

had Diversion E By:

Chad Dickerson

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

Attorneys for Applicant

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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.

Contions 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.

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 Duçan 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 0 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 prol 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 lineral 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.

Page 3 of 4 Examiner Hearing - Wednesday - October 14, 1981

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 downnole 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 738?: 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, Nest Sawyer-San Andres Fool, the N/2 NE/4 of said Section 32 to be dedicated to the well.
- <u>CASE 7388</u>: 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 Vates 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.
- <u>CASE 7391</u>: 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 Harwey F. 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 necessarily 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 abova-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 we'l.
- 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.
- <u>CASE 7395</u>: 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:

2: (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.

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2 3	STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT
5	OIL CONSERVATION DIVISION STATE LAND OFFICE BLDG.
4	SANTA FE, NEW MEXICO
5	9 September 1981
6	EXAMINER HEARING
7	IN THE MATTER OF:
8	Application of Yates Petroleum
9	Corporation for designation of a CASE tight formation, Eddy County, New 7352 Mexico.
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13	BEFORE: Daniel S. Nutter
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15	TRANSCRIPT OF HEARING
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17	APPEARANCES
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19	For the Oil Conservation W. Perry Pearce, Esq. Division: Legal Counsel to the Division
20	State Land Office Bldg. Santa Fe, New Mexico 87501
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23	Por the Applicant:
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1	2
2	MR. NUTTER: Call next Case Number 7352.
3	MR. PEARCE: Application of Yates Petro-
4	leum Corporation for designation of a tight formation, Eddy
5	County, New Mexico.
6	MR. NUTTER: Applicant has requested
7	continuance.
8	Case Number 7352 will be continued to the
9	Examiner Hearing scheduled to be held at this same place at
10	9:00 o'clock a.m. September 23rd, 1981.
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12	(Hearing concluded.)
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I, SALLY W. BOYD, C.S.R., DO MEREBY CERTIFY that the foregoing Transcript of Bearing before the Oil Conservation Division was reported by re; that the said transcript is a full, true, and correct record of the hearing, prepared by me to the best of my ability.

5 vely W. Bayd CSE

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2353-heard by me on 219 1981 , Examinar OII Conservation Division

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

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2 3	STATE OF NEW MEXICO ENERGY AND MINERALS DEPARTMENT OIL CONSERVATION DIVISION
4	STATE LAND OFFICE BLDG. SANTA FE, NEW MEXICO 9 September 1981
5	EXAMINER HEARING
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7	IN THE MATTER OF:
8	Application of Yates Petroleum
9	Corporation for designation of aCASEtight formation, Eddy County, New7352
0	Mexico.
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3	BEFORE: Daniel S. Nutter
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.5	TRANSCRIPT OF HEARING
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7	A P P E A R A N C E S
8	**
9	For the Oil Conservation W. Perry Pearce, Esq. Division: Legal Counsel to the Division State Land Office Bldg.
0	Santa Fe, New Mexico 87501
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2	For the Applicant:
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2	MR. NUTTER: Call next Case Number 7352.
3	MR. PEARCE: Application of Yates Petro-
4	leum Corporation for designation of a tight formation, Eddy
5	County, New Mexico.
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12	(Hearing concluded.)
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I, SALLY N. POTD, C.S.R., PO HEREBY CERTIFY that the foregoing Transcript of Hearing Lafere the Oil Conservation Division was repeated by not that the said transcript is a full, true, and correct record of the hearing, prepared by me to the best of ny apility.

Sully W. Bud CSE

I controly certify that the foregoing is a control the record of the processions to the base ainer hearing of Gase heard by me on 999 heard by 1981. ., Examiner Oil Conservation Division

SALLY W. BOYD, C.S.R. Rt. 1 Box 193-B Santa Fe, New Mexico 87501 Phone (505) 455-7479

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 Norrow 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.
- <u>CASE 7342</u>: 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.
- <u>CASE 7343</u>: 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.
- <u>CASE 7345:</u> 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.
- <u>CASE 7346:</u> 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.
- <u>CASE 7347</u>: 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.
Page 2 Examiner Hearing - Wednesday - September 9, 1981

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 silt 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. Kange 25 East, Springs-Upper Penn Cis Pool.

CASE 7351: Application of Nid-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 } 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.

Docket No. 28-91

DOCKET: EXAMINER HEARING - WEDNE. AY - 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. Dickets Now, 31-81 and 32-61 are tentitors by static or or 7, and October 21, 1981. Applications in Aeviite Fold is filed at least 22 bys in advance of neuropolate.

DOCKETTE EXAMINES HEAKING - WEINERLAY - EDUCTOR BUILTE STOR

9 A.M. - OIL CONSERVATION DIVISION CONFERENCE 5 - M STATE LAND OFFICE EDILLING, SAMPA FE, MEA MEAD

The following cases will be heard before Richard L. Stamets, Examiner of a disconditional Alternate Examiners

- CASE 7353: Application of Texaco, Inc., for the ameniment of box, or or sol N., R-5530, Lea County, New Mexico, Applicant, in the above-styled cauge, seeks the above of the rice No. R-5530, which auto rized its Central Vacuum Post Area Pressure.Maintenance in the to there ise the total project area allowable, or as an alternative, do reclassify the project as a waterfile a project.
- <u>CASE 7354:</u> 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

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 HW/4 of Section 17, Township 11 North, Range 26 East.

- CASE 735: 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.
- <u>CASE</u> 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.
- <u>CASE 7357</u>: 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 Juln 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 40acre 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. Fage 2 Examiner Hearing - Wednesday - September 23, 1981

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 o South, Range 33 East.

- 2

Applicant further seeks approval of an unorthodox location for its Miller "A" Well No. 1-Y, to be drilled 1800 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 Peol 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

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.

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; 201 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)

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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 SH/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 FRABING - TUDIVAY - SEPTEMBER 29, 1981 9 A.M. - OIL CONSERVATION DIVISION - MORIAN HALL STATE LAND OFFICE BUILLING, SANIA FL, NEW MEXICO

CASE 7116: (DE NOVO)

Application of Southland Poyalty 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.

<u>CASE 7361</u>: Application of Southland Royalty Company for designation of a tight formation, San Juan County, New Nexico. 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 CFK 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.

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WELL NAME:	La Cama #1
LOCATION:	20-18S-25E
DST INTERVAL:	6812-7000



C.S. Matthews - D.G. Russell eqn. 3.21a
 Plow 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 ostimated from Log

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Recovered Recovered	Feet Feet SEE PRODU	of of CTION TEST	Gauge No.	1113	Gouge	No.					
Recovered Recovered Remarks	Feet Feet SEE PRODU	of of CTION TEST 1114 6784 Ft.	Gauge No. Depth:	1113 6844	Gouge Ft. Depth:		Ft.				RANCH COUNTY ED
Recovered Recovered Remarks TEMPERATURE	Feet Feet SEE PRODU	of of CTION TEST 1114 6784 Ft. 24Hour Clock	Gauge No. Depth:	1113 6844 24 Hour	Gouge Ft. Depth: r Clock		Ft. Iour Clock	Tool			RANCH COUNTY ED
Recovered Recovered Remarks TEMPERATURE	Feet Feet SEE PRODU	of of CTION TEST 1114 6784 Ft.	Gauge No. Depth:	1113 6844 24 Hour	Gouge Ft. Depth:				1315		RANCH COUNTY ED
Recovered Recovered Remarks TEMPERATURE Est. °F.	Feet Feet SEE PRODU SEE PRODU	of of CTION TEST 1114 6784 Ft. 24Hour Clock	Gauge No. Depth: Blanked Off	1113 6844 24 Hour	Gouge Ft. Depth: r Clock		lour Clock	Tool Opened	1315	A.M. A.M.	RANCH COUNTY ED
Recovered Recovered Remarks TEMPERATURE Est. °F.	Feet Feet SEE PRODU SEE PRODU	of of CTION_TEST 1114 6784_Fr. 24Hour Clock NQ	Gauge No. Depth: Blanked Off	1113 6844 24 Hour f no	Ft. Depth: r Clock Blanke	}- d Off Pressures	lour Clock	Tool Opened Opened	1315	A.M. P.M. P.M.	RANCH COUNTY ED
Recovered Recovered Remarks TEMPERATURE Est. °F. Actual 127.F.	Feet Feet SEE PRODU SEE PRODU SEE PRODU SEE PRODU SEE PRODU SEE PRODU	of of CTION TEST CTION TEST CTION TEST 24Hour Clock NO sures Office	Gauge No. Depth: Blonked Off Pr Field	1113 6844 24 Hour f no	Gouge Ft. Depth: r Clock Blanke	}- d Off Pressures	lour Clock	Tool Opened Opened Bypas:	1315 2330	A.M. P.M. P.M.	RANCH County EDDY
Recovered Recovered Remarks TEMPERATURE Est. °F. Actual 127.F. nitial Hydrostatic	Feet Feet SEE PRODU SEE PRODU SEE PRODU SEE PRODU SEE PRODU SEE PRODU	of of CTION TEST 1114 6784 Ft. 24Hour Clock No	Gauge No. Depth: Blonked Off Field 3320	1113 6844 24 Hour f no ressures orr 329	Gouge Ft. Depth: r Clock Blanke ice Fiel	}- d Off Pressures	lour Clock	Tool Opened Opened Bypass Reported	1315 2330 Comp	A.M. P.M. P.M.	RANCH COUNTY ED
Recovered Recovered Remarks TEMPERATURE Est. •F. Actual 127.F. nitial Hydrostatic	Feet Feet SEE PRODU SEE PRODU SEE PRODU SEE PRODU SEE PRODU SEE PRODU	of of CTION TEST CTION TEST CTION TEST 24Hour Clock NO sures Office 3286	Gauge No. Depth: Blonked Off Pr Field	1113 6844 24 Hour f no ressures Off	Gouge Ft. Depth: r Clock Blanke ice Fiel 29	}- d Off Pressures	lour Clock	Tool Opened Opened Bypass Reported	1315 2330 Comp Minu	A.M. P.M. P.M.	RANCH County EDDY
Recovered Recovered Remarks TEMPERATURE Est. °F. Actual 127.F. nitial Hydrostatic Final Closed in	Feet Feet SEE PRODU SEE PROSE SEE PR	of of CTION TEST CTION TEST 1114 6784 Fr. 24Hour Clock NQ Sures Office 3286 259	Gauge No. Depth: Blanked Off Field 3320 232	1113 6844 24 Hour f no ressures 0ff 329 365	Gouge Ft. Depth: r Clock Blanke	}- d Off Pressures	lour Clock	Tool Opened Opened Bypass Reported Minutes	1315 2330 Comp Minu 2	A.M. P.M. Duted utes	RANCH County EDDY Stote
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_!	(ime Def) .000"		Time Dell. .000"	Log 1 + 0		Flow	w Period		Second Closed In Press		Th	bled	1	'	1
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PECIAL PRESSURE DATA

WITCHE'S DERID THE BUTT



					Surf. temp*F Ticket No139167
ias gravity_	······	Oil gra Chlorid	vity	······	GOR m R cs °F
-			SURING DEVICE US		
-	a.m. Choke p.m. Size	Surface Pressure psi	Gos Rote MCF	Liquid Rate BPD	· Remarks
1315	3/8"	1#			Opened tool with a good blow.
1320	u	5		·	Good blow.
1325	"	15			Good blow - no gas.
1330	u	20			11
1335	n	23	129.20		Gas to the surface in 20 minutes.
1340	n	24	132.60		Flared gas.
1345		24	132.60		11
1350		ĸ			11
1355	"	23	129.20		13
1400	a 1	li	H		" Closed tool.
1530	11.	2			Reopened tool with a good blow.
1535	"	28	146		Gas to flare in 3 minutes.
1545		43	197		Gas flare.
1600		34	166		k
1615	10	25	136		lt
1630	11	20	119		lı
1645		17	108		n
1700		18	112		tı
1730	ti	23	129		н
1800	11	24	132		Slight increase.
1830		25	136		Closed tool.
2330					Opened bypass - pulled loose.
<u></u>			+		

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RPT DATE 02 03 81 ANAL DATE 01 29 81	METER STATION NAME	METER STA 61894 OPER 9841
YPE CODE SAMPLE DATE	EFF. DATE USE MUS.	SCALE H2S GRAINS LOCATIO
00 01 21 81	02 03 81 06	0000* 1 J 1
	NORMAL MQL%	GPM
C O 2	00.00	0.000
H 2 S	\$00,00*	Q.QQQ
N2	01.74	0.000
METHANE	83+51	0.000
ETHANE	U8.93	2.387
PRUPANE	Q3+21	Q.883
I SO-BUTANE	00 =36	0.118
NORM-BUTANE	01.14	0.359
I SO-PENTANE	00.34	0.124
NORM-PENTANE	00.35	0.127
HEXANE PLUS	00.42	0.183
TUTALS	100.00	4.181
SPECIFIC GRAVITY	0.	684
MIXTURE HEATING VAL (BTU/CF @ 14.73 PSI	UE A,60 DEGREES,DRY) 1	187
RATIO DE SPECIFIC H * NO TEST SECURED E	IEATS 1. UR DETERMINATION H2S	287 CUNTENT.

*

ALL PROPERTY.

WELL, NAME:	Box Canyon #4A
LOCATION:	23-21S-21E
DST INTERVAL:	5876-6051

= 1904 psi slope (M) = 92 psi/cyclep* 365 °R Pc = 670 psi = Тc $130 + 460^\circ = 590^\circ R$ Pwf = 1592 psiт ± $\frac{P^{\star} + Pwf}{2} = \frac{1904 + 1592}{2} = 1748 \text{ psi} (Note 1)$ Pavg = $\frac{T}{Tc} = \frac{590}{1.62} = 1.62$ Tr 365 $\frac{Pavg}{Pc} = \frac{1748}{670} = 2.61$ Pr ÷ 0.84 Tsc = 520°R Psc = 13.3 psi Z æ $= 2 \cdot \frac{T}{Tsc} \cdot \frac{Psc}{Pavg} = 0.84 \cdot \frac{590}{520} \cdot \frac{13.3}{1748} = 0.0073$ (Note 1) Bg $25 \mod 178.1 = 4452.50 \text{ b/d}$ = đ = (0.0114) (1.3) = 0.0148 cp (Note 2) u $\frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6 (4452.5) (0.0148) (0.0073)}{92}$ kh 0.8502 md ft kh = h Ξ 40 ft (Note 3) ≔ 0.021 md k

C.S. Matthews - D.G. Eussell eqn 3.21a
 C.S. Matthews - D.G. Eussell Fig. G.3A&B
 F estimated from log

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9	RPT DATE ANAL DATE		KUTUK UT GRA UKLYUK	ATION NAME 4 a y 1		NETEK STA UPEK	61929 9341
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RATIC OF GROUPED GRAVS 1.4299 A NUTLOF DECEMBER FOR OF LORINATION HIS CONTENT.



FLUI	D SAMP	LE DA	ТА	Dore 2-4	- 78	Ticket Number	253334	
Sampler Pressure			.1.G. at Surface	Kind STR	ADDLE	Halliburti	on	
Recovery: Cu. Ft.	Gas 3.2	2	to an to and a constant	A second se	N HOLE	District	ARTESI	<u>A</u>
cc. Oil				1	TMAN		101100	
cc. Wai)()		Tester LAM	IAK	Witness	JONAS	
cc. Mur		<u></u>		Drilling Contractor MOil		# E		DR
	uid cc <u>18(</u>		- •F.	Contractor MOH		T & HOLE	DATA	UK
Gravity Gas/Oil Ratio		• API @	cu. ft./bbl.	Formation Tester		Upper Canyor		
			CHLORICE CONTENT	Elevation		4592 '		Ft.
			CONTENT	Net Productive I		32		Ft.
Recovery Woter		@ •F.	ppm	All Depths Meas	ured From	Kelly Drive	Bushing	(13')
Recovery Mud		@•F	, ppm			8400'		Ft.
Recovery Mud Fil	trote	@ •F.	ppm			7 7/8"		
Mud Pit Semple		(d) F.	25,000 ppm	Drill Collar Leng			2.25"	
Mud Pit Sumple F	iltrote	@•F.	ppm	I will the second		5404' I.D.		
				1		76-5051-605	<u>/'</u>	Ft.
Mud Weight		<u>9 vis</u>		Ceptil Tester Vo	lve	5863 '		<u>Ft.</u>
TYPE Cushion	AMOUNT		Depth Bac Ft. Pres, Valv	ik Ie	Surface Choke		tom oke .75"	
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Recovered Remarks TEMPERATURE	SEE	PRODUCTIC 512 5964	Gauge No Ft. Depth	. 113 2905 Ft	Gauge No.	Ft.		ME
Recovered Remarks TEMPERATURE	SEE Gauge Nio, Depth:	PRODUCTIC PRODUCTIC 512 5964 24 Hour C	Gauge No Ft. Depth lock	. 113 5905 гг 24 Hour Clock	Gauge No.	F1. Hour Clock	Ti	 МЕ А.М.
Recovered Remarks TEMPERATURE	SEE Gauge Nio.	PRODUCTIC PRODUCTIC 512 5964 24 Hour C	Gauge No Ft. Depth	. 113 5905 гг 24 Hour Clock	Gauge No.	F1. Hour Clock	Ti Tool Opened 10	ме А.М. 200 р.М.
Recovered Remarks TEMPERATURE Calc. Est. 130 *F.	SEE Gauge No. Depth: Blanked Off	512 5964 24 Hour C	Gauge No Ft. Depth lock Planked O	. 113 5905 Ft 24 Hour Clock #F Yes	Gauge No. Death: Blanked Off	Ft. Hour Clock f	Ti Tool Opened 10 Opened 15	ME A.M. 000 P.M. 530 A.M.
Recovered Remarks TEMPERATURE	SEE Gauge No. Depth: Blanked Off Pr	512 5964 24 Hour C No essures	Gauge No Ft. Depth lock Planked O	2905 Ft 24 Hour Clock off Yes Pressures	Gauge No. Death: Blanked Off	F1. Hour Clock f essures	Ti Tool Opened 10	ме А.М. 200 р.М.
Recovered Remarks TEMPERATURE Calc. Est. 130 *F. Actual *F.	SEE Gauge No. Depth: Blanked Off Pr Field	512 5964 24 Hour C No essures	Gauge No Ft. Depth lock Planked O Field	2905 Ft 24 Hour Clock Heres Pressures Office	Gauge No. Death: Blanked Off	Ft. Hour Clock f	Ti Tool Opened 10 Opened 15 Bypass Reported	ME A.M. 000 P.M. 030 A.M. P.M. Computed
Recovered Remarks TEMPERATURE Calc. Est. 130 °F. Actual °F. Initial Hydrostatic	SEE Gauge No. Depth: Blanked Off Field 2836	SI2 512 5964 24 Hour C No essures 0011/ce 2817	Gauge No Ft. Depth lock Planked O Field 7 2857	24 Hour Clock Hour Clock Hour Clock Pressures Office 2846	Gauge No. Death: Blanked Off	F1. Hour Clock f essures	Ti Tool Opened 10 Opened 15 Byposs	ME A.M. 000 P.M. 030 A.M. P.M.
Recovered Remarks TEMPERATURE Calc. Est. 130 °F. Actual °F. Initial Hydrostatic	SEE Gauge No. Depth: Blanked Off Pr Field 2836 355	SI2 5964 24 Hour C No essures 011/ce 2817 446	Gauge No Ft. Depth lock Planked O Field 2857 398	24 Hour Clock 24 Hour Clock H Yes Pressures 0ffice 2846 575	Gauge No. Death: Blanked Off	F1. Hour Clock f essures	Ti Tool Opened 10 Opened 15 Bypass Reported Minutes	ME A.M. 000 P.M. 030 A.M. P.M. Computed Minutes
Recovered Remarks TEMPERATURE Calc. Est. 130 °F. Actual °F. Initial Hydrostatic S Flow Initial Final	SEE Gauge No. Depth: Blanked Off Field 2836 355 801	Exer of PRODUCTIC 512 5964 24 Hour C NO essures 0 office 2817 446 783	Gauge No Ft. Depth lock Planked O Field 2857 398 519	24 Hour Clock 24 Hour Clock H Yes Pressures 2846 575 811	Gauge No. Death: Blanked Off	F1. Hour Clock f essures	Ti Tool Opened 10 Opened 15 Bypass Reported Minutes 	ME A.M. 000 P.M. 030 A.M. P.M. Computed Minutes
Recovered Remarks TEMPERATURE Calc. Est. 130 °F. Actual °F. Initial Hydrostatic Final Closed in	SEE Gauge No. Depth: Blanked Off Pr Field 2836 355 801 1895	Exer of PRODUCTIC 512 5964 24 Hour C No essures 0 office 2817 446 781 1896	Gauge No Ft. Depth lock Planked O Frelø 2857 398 519 1904	. 113 5905 Ft 24 Hour Clock Ff Yes Pressures 0111 2846 575 811 1909	Gauge No. Death: Blanked Off	F1. Hour Clock f essures	Ti Tool Opened 10 Opened 15 Bypass Reported Minutes	ME A.M. 000 P.M. 030 A.M. P.M. Computed Minutes
Recovered Remarks TEMPERATURE Calc. Est. 130 °F. Actual °F. Initial Hydrostatic Final Closed in	SEE Gauge No. Depth: Blanked Off Pr Field 2836 355 801 1895 749	Eet of PRODUCTIC 512 5964 24 Hour C No Essures 011/ce 2817 446 781 1896 733	Gauge No Ft. Depth lock Planked O Fteld 2857 398 519 1904 767	24 Hour Clock 24 Hour Clock 47 Yes Pressures 2846 575 811 1909 759	Gauge No. Death: Blanked Off	F1. Hour Clock f essures	Ti Tool Opened 10 Opened 10 Bypass Reported Minutes 30 90	ME A.M. 000 P.M. 030 A.M. P.M. Computed Minutes 30 90
Recovered Remarks TEMPERATURE Calc. Est. 130 °F. Actual °F. Initial Hydrostatic Plow Initial Closed in Closed in State State Sta	SEE Gauge No. Depth: Blanked Off Field 2836 355 801 1895 749 1591	Eet of PRODUCTIC 512 5964 24 Hour C No essures 011/ce 2817 446 783 1896 733 1592	Gauge No Ft. Depth lock Planked O Field 2857 398 519 1904 767 265	24 Hour Clock 24 Hour Clock 47 Yes Pressures 07 Office 2846 575 811 1909 759 1622	Gauge No. Death: Blanked Off	F1. Hour Clock f essures	Ti Tool Opened 10 Opened 12 Bypass Reported Minutes 	ME A.M. 000 P.M. 030 A.M. P.M. Computed Minutes 30 90 90
Recovered Remarks TEMPERATURE Calc. Est. 130 °F. Actual °F. Initial Hydrostatic Store Initial Closed in Closed in Closed in Closed in	SEE Gauge No. Depth: Blanked Off Pr Field 2836 355 801 1895 749 1591 1895	Eet of PRODUCTIC 512 5964 24 Hour C No Essures 011/ce 2817 446 781 1896 733	Gauge No Ft. Depth lock Planked O Field 2857 398 519 1904 767 265	24 Hour Clock 24 Hour Clock 47 Yes Pressures 2846 575 811 1909 759	Gauge No. Death: Blanked Off	F1. Hour Clock f essures	Ti Tool Opened 10 Opened 10 Bypass Reported Minutes 30 90	ME A.M. 000 P.M. 030 A.M. P.M. Computed Minutes 30 90
Recovered Remarks TEMPERATURE Calc. Est. 130 °F. Actual °F. Initial Hydrostatic S Flow Initial Closed in Final Closed in Closed in Closed in	SEE Gauge No. Depth: Blanked Off Pr Field 2836 355 801 1895 749 1591 1895	Eet of PRODUCTIC 512 5964 24 Hour C No essures 011/ce 2817 446 783 1896 733 1592	Gauge No Ft. Depth lock Planked O Field 2857 398 519 1904 767 265	24 Hour Clock 24 Hour Clock 47 Yes Pressures 07 Office 2846 575 811 1909 759 1622	Gauge No. Death: Blanked Off	F1. Hour Clock f essures	Ti Tool Opened 10 Opened 12 Bypass Reported Minutes 	ME A.M. 000 P.M. 030 A.M. P.M. Computed Minutes 30 90 90
Recovered Remarks TEMPERATURE Calc. Est. 130 °F. Actual °F. Initial Hydrostatic Plow Initial Final Closed in Closed in	SEE Gauge No. Depth: Blanked Off Pr Field 2836 355 801 1895 749 1591 1895	Eet of PRODUCTIC 512 5964 24 Hour C No essures 011/ce 2817 446 783 1896 733 1592	Gauge No Ft. Depth lock Planked O Field 2857 398 519 1904 767 265	24 Hour Clock 24 Hour Clock 47 Yes Pressures 07 Office 2846 575 811 1909 759 1622	Gauge No. Death: Blanked Off	F1. Hour Clock f essures	Ti Tool Opened 10 Opened 12 Bypass Reported Minutes 	ME A.M. 000 P.M. 030 A.M. P.M. Computed Minutes 30 90 90
Recovered Remarks TEMPERATURE Calc. Est. 130 °F. Actual °F. Initial Hydrostatic Plow Initial Closed in Closed in Closed in Final Closed in Final Closed in Final	SEE Gauge No. Depth: Blanked Off Pr Field 2836 355 801 1895 749 1591 1895	Eet of PRODUCTIC 512 5964 24 Hour C No essures 011/ce 2817 446 783 1896 733 1592	Gauge No Ft. Depth lock Planked O Freid 2857 398 519 1904 767 1626 1904	24 Hour Clock 24 Hour Clock 47 Yes Pressures 07 Office 2846 575 811 1909 759 1622	Gauge No. Death: Blanked Off	F1. Hour Clock f essures	Ti Tool Opened 10 Opened 12 Bypass Reported Minutes 	ME A.M. 000 P.M. 030 A.M. P.M. Computed Minutes 30 90 90

RMATON 15 .51 DAIA

Gauge No.		512		Depth	5864 '		Clock No	<u>. 1373</u>	6	24 hour	Ticket No.	253334		
First Flow Pe	riod	CI	First osed In Pressi	ure	Sec Flow	ond Period	CI	Second osed In Pressu	re	Thi Flow F	rd Period	CI	Third osed In Press	Jre
Time Dell. .000"	PSIG Temp. Carr.	Time Defl. .000''	$\log \frac{1+\theta}{\theta}$	PSIG Temp. Carr	Time Defl. .000''	PSIG Temp. Corr.	Time Defl. .000"	$\log \frac{1+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000*f	PSIG Temp. Corr.	Time Defl. .000"	$\log \frac{1+\theta}{\theta}$	PSIG Temp. Corr.
0.000	446	.000	•	781	.090	733	.000	1	1592					
1.0167	396	.0201	······	1745	.0503	797	.0269	f f	1788			1	1	<u> </u>
2 .0333	485	.0403		1805	.1007	1158	.0537	[]	1811			1		
3 .0500	526	.0604		1832	.1510	1318	.0806	t1	1826			1	1	[
4 .0667	628	.0805		1850	.2013	1435	1075		1838				1	
5 0334	720	.1007	••••••••••••••••••••••••••••••••••••••	1860	.2517	1525	1.1344	tt	1850			1	1	t
6 . 1000	781	.1208		1864	.3020	1592	.1612	t t	1859	1		1	1	1
7	· · · · · · · · · · · · · · · · · · ·	.1409		1868			.1881	11	1864			1	1	t
8		.1610		1868			.2150		1868			1	1	
9		.1812		1869			.2418		1871			1		h
10		.2013		1873			.2687		1873			1		†
11		.2214		1877			.2956	tt	1875			<u> </u>	1	<u> </u>
12		.2416		1884			.3224	11	1876			#	1	<u> </u>
13		.2617		1888			.3493	f	1880			1	1	<u> </u>
14		.2818		1892			.3762	łł	1881			#		<u> </u>
15		.3020		1896	h		.4030	łł	1883			#	<u> </u>	
Gauge No.	113 575	.000		Depth 811	590	15' 1 759	Clock N	p. 13528	1622	hour	24	<u>п</u>	<u>r</u>	·
1.0172	422	.0203		1765	.050	996	.0272	<u> </u>	1804			#	+	<u> </u>
2 .0343	519	.0405		1816	.100	1180	.0544	}	1827			1		
3 .0515	549	.0608	 	1848	.150	1334	.0816	<u>↓</u>	1841			₩	1	
4 .0687	656	.0811	<u> </u>	1865	.200	1455	.1088	<u>+</u>	1855			₩	÷	<u> </u>
5 .0859	739	.1014		1874	.250	1549	.1360	<u> </u>	1862				<u> </u>	
6.1030	811	.1216	ł	1880	.300	1622	.1632		1872			₩		}
7	<u></u>	.1419		1882			.1904	<u>├</u> ───┤	1878	∱ [<u> </u>	f	{
8		1622	<u></u>	1884	l		.2176	<u> </u>	1881			╉		
9		.1824	ł	1885	#	{	.2448	<u>├</u> }	1884	∦ 		#	+	<u> </u>
10		.2027	ł	1889	ff	h	.2720	┟╌╾╼──┤	1885	}		∦		
11		.2230	h	1893	lt	<u>+</u>	.2992	<u> </u>	1886			⋕	1	}
12		.2432	{i	1898		[.3264	t t	1889			.		
13		.2635		1902		+	.3536	<u> </u>	1890			#	 	
14		.2838		1906	H	t	.3808	<u> </u>	1892	<u>├</u> }		#	· /	
15	-	.3040		1909	H	<u> </u>	.4080	<u>├</u>	1893			H	t	<u> </u>
Reading Intervo	L	1.040	6		H	1		8	10,75	<u>+</u> !		#	L	Minute
REMARKS:		ü	<u>~</u>		u		علي			L		Щ		14141016
VEW/1/1/23								··· —· ·· _ · _ _						

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CONTRACTORS FOR SOLD CLARK



Casing perfs		Bottom	.75"		Surf. temp*F Ticket No253334
Sas gravity	E AND SIZE	Oil grav Chloridi OF GAS MEAS	URING DEVICE US	<u>ъ 1/4 х е</u>	GOR TPST gauge *F
Date Fime a.m p.m	Jize	Surface Pressure psi	Gas Rate MCF	Liquid Rate BPO	Remarks
1000		1 1/2#			Opened tool with a good blow
1005	1/4"	35	73.50		Opened on 1/4" choke
1010	ti	53	99.96		Gas to surface
1015	11	55	102.90		
1020	H	57	105.84		Started losing pressure
1025	ų	52	98.49		-
1030	15	43	85.26		Closed tool
1200	н	0	-		Opened tool
1205	11	0	-		
1210	14	0	-		
1215	it	0	-		
1230	11	2	24.99		Pressure climbing
1245	11	5	29.40		
1200	11	2	24.99		
1215	11	2	24.99		
1330	u	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 a
					6304'-6490', could not hook, came up
					and straddled section at 5876'-6051'.
					Got hook to set and went on with test

SIGAIL	mberger	FOR	MATION D				RIX ITY	J/-			
		Curyon Curyon ddy + 1450 Fr	Z (1 ⊂ → L 	Other	Services:	to were furnished by the customer.	INDEX % / ATTICE MATRIX		COMPENSATED NEUTRON FOROSITY	19% w/	
Permonent Datum: Log Measured From Dritting Measured Fr Date Run No. Depth-Drifter		GL,	Elev. 4552 sve Perm. Datum	Elev.	: K.B. <u>4(-05</u> D.F. G.L. <u>459</u> 2	and borchole reference via	POROSITY COMPENS	20	20	045886 89/6 30003 5886 66 5355 m 1/4 66	
Depth Logger Brm. Log Interval Top Log Interval Casing - Driller Casing Logger	8401 8400 546444 878 @14867 1492	1 98 (a.	<i>.</i>		<u>ē</u>	location	DEPTH				300 (
Bit Size Type Fluid in Hole Dens. Visc pH I Fluid Loss Source of Sample Rm & Meas. Temp Rm & Meas. Temp Rmc & Meas. Temp Source: Rmf Rmc Rm & BHT W Circulation Stopped Logger on Boltom Max. Rec. Temp. En.ip. Location	77_8 5.41 $M-48.8$ 418.5 8.0 ml 9.1 .252 @ 62 F .186 @ 62 F $$		mi F 2 F 2 F 2 F 2 F 2 C C C C C C C C C C C C C	ml F F F F F F		14 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	CALIPER DIAM. IN INCHES	GAMMA RAY API UNITS	00/ 201		





WELL NAME:	Cities JG State #1
LOCATION:	13-18S-24E
DST INTERVAL:	6544-6865

p*	82	$2\hat{z}_{12}$ psi slope (M) = 260 psi/cycle
Тс	2	$377 ^{\circ}R Pc = 669 psi$
т	8	$122 + 460^\circ = 582 \circ R$ $Pwf = 116 psi$
Pavg	=	$\frac{P^{\star} + Pwf}{2} = \frac{2312 + 116}{2} = 1214 \text{ psi} \text{ (Note 1)}$
Tr	*	$\frac{T}{Tc} = \frac{582}{377} = 1.54$
Pr	~	$\frac{Pavg}{Pc} = \frac{1214}{669} = 1.81$
Z	ż	0.885 $Tsc = 520^{\circ}R$ $Psc = 13.3 \text{ psi}$
Bg	72	$z \cdot \frac{T}{Tsc} \cdot \frac{Psc}{Pavg} = 0.885 \cdot \frac{582}{520} \cdot \frac{13.3}{1214} = 0.0109$ (Note 1)
q	3	189 mcfd · 178.1 = 33660.9 b/d
u		(1.2) (0.0114) = 0.0137 CP (Note 2)
kh	12	$\frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6 (33660.9) (0.0137) (0.0109)}{260}$
kh	=	3.144 md · ft
h	=	45 ft (Note 3)
k	-	0.69 md

C.S. Matthews - D.G. Russell eqn. 3.21a
 C.S. Matthews - D.G Russell Fig. G. 3A&B
 h estimated from Log

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FLUID	D SAMP	LE DATA	<u> </u>	Date 11	-14-78		Ticket Number	5204!	51		Sec.		
Sampler Pressure	85	Concernment of the second s	a: Surface	Kind			Halliburg		·		Lucution Tup - R	1	CI
Recovery: Cu. Ft. (Gos .10	/			EN HOLE		District	ARTES	<u>A1A</u>		R		T
cc. Oil		•		Tester R.I.	CHARD PE	DDEDE	Wanad	1 10	NUMC		PO	5	ء ِ
cc. Wate cc. Mud	500	* <u></u> *			UNARU PI	ITTERS			MAS_			2.4	"Յն"
Tot. Ligu				Drilling Contractor LA	NDIS DRI	LLING	<i>#</i> 4		_	DR	13-	- Z 1	ST
Grovity		• API @	•F.	EQI	IPNEN			DAT	Α		18		TATE
Gas/Oil Ratio			cu. ft./bbl	Formation Tested		ower (lisco				N.		
	RESI	STIVITY CHI CO	LORIDE NTENT	Elevation Net Productive Ir		<u>8651'</u> ?0'			·····	<u>Ft.</u> Ft.	24E		COMM
Recovery Water	1	@ •F.	ppm	All Depths Measure			Bushing		·• ·····	<u> </u>			<u>,</u>
Recovery Mud		@ •F	ppm	Total Depth		5856				Ft.			
Recovery Mud Filti		@+F	ppm	Main Hole/Cosir		7/8"						11	
Mud Pit Sample		@ •F @ •F	ppm	Drill Collar Leng		352		1.25				¥	
Mud Pit Somple Fi		©*F	com	Drill Pipe Lengt Pocker Depth(s)	and the second particular and	5156' 5538-6		3.826)			E No	
Mud Weight	8.6	vis 2	8 sec	-		5518'	<u> </u>			Ft. Ft			
TYPE	AMOUNT	<u> </u>	Depth Bac		Surface		Bon				1		
Cushion		Ft.	Pres. Valv		Choke (5/8"	Che	oke .75	5"		L	Ē	
Recovered	442 Fe	not drillin	a mud							2	Field	No	
			9							e,	00		
Recovered	Fee	et of								From			
Recovered	Fai	t of								Taster			~
													54
Recovered	Fee	t of								Volve			6544-6856
		_											689
Recovered	Fee	et of		······				<u> </u>				Tested	õ
Remarks	SEE PR	DUCTION TE	ST DATA	SHEET									
· · · · · · · · · · · · · · · · · · ·											1	Intervo	
t												2	
	•										ļ	4	
											C.		
											ounty		
						··					1		
	Gauge No.	1114	Gouge No.	1113	Gauge No								~
TEMPERATURE	Depth:	6522 Ft.	1	6852 Ft.	-	•	F1,		TIME		m		VATES
	<u></u>	24 Hour Clock		24 Hour Clock			our Clock	Tool		A.M.	ррү	1 1	
Est. •F.	Blanked Off	No	Blanked Of	HYes	Bionked C	Hf		Opened	0800	<u>P.M.</u>	 ~		PE
Actual 122 •7.								Opened Bypass	1300	A.M. P.M.	1		LKO
Actual 122 °F.		ssures		ressures	Field	ressures	office	Reporte	-	nputed	{	5	PETROLEUM
Initial Hydrostatic	Field 2993	Office 2964	Field 3153	Office 3106	F131G	· · · ·		Minutes	1	nutes	l		
l-isial	125	226	214	416							5101	N N	CO
Flow Finol	178	178	285	312				30	33		1°	r/C	CORPORATION
Closed in	2300	2297	2477	2429				90	89)]	1 2	1HO
Flow Initial . Final	178	395	267	382	• • • • • • • • • • • • • • • • • • • •		; 				4	by t	
Final Closed in	125 2265	116	231	246	• • • • • • • • • • • • • • • • • • • •			60	60			Owner/Company Name	02
Initial	2200	2.265	2406	2394	•			120	12		NEW		
Flow Final													
Closed in					• ••• •• •• •• •• •• ••	••••••••••••••••••••••••••••••••••••••					MEXI		
Final Hydrostatic	2975	2952	3135	3099	•	····					ICO		
		1	l	·····							ſ	1	
TOPH ISLAS-PRINTED IN	U S A	FORM	ΛΔΤΙΟ	N TEST	TAC 1	Δ					1	~	

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asing perts	<u></u>	Botton	n choke			51
sec. gravity_		Chlori	jes		opm Res*F	
	TPE AND SIZE	OF GAS MEA	SURING DEVICE L	JSED		
ine a	n.m. Choke n.m. Size	Surface Pressure psi	Gas Rote MCF	Liquid Rote BPD	Remorks	
0 800	1/8"				Opened tool with a good blow	
0 805	n	18			Good blow, no gas	
0810	u	28			и	
0815	н	38			n	
0820	u	49			()	
0825	u	60			u	
0 830	łà	70			Closed tool	
0834					Gas to surface	
1000	5/8"				Opened tool, gas flare	
1005	11	15	299			
010	n	10	249		Gas depleating	
1015	•	6	209		Gas Stabilized	
1020	н	6	209		n	
1025	n	6	209		n	
1030	11	6	209		14	
035	17	6	209		11	
1040	FI	6	209		11	
1045	н	6	209		11	
3050	n	5	199		Gas depleating	
:055	u	4	189		П	
100	11	- 4	189		Closed tool	
.300			·		Pulled tool loose	~~~
				1		

QURI-PRINTED IN U.S.A.

PRODUCTION TEST DATA

LITTLE & 91572 \$H \$/74

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Gouge No. First Flow Pe		1114	First osed In Press	Depth	652 Seco	ond	Clock No	Second		24 hour	ird	520451	Third	
			osed In Press		h	Period	()	osed In Press	and the second division of the second divisio	Flow f	and the second se		osed In Pressi	
Time Deft.	PSIG Temp. Corr.	1ime Deft. .000''	$Loo \frac{1+\theta}{\theta}$	PSIG Temp. Corr	Time Dett. .000"	PSIG Temp. Corr.	Time Defl. .000''	1001+0 A	PSIG Temp. Corr.	Time Defi. .000''	PSIG Temp. Corr.	Time Defl. .000''	$\log \frac{1+\theta}{\theta}$	rsig Temp. Corr.
000.0	336	.000		178	.000	395 0	.000	·	116		····	·	*····	
.0197	89*	.0165		848**	.0342	121	.0265		1219		- son			
.0362	110	0363		1502	.0683	107	.0531		1693)) · · · · · · · ·			1	{
.0526	132	.0562		1850	.1025	112	.0796		1876	1				
4 .0691	148	.0760		1970	.1367	114	.1061		2018		ingen winnen gen der Be		1	-
5 .0855	164	.0958		2057	.1709	116	.1327		2124			4		
6 .1020	178	.1155		2125	.2050	116	.1592		2186					
7		.1354		2180			.1857		2219				1	
B		.1553	[2217			.2122		2235					
9		.1751		2246		•	.2389	1	2246					
0		. 1949		2263			.2653		2251	1			[
1	1	.2147		2276			.2918		2253					
2		.2345	}	2284			.3184		2256					
3		.2544		2290			.3449		2260					}
4		.2742	1	2293			.3714	1	2263	1				1
5		.2940	1	2297			.3980	1	2265					
<u>Cauge No.</u> 0 . 000	11	13	1	Depth	6852'	1 101	Clock N	<u>o. 43</u>	65	hour	24	ır	·····	
	218*			312	.000	382	000.	· · · · · · · · ·	246			<u>}</u>		
	244	.0167	· · · · · · · · · · · · · · · · · · ·	1033**	.0332	237	.0267		1371	₩ • • • • • • • • • •]		
	263	.0367		1643	.0663	232	.0533		1807		and and the			l
3 .0532 4 .0698	279	.0567		1957	.0995	239	.0800		2005				٠. ۱	}
		.0768	1	2086	.1327	244	.1067	ļ	2145				. <u>}</u>	
	296	0968	l	2178	.1652_	246	.1334	1	2244					
6.1030	[312	.1168		2253	.1990	246	.1600	Į	2310			<u>}</u>	1	
7	_	.1368		2314			.1867		2348					
8		.1558		2355			.2134	Å	2368					
9	}	.1769		2383			.2400		2376		·· ·			
	.	.1969	ļ	2402			.2667	·	2383	·#•				
0		.2159		2411			.2934		2385					l
1	<u></u>	.2369	L	2420			.3200		2389		saaama oo aaraa ahaa ah	· · · · · · · · · · · · · · · · · ·		
1	1	.2569	ļ	2427			.3467		2392	.	L	}		
	L	.2769		2429		.	.3734	1 1	2394	 		 		
1 2 3 4		1		1 0400	1	1	.4000	1	1 2394	·	L	H	I	L
1 2 3 4		2970	l	2429		ł	ff							
1 2 3		.2970		6	1	10		8		<u></u>		ll		Minut
1 2 3 4 5		1.2970 minutes	**_	6 5 minutes	5 Q-(10 Juestion		8		<u></u>		U	· · · · · · · · · · · ·	Minul

SPECIAL PRESSURE DATA

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	FORMATION DENSITY	•••• •			
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UNIT D Alion	Other South				
COUNTY FIELD LOCATIO WELL COMPANY		DPH I		non - frank a series and a series of the ser	
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GAS QUALITY		COMPANY SELLER Y FIELD OR LOCATION SOURCE OR RESERVOIR AELL OR STATION NAME	CONTRACT TEST DATE	•		
COMPOUND COMPONENTS	COMPONENT SPECIFIC GRAVITY	COMPONENT MOLE FRACTION	MOLE FRACTION	G. P. M. CONTENT		
NITROGEN	.9672	.0126	PROPANE	27.514		
CARBON DIOXILE	1.5195	.0019	ISO-BUTANE	32.698		
HELIUM	.1382	•	N-BUTANE	31.510		
OXYGEN	1.1048	.0002	LPG			
HYDROGEN SULFIDE	1.1766		ISO-PENTANE	36.582		
WATER VAPOR	.6220		N-PENTANE	36.213		
		(. 0147 ,	HEXANES	41,111	• •	
HIDROC	ARBON DILUENTS	(. • • • • • • • •	HEPTANES +	46.126		
METHANE	. 5539	. 8632	NATURAL	GASOLINE -	•	
ETHANE	1.0382	. 0710	TOTAL LIQUEFIA	BLE GPM		
PROPANE	1.5225	.0740		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	*****	
ISO-BUTANE	2.0068	.0039	WATER VAPOR CO		÷	
N-BUTANE	2.0068	1800	÷	latic Pressure P Dew Point ^O F		
ISO-PENTANE	2.4910	.0024	8	ew Point °F		
N-PENTANE	2.4910	.0021		or per MMCF		
HEXANES	2.9753	· 0078	Conversion			X 0.000021
HEPTANES +	3.7018	. 0020	S Water Vupor M	Iole Fraction		
COMPOSITION		1.0000	Moisture recor Make or type _	der reading		
MIXTURE SPECIFI	C GRAVITY:	. (SULFUR CONTENI	۲:		
Colculated From	Anolysis	.664	H ₂ S - Hydroge		00 cf	.00
Determined by Te	est Instrument 🧷	.663	RSH - Mercapto	ans 😶		.02
Instrument Make	or type KAY		RSR - Sulfides RSSR - Residua	···		.24
	/ ************************************		g – Kosk – Kesidua S – Total Sulfur,			.26
MIXTURE HEATING			H ₂ 5 Grains to fr		 n	X 0.0000157
(Btu/cf ot 14.73 Psi		Ida	8 H ₂ S Mote Fractio	n		
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MEASUREMENT	·····		GAS LTCO	(
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الاستعاد المحموليون التي المحمد ال

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WELL NAME:	Irish Hills KW #2
LOCATION:	2-195-24E
DST INTERVAL:	6532-6640

slope (M) = 2305 psi/cycle = 2440 psi P* 370[°]R Pc = 670 psiTC = 125 + 460° = 585°R Pwf = 77.4 psiт = $\frac{P^* + Pwf}{2} = \frac{2440 + 77.4}{2} = 1259 \text{ psi} \text{ (Note 1)}$ Pavg = $\frac{T}{Tc} = \frac{585}{370} = 1.58$ Tr = $\frac{Pavg}{Pc} = \frac{1259}{670} = 1.90 \text{ (Note 1)}$ = Pr 670 Tsc = 520°R Psc = 13.3 psi **z** ≐ 0.86 $= Z \cdot \frac{T}{Tsc} \cdot \frac{Psc}{Pavg} = 0.86 \cdot \frac{585}{520} \cdot \frac{13.3}{1259}$ = 0.010 Bg (Note 1) 69.7 mcfd \cdot 178.1 = 12414 b/d = q $1.20 \times 0.0114 = 0.0137$ cp (Note 2) == น $\frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6 (12414) (0.0137) (0.010)}{2305}$ kh = 0.1200 md · ft kh = = 58 ft (Note 3) h k = 0.0021 md (Note 4) C. S. Matthews - D.G. Russell eqn. 3.21a
 C. S. Matthews D.C. Russell Fig. C.3A&B 3) h estimated from Log

4) k = 0.0026 md for T=192°F

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				Pucker Depth(s)_				546'	· · · · · ·		Ft.	
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Gauge No.	512	Depth	651	<u>ا</u> ،	Clock No	13528		2ª hour	Ticket No.	87963	19	
First Flow Period	First Closed In Pres	ure	Seco Flow F	'errod	<u> </u>	Second used In Press	ле	ा। हाल्फ्रा	ird Tenod	<u> </u>	Third Osed In Pressu	<u>ire</u>
Time Dell. PSIG D00" Corr.	Time Dell. Log 1. F. H. 000''	PSIG Temp Cere	Time Dell. 00011	PSIG Temp Corr.	Time Defl 000''	$\log \frac{t+\theta}{\theta}$	PSIG Temp Corr	Time Celt ODD''	D' RG Tennys Core	Lanve Dell Good	Log t + d d	D'SIG Tamp Cour
0 .0000 57.7 1 .0139* 80.0 2 .0313 81.3 3 .0488 81.3 4 .0662 80.0 5 .0836 80.0 6 .1010 30.0 7	.0000 .0272** .0579 .0885 .1192 .1498 .1804 .2711 .2417 .2724 .3030	80.0 274.2 436.9 602.6 764.4 910.5 1051.3 1184.2 1298.6 1413.1 1496.0	.0000 .0263* .0602 .0936 .1271 .1606 .1940	60.3 72.1 70.8 74.8 76.1 76.1 77.4	.0000 .0705** .1308 .1912 .2516 .3120 .3724 .4328 .4932 .5536 .6140		77.4 628.9 990.7 1301.3 1557.9 1760.5 1911.8 2018.4 2094.7 2148.6 2181.5					
	2	Danth	66.92		Clock No). 6728	24	hour		<u></u>		<u> </u>
Couge No. 11 0 .0000 96.0 1 .0135* 106.5 2 .0304 107.8 3 .0473 107.8 4 .0642 103.9 5 .0811 100.0 6 .0980 100.0 7	3 .0000 .0270** .0573 .0876 .1180 .1483 .1787 .2090 .2393 .2697 .3000	Depth 100.0 242.1 415.7 575.2 733.5 881.2 1029.0 1163.6 1287.6 1402.4 1509.2	6583 .0000 .0270* .0608 .0946 .1284 .1622 .1960	102.6	.0000 .0705** .1308 .1912 .2516 .3120 .3724 .4328 .4932 .5536 .6140		92.1 609.5 984.1 1296.8 1550.1 1758.6 1915.6 2029.0 2106.9 2160.9 2197.9					
Reading Interval 5		}		10		18			•			Mine
	t interval is ec	ual to 4	the second s		minutes		21 minut	es.				

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Casing perfs	T. Bottom choke	· · _ Surt temp*
Con acause	Cul arayity	:505

INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED

ine a.m p.m	· 946 ;	Surface Pressure psi	Gos Rate MCF	Liquid Rate EPD	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	378"	1^{1}			Opened 3/8" choke	
1930	n	0			Closed tool -no gas to the surface	
2100	111	10			Opened tool on 3/8" choke	
2105	h.	12				
2106	n	11	88.4		Gas to the surface	
2110	11 j	5 ¹ 2	69.7		Pressure dropped	
2115	11	1/2	TSTR		11	
2130	EL .		TSTR		μ	
2145	11		TSTR		11	
2200	a t		TSTR		Closed tool	
7-7-80						
0100					Opened bypass and started out of hole	
			TSTR = tpo	small to	record	
			· · · · · · · · · · · · · · · · · · ·			
			PRODUCT		<u> </u>	

	FORMATION E	DENSITY			3.000
	COMPANY Yates Petroleum (WELL Irish Hills "KW" Sta FIELD Wildcat COUNTY Eddy STATE Ne	te Com #2	UNIT VALUE	INCH 7.875 LIME PHIX	VC 3)
e engenter	1983 'FNL + 1980 'FEL 1983 'FNL + 1980 'FEL 19-1 ENE	Other Services: DLL-MSEL	арананан Э МӨМ Эмөн ӨМӨМ	田 王 王 王 公式 正	0, 4500 FHUB(G/C32, HPH1(2)
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STA. NO. 1397-1 CONTRACT NO.__

TEST DATE 03:26-81

4 PONENT MOLE G. P. M. G. P. M. FRACTION CONTENT 27.514 PROPANE 0124 1.5195 CARBON DIOXIDE · 0008 ISO-BUTANE 32.698 HELIUM .1382 N-BUTANE 31.510 XYGEN 1.1048 LPG ----YDROGEN SULFIDE 1.1766 ISO-PENTANE . 36.582 .6220 WATER VAPOR N-PENTANE • 36.213 HEXANES 41.111 1.0132 HYDROCARBON DILUENTS HEPTANES + 46.126 .5539 **ETHANE** - 8859 NATURAL GASOLINE -THANE 1.0382 .0613 TOTAL LIQUEFIABLE GPM ROPANE 1.5225 ·0230 WATER VAPOR CONTENT: 50-BUTANE 2.0068 .0035 Gus Mixture Static Pressure PSIG 610# 65° -BUTANE 2.0068 · 0066 Hydrocarbon Dew Point OF SO-PENTANE 2.4910 .0020 Water Vapor Dew Point "F ... **N-PENTANE** 2.4910 Lbs Water Vapor per MMCF_ .0018 Conversion Constant X 0.000021 EXANES 2.9753 · 0017 Water Vapor Mole Fraction 3.7018 REPTANES + · 0010 Moisture recorder reading ____ Make or type OMPOSITION _ _ _ _ _ _ _ _ _ _ 1.0000 IXTURE SPECIFIC GRAVITY: SULFUR CONTENT: Calculated From Analysis KEAL .. 643 H2S - Hydrogen Sulfide, Gr./100 cf 00 RSH - Mercaptons .. 645 Determined by Test Instrument RSR - Sulfides Instrument Make or Type _ RSSR - Residuals Total Suller, Cr./100 of . IXTURE HEATING VALUE: H2S Groups to fraction conversion X 0.0000157 stu/cl of 14.73 Psio, 60°F, Sut.) H₁S Mole Fraction . 1109 . Calculated From Analysis Determined by Colorimeter ...) Colorimeter Verified (Critical Pressure Critical Temperature EMARKS INJTIAL DELIVERY EASUREMENT GAS GAS MARYSI GARRATT ALSTON 21 REA 237-A Rev. 10-75



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OIL CONSERVATION DIVISION

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207 SOUTH FOURTH STREET ARTESIA. NEW MEXICO 88210 TELEPHONE (505) 748-1331 RECEIVED

S. P. YATES PRESIDENT MARTIN YATES, III VICE PRESIDENT JOHM 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

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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 <u>currently producing</u> 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

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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 "N" 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 basis shown on Exhibit No. 2 are for the

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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.

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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.

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OIL CONSERVATION DIVISION

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ARTESIA. NEW MEXICO 88210

TELEPHONE (505) 748-133:

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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.

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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.

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. All Sections

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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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Sections 1 through 12

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

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TIGHT FORMATION APPLICATION CASE NO. 7352

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

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Tewnship 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

A.J. LOSEE JOEL M. CARSON CHAD DICKERSON DAVID R. VANDIVER LOSEE, CARSON & DICKERSON & A 300 AMERICAN HOME BUILDING CIL CONDENVATION, DAREA GODE 505 P. 0. DRAWER 239 SANIA ST. 746-3508 ARTESIA, NEW MEXICO 88211-0239

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.

denon

Chad Dickerson

CD:pvm Enclosure

cc w/enclosure: Mr. Dave Boneau

LAW OFFICES

A.J. LOSEE JOEL M. CARSON CHAD DICKERSON DAVID R. VANDIVER LOSEE, CARSON & DICKERSON, P. A. 300 AMERICAN HOME BUILDING P. O. DRAWER 239 ARTESIA, NEW MEXICO 88210



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.

Hukewon 100 Chad Dickerson

CD:pvm Enclosures

cc: Yates Petroleum Corporation

August 26, 1981

NSP:

SF

1-20 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

CASE

of the Perma Penn formation underlying

all of the fallowing to coverings : Tourising 17 South, "Kauser 24 Hora 26 East; 18 South, 24 min to East; 19 Sauth, 23 thru 25 East; 20 South, 21,23 and 24 Fair ; 20 ; Emile, 21 and 22 East; 21 South, 21 and 22 Fast. Filso Sections Itime 12 in 22 South, 21 and 22 Ear, acc of the acous

containing 315000 acres, more or less.



BEFORE THE OIL CONSERVATION DIVISION GANTA FL

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:

 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 <u>in situ</u> 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

1ekerion By: 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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APPLICATION

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Chad Dickenson

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SENCES SEE CHE COESERVATION DEVISION SANTA DE DIVISION OF THE STATE OF ERS. PRXICO.

IN THE FATILE OF THE APPLICEMENT: : PRERONCER CONFERENCE, : L. MO. s carde PERS CORDER, ME MURICO

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APPLICATION

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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:

APPLICATION OF YATES PETROLEUM CORPORATION FOR DESIGNATION OF A TIGHT FORMATION, EDDY COUNTY, Case No. 7352 Order No. R- 6904

 $C \downarrow 2c$

ORDER OF THE DIVISION

BY THE DIVISION:

NEW MEXICO.

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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 <u>day of February</u>. 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
-2-Case No. 7352 Order No. R-

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 formation are solved average depth to the top of such formation are 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 nonproductive; the markers picked to define the Permo-Penn formation

anthe

-3-Case No. 7352 Order No. R-

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 apected 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 tvision has not authorized the formation or any portion thereof to be developed by infill drilling.

(13) That the Artesian acquifer within the proposed area

-4-Case No. 7352 Order No. R-

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- 3904

EXHIBIT "A"

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

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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 DAME:	Box Canyon #4A
LOCATION:	23-21S-21E
DST INTERVAL:	5876-6051

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Mud Pit Sample					Drill Collor Leng	-		2.25"	
Mud Pit Somple F	iltrate	(a)	•F		Drill Pipe Lengt				·
			· · · · · · · · · · · · · · · · · · ·		Packer Depth(s)				
Mud Weight		g .	vis d		Depth Tester Va	the second s	5863 '	/	Ft
ТҮРЕ	AMOUNT			Depth Back		Surface		torn	<u>Ft</u>
Cushion			Ft.	Pres. Valve		Choke 1		oke .75"	r
•	proximati								Ĭ
Recovered 20	and the second s	eet of dr	illin	g mud			·		
	proximat					Paragram (
Recovered 20	00) Fe	eet of for	rmatio	on fluid		F		<u>````</u>	
						ŀ			
Recovered	Fe	eet of				: 	<u></u>		
_						ł		•	
Recovered	Fe	et of				÷			12
							·····		
Pageura- J	· •				· · ·				
	·	PRODUCT	ION T	EST DATA	SHEET				6
	·	· · · · · · · · · · · · · · · · · · ·	ION TI	EST DATA	SHEET				
Recovered Remarks	SEE	PRODUCT	ION TI					·	
	·	PRODUCT		Gauge No.	113	Gouge No.			
TEMPERATURE	SEE	PRODUCT 512 5964	Ft.		113 5905 Ft		F1.	T	
Remorks TEMPERATURE	SEE Gauge No. Depth:	<u>PRODUCT</u> 512 5964 24 нош		Gauge No. Depth:	113 5905 гт. 24 Hour Clock	Gauge No. Depth:	Ft. Hour Clock	Tool	A.M
Remarks TEMPERATURE	SEE Gauge No.	<u>PRODUCT</u> 512 5964 24 нош	Ft.	Gauge No.	113 5905 гт. 24 Hour Clock	Gouge No.	Ft. Hour Clock	Ti Tool Opened 1(А.М 000 р.М
TEMPERATURE Calc. Est. 130 °F.	SEE Gauge No. Depth: Blanked Off	512 5964 24 нолг No	Ft.	Gauge No. Depth: Blanked Off	113 5905 Ft 24 Hour Clock Yes	Gauge No. Depth: Blanked Off	Ft. Hour Clock	Tool Opened 1(Opened 1)	а.м 200 р.м 530 а.м
TEMPERATURE Calc. Est. 130 °F.	SEE Gauge No. Depth: Blanked Off Pr	512 5964 24 Hour No essures	Ft. r Clock	Gauge No. Depth: Blanked Off Pre	113 5905 Ft. 24 Hour Clock Yes essures	Gauge No. Depth: Blanked Off Pre	Ft. Hour Clock	Ti Tool Opened 1(А.М 000 р.М
Remarks TEMPERATURE Calc. Est. 13() •F. Actual •F.	SEE Gauge No. Depth: Blanked Off Field	512 5964 24 Hour No essures off	Ft. r Clock	Gauge No. Depth: Blanked Off Field	113 5905 Ft. 24 Hour Clock Yes essures Office	Gauge No. Depth: Blanked Off	Ft. Hour Clock	Tool Opened 1(Opened 15 Byposs Reported	A.M 000 P.M 530 A.M P.M Computed
Remarks TEMPERATURE Calc. Est. 120 °F. Actual °F.	SEE Gauge No. Depth: Blanked Off Field 2836	PRODUCT 512 5964 24 No essures off 281	Ft. r Clock	Gauge No. Depth: Blanked Off Field 2857	113 5905 Ft. 24 Hour Clock Yes essures Office 2846	Gauge No. Depth: Blanked Off Pre	Ft. Hour Clock	Tool Opened 1(Opened 15 Byposs	A.M 000 P.M 530 A.M P.M
Remarks TEMPERATURE Calc. Est.) 30 °F. Actual °F.	SEE Gauge No. Depth: Blanked Off Pr Field 2836 355	512 5964 24 No essures 011 281 44	Ft. r Clock	Gauge No. Depth: Blanked Off Field 2857 398	113 5905 Ft. 24 Hour Clock Yes essures 0ffice 2846 575	Gauge No. Depth: Blanked Off Pre	Ft. Hour Clock	Tool Opened 1(Opened 1 Bypass Reported Minutes	A.M 000 P.M 530 A.M P.M Computed Minutes
Remarks TEMPERATURE Calc. Est. 130 •F. Actual •F. nitial Hydrostatic B Flow Initial Final	SEE Gauge No. Depth: Blanked Off Field 2836 355 801	<u>PRODUCT</u> 512 5964 24 нош NO essures 0ff 281 44	Ft. r Clock ice 7 6	Gauge No. Depth: Blanked Off Field 2857 398 519	113 5905 Ft. 24 Hour Clock Yes essures 0ffice 2846 575 811	Gauge No. Depth: Blanked Off Pre	Ft. Hour Clock	Tioni Opened 1(Opened 18 Byposs Reported Minutes 	A.M 000 P.M 530 A.M P.M Computed Minutes
Remarks TEMPERATURE Calc. Est. J.30 •F. Actual •F. nitial Hydrostatic Est. Initial Flow Initial Flow Closed in	SEE Gauge No. Depth: Blanked Off Pr Field 28.36 355 801 1895	<u>PRODUCT</u> 512 5964 24 ноит No essures 0ff 281 44 1 78 13	Ft. r Clock 7 6 1 96	Gouge No. Depth: Blanked Off Field 2857 398 519 1904	113 5905 Ft. 24 Hour Clock Yes essures 0ffice 2846 575 811 1909	Gauge No. Depth: Blanked Off Pre	Ft. Hour Clock	Tool Opened 1(Opened 1 Bypass Reported Minutes	A.M 000 P.M 530 A.M P.M Computed Minutes
Remarks TEMPERATURE Calc. Est. J.30 •F. Actual •F. nitial Hydrostatic B Flow Initial Final Closed in	SEE Gauge No. Depth: Blanked Off Field 2836 355 801 1395 749	PRODUCT 512 5964 24 нош No essures 0н 281 281 44 178 13 13 73	Ft. r Clock ice 17 6 1 96 3	Gauge No. Depth: Blanked Off Field 2857 398 519 1904 767	113 5905 Ft 24 Hour Clock Yes essures 0ffice 2846 575 811 1909 759	Gauge No. Depth: Blanked Off Pre	Ft. Hour Clock	Tool Opened 10 Opened 10 Byposs Reported Minutes 30 90	A.M 000 P.M 530 A.M P.M Computed Minutes 30 90
Remarks TEMPERATURE Calc. Est. J.3() •F. Actual •F. Initial Hydrostatic Flow Initial Closed in Closed in Flow Final	SEE Gauge No. Depth: Blanked Off Field 2836 355 801 1395 749 1591	<u>PRODUCT</u> 512 5964 24 нош No essures 0ff 281 281 313 13 73 15	Ft. r Clock rce 17 6 1 96 3 92	Gauge No. Depth: Blanked Off Field 2857 398 519 1904 767 1626	113 5905 Ft. 24 Hour Clock Yes essures 0ffice 2846 575 811 1909 759 1622	Gauge No. Depth: Blanked Off Pre	Ft. Hour Clock	Tool Opened 10 Opened 11 Bypass Reported Minutes 	A.M 000 P.M 530 A.M P.M Computed Minutes 30 90 90
Remarks TEMPERATURE Calc. Est.):?() •F. Actual •F. Initial Hydrostatic Est.):?() •F. Actual •F. Initial Hydrostatic Flow Initial Closed in Flow Initial Closed in	SEE Gauge No. Depth: Blanked Off Field 2836 355 801 1395 749	<u>PRODUCT</u> 512 5964 24 нош No essures 0ff 281 281 313 13 73 15	Ft. r Clock ice 17 6 1 96 3	Gauge No. Depth: Blanked Off Field 2857 398 519 1904 767	113 5905 Ft 24 Hour Clock Yes essures 0ffice 2846 575 811 1909 759	Gauge No. Depth: Blanked Off Pre	Ft. Hour Clock	Tool Opened 10 Opened 10 Byposs Reported Minutes 30 90	A.M 000 P.M 530 A.M P.M Computed Minutes 30 90
Remorks TEMPERATURE Calc. Est. 13() •F. Actual •F. Initial Hydrostatic Est. Initial Final Closed in Closed in Closed in Closed in	SEE Gauge No. Depth: Blanked Off Field 2836 355 801 1395 749 1591	<u>PRODUCT</u> 512 5964 24 нош No essures 0ff 281 281 313 13 73 15	Ft. r Clock rce 17 6 1 96 3 92	Gauge No. Depth: Blanked Off Field 2857 398 519 1904 767 1626	113 5905 Ft. 24 Hour Clock Yes essures 0ffice 2846 575 811 1909 759 1622	Gauge No. Depth: Blanked Off Pre	Ft. Hour Clock	Tool Opened 10 Opened 11 Bypass Reported Minutes 	A.M 000 P.M 530 A.M P.M Computed Minutes 30 90 90
Remorks TEMPERATURE Calc. Est. 130 °F. Actual °F. Initial Hydrostatic Sec. Flow Initial Closed in Closed in Closed in Final Closed in Final Closed in Final	SEE Gauge No. Depth: Blanked Off Field 2836 355 801 1395 749 1591	<u>PRODUCT</u> 512 5964 24 нош No essures 0ff 281 281 313 13 73 15	Ft. r Clock rce 17 6 1 96 3 92	Gauge No. Depth: Blanked Off Field 2857 398 519 1904 767 1626	113 5905 Ft. 24 Hour Clock Yes essures 0ffice 2846 575 811 1909 759 1622	Gauge No. Depth: Blanked Off Pre	Ft. Hour Clock	Tool Opened 10 Opened 11 Bypass Reported Minutes 	A.M 000 P.M 530 A.M P.M Computed Minutes 30 90 90
Remarks TEMPERATURE Calc. Est. 120 °F. Actual °F. Initial Hydrostatic Prinal Final Closed in Final Closed in Closed in Closed in	SEE Gauge No. Depth: Blanked Off Field 2836 355 801 1395 749 1591	PRODUCT 512 5964 24 Hour No essures 0ff 281 281 144 178 13 15 18	Ft. r Clock rce 17 6 1 96 3 92	Gauge No. Depth: Blanked Off Field 2857 398 519 1904 767 1626	113 5905 Ft. 24 Hour Clock Yes essures 0ffice 2846 575 811 1909 759 1622	Gauge No. Depth: Blanked Off Pre	Ft. Hour Clock	Tool Opened 10 Opened 11 Bypass Reported Minutes 	A.M 000 P.M 530 A.M P.M Computed Minutes 30 90 90

FORMATION TEST DATA

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		512		Depth	5864 '		Clock No	<u>, 1373</u>	6	24 hour	Ticket No.	253334		L
First Flow Per	riod	Cle	First osed In Pressu		Sec Flow	ond Period	CI	Second osed in Pressu		Th Flow F		Third Closed In Pressure		
Time Defl. _000''	PSIG Temp. Corr.	Time Detl. .000''	$\log \frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl. .000''	PSIG Temp. Carr.	Time Defl. 000"	$\log \frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Defl, .000''	PSIG Temp. Corr.	Time Defl.	$\frac{\log d \ln Press}{\theta}$	PSIG Temp. Corr
0.000	446	.000		781	.000	733	.000		1592	••••••••••••••••••••••••••••••••••••••	·		• • • • • • • • • • • • • • • • •	
.0167	396	.0201	· · · · · · · · · · · · · · · ·	1745	.0503	797	.0269	1	1788	 الــــــــــــــــــــــــــــــ				1
2 .0333	485	.0403		1805	.1007	1158	.0537	tt	1811	11		11	1	1
3 .0500	526	.0604		1832	.1510	1318	.0806		1826	ff				+
4 .0667	628	.0805		1850	.2013	1435	.1075	t • • •	1838	1		1	+	
5 .0834	720	.1007		1860	.2517	1525	1344	1	1850	1		1	+	1
6 .1000	781	.1208		1864	.3020	1592	.1512	· · · · · · · · · · · · · · · · · · ·	1859			1		· [
7		.1409		1868			.1881		1864	1		+		
8		.1610		1868			.2150		1868	#			+	+
9		.1812		1869			.2418		1871	#				+
		.2013		1873	H	t	.2687	f	1873	<pre>//</pre>		∦	·	+
0		.2214		1877	h		.2956	}}	1875			-		
2		.2416		1884		ł	.3224	tt	1876			-#		+
3		.2617		1888	H	{	.3493	1	1880	₿			·	ł
		.2818		1892		+	.3762	<u>}</u> }	1881	₩		-₩	<u> </u>	+
4		.3020		1896	H	f	.4030	<u>}</u> }	1883	 -		H	ł	+
Coucos No	113			Denth	590	15'	Clock N	0. 13528		hour	24			
	113 575	.000		Depth 811	590 .000	759	Clock N	o. <u>13528</u>	1622	hour	24			[
<u>o</u> .000 1 .0172	575 422	.0203		811 1765	.000	759 996	.000	o. 13528	1622 1804	hour	24			
0 .000 1 .0172 2 .0343	575 422 519	.0203 .0405		811 1765 1816	.000 .050 .100	759 996 1180	.000 .0272 .0544	o. 13528	1622 1804 1827	hour	24			
0 .000 1 .0172 2 .0343 3 .0515	575 422 519 549	.0203 .0405 .0608		811 1765 1816 1848	.000 .050 .100 .150	759 996 1180 1334	.000 .0272 .0544 .0816	o. 13528	1622 1804 1827 1841	hour	24			
0 .000 1 .0172 2 .0343 3 .0515 4 .0687	575 422 519 549 656	.0203 .0405 .0608 .0811		811 1765 1816 1848 1865	.000 .050 .100 .150 .200	759 996 1180 1334 1455	.000 .0272 .0544 .0816 .1088	o. 13528	1622 1804 1827 1841 1855	hour	24			
0 .000 1 .0172 2 .0343 3 .0515 4 .0687 5 .0859	575 422 519 549 656 739	.0203 .0405 .0608 .0811 .1014		811 1765 1816 1848 1865 1874	.000 .050 .100 .150 .200 .250	759 996 1180 1334 1455 1549	.000 .0272 .0544 .0816 .1088 .1360	o. 13528	1622 1804 1827 1841 1855 1862	hour	24			
0 .000 1 .0172 2 .0343 3 .0515 4 .0687 5 .0859	575 422 519 549 656	.0203 .0405 .0608 .0811 .1014 .1216		811 1765 1816 1848 1865 1874 1880	.000 .050 .100 .150 .200	759 996 1180 1334 1455	.000 .0272 .0544 .0816 .1088 .1360 .1632	o. 13528	1622 1804 1827 1841 1855 1862 1872	hour	24			
0 .000 1 .0172 2 .0343 3 .0515 4 .0687 5 .0859 6 .1030	575 422 519 549 656 739	.0203 .0405 .0608 .0811 .1014 .1216 .1419		811 1765 1816 1848 1865 1874 1880 1882	.000 .050 .100 .150 .200 .250	759 996 1180 1334 1455 1549	.000 .0272 .0544 .0816 .1088 .1360 .1632 .1904	o. 13528	1622 1804 1827 1841 1855 1862 1872 1878	hour	24			
o .000 1 .0172 2 .0343 3 .0515 4 .0687 5 .0859 6 .1030 7 8	575 422 519 549 656 739	.0203 .0405 .0608 .0811 .1014 .1216 .1419 .1622		811 1765 1816 1848 1865 1874 1880 1882 1884	.000 .050 .100 .150 .200 .250	759 996 1180 1334 1455 1549	.000 .0272 .0544 .0816 .1088 .1360 .1632 .1904 .2176	o. 13528	1622 1804 1827 1841 1855 1862 1872 1878 1881	hour	24			
0.000 1.0172 2.0343 3.0515 4.0687 5.0859 6.1030 7 8 9	575 422 519 549 656 739	.0203 .0405 .0608 .0811 .1014 .1216 .1419 .1622 .1824		811 1765 1816 1848 1865 1874 1880 1882 1884 1885	.000 .050 .100 .150 .200 .250	759 996 1180 1334 1455 1549	.000 .0272 .0544 .0816 .1088 .1360 .1632 .1904 .2176 .2448	o. 13528	1622 1804 1827 1841 1855 1862 1872 1878 1881 1884	hour	24			
0 .000 1 .0172 2 .0343 3 .0515 4 .0687 5 .0859 6 .1030 7 8 9 0	575 422 519 549 656 739	.0203 .0405 .0608 .0811 .1014 .1216 .1419 .1622 .1824 .2027		811 1765 1816 1848 1865 1874 1880 1882 1884 1885 1885 1889	.000 .050 .100 .150 .200 .250	759 996 1180 1334 1455 1549	.000 .0272 .0544 .0816 .1088 .1360 .1632 .1904 .2176 .2448 .2720	o. 13528	1622 1804 1827 1841 1855 1862 1875 1872 1878 1881 1884 1885	hour	24			
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o .000 1 .0172 2 .0343 3 .0515 4 .0687 5 .0859 6 .1030 7 8 9 9 0 1 2	575 422 519 549 656 739	.0203 .0405 .0608 .0811 .1014 .1216 .1419 .1622 .1824 .2027 .2230 .2432		811 1765 1816 1848 1865 1874 1880 1882 1884 1885 1889 1893 1893	.000 .050 .100 .150 .200 .250	759 996 1180 1334 1455 1549	.000 .0272 .0544 .0816 .1088 .1360 .1632 .1904 .2176 .2448 .2720 .2992 .3264	o. 13528	1622 1804 1827 1841 1855 1862 1872 1878 1881 1884 1885 1886 1889	hour	24			
o .000 1 .0172 2 .0343 3 .0515 4 .0687 5 .0859 6 .1030 7 8 9 9 0 1 2	575 422 519 549 656 739	.0203 .0405 .0608 .0811 .1014 .1216 .1419 .1622 .1824 .2027 .2230 .2432 .2635		811 1765 1816 1848 1865 1874 1880 1882 1884 1885 1889 1893 1893 1898 1902	.000 .050 .100 .150 .200 .250	759 996 1180 1334 1455 1549	.000 .0272 .0544 .0816 .1088 .1360 .1632 .1904 .2176 .2448 .2720 .2992 .3264 .3536	o. 13528	1622 1804 1827 1841 1855 1862 1872 1878 1881 1884 1885 1886 1889 1890	hour	24			
o .000 1 .0172 2 .0343 3 .0515 4 .0687 5 .0859 6 .1030 7 8 9 9 10 11 2 3 4	575 422 519 549 656 739	.0203 .0405 .0608 .0811 .1014 .1216 .1419 .1622 .1824 .2027 .2230 .2432 .2635 .2838		811 1765 1816 1848 1865 1874 1880 1882 1884 1885 1889 1893 1893 1898 1902 1906	.000 .050 .100 .150 .200 .250	759 996 1180 1334 1455 1549	.000 .0272 .0544 .0816 .1088 .1360 .1632 .1904 .2176 .2448 .2720 .2992 .3264 .3536 .3808	o. 13528	1622 1804 1827 1841 1855 1862 1872 1878 1881 1884 1885 1886 1889 1890 1892	hour	24			
o .000 1 .0172 2 .0343 3 .0515 4 .0687 5 .0859 6 .1030 7 8 9 0 1 2 3	575 422 519 549 656 739 811	.0203 .0405 .0608 .0811 .1014 .1216 .1419 .1622 .1824 .2027 .2230 .2432 .2635	6	811 1765 1816 1848 1865 1874 1880 1882 1884 1885 1889 1893 1893 1898 1902	.000 .050 .100 .150 .200 .250	759 996 1180 1334 1455 1549	.000 .0272 .0544 .0816 .1088 .1360 .1632 .1904 .2176 .2448 .2720 .2992 .3264 .3536 .3808 .4080	o. 13528	1622 1804 1827 1841 1855 1862 1872 1878 1881 1884 1885 1886 1889 1890	hour	24			

สาราย เป็นสาราราชาวิณีที่สารากการการ

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Star All and a star star and a star star star and a star star star and

						_Surf. temp*F Ticket No253334
Spec. gravity.			Oil grav	ity		_GOR@*F
INDICATE	TYPE AN	D SIZE	OF GAS MEAS	URING DEVICE USED	<u>1/4 x t</u>	BU PST gauge*
Date Time		hoke 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	н		53	99.96		Gas to surface
1015	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		55	102.90		
1020			57	105.84		Started losing pressure
1025	11	<u> </u>	52	98.49		
1030			43	85.26		Closed tool
1200	i		0	-		Opened tool
1205			0	-		
1210			0	-		
1215			0	-		
1230	u		2	24.99	<u>-</u>	Pressure climbing
1245	16		5	29.40		
1200	19		2	24.99		
1215	11		2	21.99		
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'.
			ar. a	• <i>.</i>		Got hook to set and went on with test.
	· · · ·					
						EST DATA

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- Flow during DST was actually less.
- 3) C.S. Matthews D.G. Russell Fig. G. 3A&B
- 4) h estimated from Log -



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Т.

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DT

NOT SENT TO STATING I CALL AND THE STATE

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FLUI	DSAMP	LE DAT	A	Date	10-9-77		ket mber	13916	7	500
Sampler Pressure_		P.S.I.C	3. at Surface	Kind	10-2-11		lliburton		4	Twp R
Recovery: Cu. Ft.	C	······	1		OPEN HOLE T	EST Di	trict	ARTES	IA	R
cc. Oil	arter educe - type of the			~	DATNES			1		ķ
cc. Wat					RAINES	Wi	tness	J. MC	DONAL	D
cc. Muc Tot Lie		······		Drilling Contractor	MORAN BROT	HEDS NOTH	ITNO	CONDAN	Y P	W 12
Gravity	juid cc	API @			EQUIPME			DATA		<u>"-</u> ^
Gos/Oil Rotio			cu. ft./bbl.	Formation		Cisco				-Ľ
			HLORIDE	Elevation		35781				\overline{Ft}
		C	ONTENT	-	ictive Interval	16.				Ft.
Recovery Water	(ê•F	ppm	All Depths	s Measured From	Kelly E	lushin	ig- AGL	3593'	25
Recovery Mud		₽•F	ppm	Total Dep	·····	70001	·			Ft.
Recovery Mud Fil		•F	ppm		le/Casing Size	<u>7 7/8"</u>				
Mud Pit Sample Mud Pit Sample F		•F.	ppm		or Length	379'?	l.D.	2.250		
mud eit Sample e		<u>و جارعہ ج</u>	ppm		Length	<u>6448'</u> 6800'-	1.D. 68061	3.340		-1
Mud Weight	C).3 vis	sec	Packer De	ster Volve	6775'	0005	- 681	2	Ft.
TYPE	AMOUNT		Depth Back		Surface		Bottor			EL_
Cushion	Party of the	Fi	. Pres. Volve		Choke	3/8"	Chok		5"	}
					-					
Recovered	1383 Fee	t of dril	ling mud ·	- 500'	of water.			<u> </u>		
Recovered	5 ~~	t of								
							·			From DI
Recovered	Fee	t of								DINKUS
		<u> </u>						····		2
Recovered	Fee	t of					_			RA
Recovered	Fee	t of		<u> </u>						RANC
		t of								RANCH
Recovered								······································		RANCH
Recovered										RANCH
Recovered	Fee	t of	Τ ΠΔΤΔ ςυι	FFT						RANCH
	Fee	t of	T DATA SHI	 EET						RANCH
Recovered	Fee	t of	T DATA SHI	EET	•					
Recovered	Fee	t of	t data shi	EET	••			· · · · · · · · · · · · · · · · · · ·		
Recovered	Fee	t of	T DATA SHI	EET	•					RANCH County
Recovered	Fee	t of	T DATA SHI	EET						
Recovered Remarks	Fee SEE PRODI	t of			Gauge N					
Recovered	Fee SEE PRODI	ICTION TES	Gauge No.	1113	Gauge N		Ft			
Recovered Remarks	Fee SEE PRODI	1114 6784 F	Gauge No. 1. Depth:		Gauge N Ft. Depth:		Ft.	т т Тоо!		County EDDY
Recovered Remarks	Fee SEE PRODI	ICTION TES	Gauge No. 1. Depth:	1113 6844 24 Нои	Gauge N Ft. Depth:	lo. Hour	Ft. Clock 1			County EDDY
Recovered Remarks TEMPERATURE Est. °F.	Fee SEE PRODU Gauge No. Depth: Blanked Off	ICTION TES	Gauge No. 1. Depth: k	1113 6844 24 Нои	Gauge N Ft. Depth: r Clock	lo. Hour Off	Ft. Clock 1 (Tool Opened Opened	A 1315 p A	County EDDY
Recovered Remarks TEMPERATURE Est. °F.	Fee SEE PRODU Gauge No. Depth: Blanked Off	ICTION TES	Gauge No. t. Depth: k Blanked Off	1113 6844 24 Нои	Gauge N Ft. Depth: r Clock	lo. Hour	Ft. Clock 1 (Tool Opened Opened Bypass	A 1315 p A 2330 p	
Recovered Remarks TEMPERATURE Est. °F. Actual 127°F.	Fee SEE PRODU Gauge No. Depth: Blanked Off Pre	t of ICTION TES 1114 6784 F 24Hour Cloc NO ssures Offlice	Gauge No. 1. Depth: k Blanked Off Pr Field	1113 6844 24 Hou f no ressures Off	Gauge N Ft. Depth: r Clock Blanked	lo. Hour Off	Ft. Clock 1 ((E	Tool Opened Opened Bypass Reported	A 1315 p A 2330 P Comput	
Recovered Remarks TEMPERATURE Est. °F. Actual 127°F. Initial Hydrostatic	Fee SEE PRODU Gauge No. Depth: Blanked Off Pre field 3461	ICTION TES	Gauge No. 1. Depth: k Blanked Off Field 3320	1113 6844 24 Hour f n0 ressures 0ff 329	Gauge N Ft. Depth: r Clock Blanked ice Field	lo. Hour Off Pressures	Ft. Clock 1 ((E	Tool Opened Opened Bypass	A 1315 p A 2330 p	
Recovered Remarks TEMPERATURE Est. °F. Actual 127°F. Initial Hydrostatic	Fee SEE PRODU Gauge No. Depth: Blanked Off Pre field 3461 249	t of JCTION TES JITION TES 1114 6784 F 24Hour Cloc NO ssures 0ffice 3286 269	Gauge No. t. Depth: k Blanked Off Pr Field 3320 202	1113 6844 24 Hour f no ressures 0ff 329 366	Ft. Depth: r Clock Blanked lice Field	lo. Hour Off Pressures	Ft. Clock 1 ((E	Tool Opened Dened Bypass Reported Minutes	A 1315 P A 2330 P Comput Minute	
Recovered Remarks TEMPERATURE Est. *F. Actual 127*F. Initial Hydrostatic Flow Initial Flow Final	Fee SEE_PRODU Gauge No. Depth: Blonked Off 9re i ield 3461 249 392	t of JCTION TES JITION TES JITIA 6784 F 24Hour Cloc NO ssures Office 3286 269 400	Gauge No. t. Depth: k Blanked Off Pr Field 3320 202 405	1113 6844 24 Hour f no ressures 0ff 329 366 405	Gauge N Ft. Depth: r Clock Blanked lice Field	lo. Hour Off Pressures	Ft. Clock 1 ((E	Tool Opened Dened Bypass Reported Minutes 45	A 1315 P A 2330 P Comput Minut 45	
Remarks Remarks TEMPERATURE Est. °F. Actual 127•F. Initial Hydrostatic Final Closed in	Fee SEE PRODU Gauge No. Depth: Blanked Off Pre i letd 3461 249 392 2178	t of ICTION TES ICTION TES	Gauge No. t. Depth: k Blanked Off Field 3320 262 405 2149	1113 6844 24 Hour f no ressures 0ff 329 366 405 214	Gauge N Ft. Depth: r Clock Blanked fice Field	lo. Hour Off Pressures	Ft. Clock 1 ((E	Tool Opened Dened Bypass Reported Minutes	A 1315 P A 2330 P Comput Minute	County ECDY state
Remarks Remarks TEMPERATURE Est. °F. Actual 127•F. Initial Hydrostatic Final Closed in	Fee SEE PRODU Gauge No. Depth: Blanked Off Pre i reld 3461 249 392 2178 392	t of ICTION TES ICTION TES ICTION TES ICTION TES Sures Office 3286 269 400 2157 555	Gauge No. t. Depth: k Blanked Off Field 3320 262 405 2149 370	1113 6844 24 Hour f no ressures 0ff 329 366 405 214 594	Gauge N Ft. Depth: r Clock Blanked ice Field 99 5 5 5 49	lo. Hour Off Pressures	Ft. Clock 1 ((E	Tool Opened Dened Bypass Reported Minutes 45 90	A 1315 P A 2330 P Comput Minute 45 9(
Remarks Remarks TEMPERATURE Est. °F. Actual 127•F. Initial Hydrostatic Final Closed in	Fee SEE PRODU Gauge No. Depth: Blanked Off Pre field 3461 249 392 2178 392 2178 392 551	t of ICTION TES ICTION TES ICTION TES ICTION TES Sures Control Sures Sur	Gauge No. t. Depth: k Blanked Off Field 3320 262 405 2149 370 563	1113 6844 24 Hour f no ressures 0ff 329 366 405 214 594 549	Gauge N Ft. Depth: r Clock Blanked ice Field 19 19 19	lo. Hour Off Pressures	Ft. Clock 1 ((E	Tool Opened Dypass Reported Minutes 45 90 180	A 1315 P A 2330 P Comput Minute 45 9(9(
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First Flow Peri	iod	CI	First osed In Pressu	ure		ond Period	Cic	Second osed in Press	urð	Th	ird Period	CI	Third losed in Pressu	128
Time Defl.	PSIG Tomp, Corr,	Time Defl. .000"	$Log \frac{1+\theta}{4}$	PSIG Temp. Corr.	Time Defl.	PSIG Temp. Corr.	Time Deft.	$\log \frac{t+\theta}{\theta}$	PSIG Temp. Corr.	Time Deft,	PSIG Temp. Corr.	Time Defl.	$\log \frac{t+\theta}{\theta}$	PSIG Tame Corr.
0.000	269	.000		400	.000	555	.000		551		Lorr.			Corr
1.0164*	254	.0298		1048	.0969**	415	.0692*1	*	1585		ł	#		
2.0428	295	.0596	<u>├</u> ────┤	1433	1.1971	448	.1351		1926	#		-#		
3.0691	317	•0894	}}	1658	.2973	488	.2010		2086	H	 -		-	
4.0954	349	.1192	} }	1809	.3975	514	.2669		2164	H			+	ļ
5.1217	377	.1490	<u>├</u>	1913	.4978	535	.3329		2217	₩		· //	++	
6.1480	400	.1788	}f	1989	.5980	551	. 3988	<u>}</u>	2251			- #	1	
7	400	.2086	<u> </u>	2046	1.0500		.4646		2276					
8		.2384	<u>↓</u>	2091	∦		.5306		2292				·]	
9		.2682	h	2128	 -	··	.5965		2304				ł i	
0		.2980		2157	#		.6624	en la la factorio este de la caracteristica	2313	· · · · · · · · · · · · · · · · · · ·			1	
1		1.300	<u>├</u> ──── ┤		#		.7283		2318				•	
2		*****	[]		1		.7942		2324			-#	+	
3		H	t				.8601		2326			-	<u> </u>	·
		¥	<u> </u>		1		.9260		2327			- 	}}	
			f 1	1			# *JZUU /							
4		1113		Depth	6844'		.9920	. 13433	2327	24 hour			11	
4 5 Couge No. 0 .000 1 .0167*	366 271	1113		Depth 405 1044	6844' .000 .0964*1		.9920 Clock No .000 .0698*1). 13433 **	2327 549 1552	24 hour				
4 5 Couge No. 0 .000 1 .0167* 2 .0433	366 271 305	.000 .0300 .0600		405 1044 1422	.000 .0964*1 .1961	415 449	.9920 Clock No .000 .0698*1 .1362		2327 549 1552 1908	24 hour				
4 5 5 .000 0 .000 1 .0167* 2 .0433 3 .0700	366 271 305 322	.000 .0300 .0600 .0900		405 1044 1422 1646	.000 .0964*1 .1961 .2958	415 449 484	.9920 Clock No .000 .0698* .1362 .2027		2327 549 1552 1908 2066	24 hour				
4 5 Couge No. 0 .000 1 .0167* 2 .0433 3 .0700 4 .0967	366 271 305 322 352	.000 .0300 .0600 .0900 .1200		405 1044 1422 1646 1796	.000 .0964*1 .1961 .2958 .3956	415 449 484 512	.9920 Clock No .000 .0698* .1362 .2027 .2691		2327 549 1552 1908 2066 2156	24 hour				
4 5 Couge No. 0 .000 1 .0167* 2 .0433 3 .0700 4 .0967 5 .1234	366 271 305 322 352 379	.000 .0300 .0600 .0900 .1200 .1500		405 1044 1422 1646 1796 1901	.000 .0964*1 .1961 .2958 .3956 .4953	415 449 484 512 533	.9920 Clock No .000 .0698*1 .1362 .2027 .2691 .3356		2327 549 1552 1908 2066 2156 2210	24 hour				
4 5 5 .000 0 .000 1 .0167* 2 .0433 3 .0700 4 .0967 5 .1234 6 .1500	366 271 305 322 352	.000 .0300 .0600 .0900 .1200 .1500 .1800		405 1044 1422 1646 1796 1901 1977	.000 .0964*1 .1961 .2958 .3956	415 449 484 512	.9920 Clock No .000 .0698** .1362 .2027 .2691 .3356 .4020		2327 549 1552 1908 2066 2156 2210 2247	24 hour				
4 5 0 .000 1 .0167* 2 .0433 3 .0700 4 .0967 5 .1234 6 .1500 7	366 271 305 322 352 379	.000 .0300 .0600 .0900 .1200 .1500 .1800 .2100		405 1044 1422 1646 1796 1901 1977 2038	.000 .0964*1 .1961 .2958 .3956 .4953	415 449 484 512 533	.9920 Clock No .000 .0698** .1362 .2027 .2691 .3356 .4020 .4685		2327 549 1552 1908 2066 2156 2210 2247 2271	24 hour				
4 5 0 .000 1 .0167* 2 .0433 3 .0700 4 .0967 5 .1234 6 .1500 7 8	366 271 305 322 352 379	.000 .0300 .0600 .0900 .1200 .1500 .1800 .2100 .2400		405 1044 1422 1646 1796 1901 1977 2038 2084	.000 .0964*1 .1961 .2958 .3956 .4953	415 449 484 512 533	.9920 Clock No .000 .0698* .1362 .2027 .2691 .3356 .4020 .4685 .5349		2327 549 1552 1908 2066 2156 2210 2247 2271 2288	24 hour				
4 5 0 .000 1 .0167* 2 .0433 3 .0700 4 .0967 5 .1234 6 .1500 7 8 9	366 271 305 322 352 379	.000 .0300 .0600 .0900 .1200 .1500 .1800 .2100 .2400 .2700		405 1044 1422 1646 1796 1901 1977 2038 2084 2121	.000 .0964*1 .1961 .2958 .3956 .4953	415 449 484 512 533	.9920 Clock No .000 .0698* .1362 .2027 .2691 .3356 .4020 .4685 .5349 .6014		2327 549 1552 1908 2066 2156 2210 2247 2271 2288 2301	24 hour				
4 5 0 .000 1 .0167* 2 .0433 3 .0700 4 .0967 5 .1234 6 .1500 7 8 9 0	366 271 305 322 352 379	.000 .0300 .0600 .0900 .1200 .1500 .1800 .2100 .2400		405 1044 1422 1646 1796 1901 1977 2038 2084	.000 .0964*1 .1961 .2958 .3956 .4953	415 449 484 512 533	.9920 Clock No .000 .0698* .1362 .2027 .2691 .3356 .4020 .4685 .5349 .6014 .6678		2327 549 1552 1908 2066 2156 2210 2247 2271 2288 2301 2311	24 hour				
4 5 5 0 .000 1 .0167* 2 .0433 3 .0700 4 .0967 5 .1234 6 .1500 7 8 9 9 0 1	366 271 305 322 352 379	.000 .0300 .0600 .0900 .1200 .1500 .1800 .2100 .2400 .2700		405 1044 1422 1646 1796 1901 1977 2038 2084 2121	.000 .0964*1 .1961 .2958 .3956 .4953	415 449 484 512 533	.9920 Clock No .000 .0698* .1362 .2027 .2691 .3356 .4020 .4685 .5349 .6014 .6678 .7343		2327 549 1552 1908 2066 2156 2210 2247 2271 2288 2301 2311 2316	24 hour				
4 5 0 .000 1 .0167* 2 .0433 3 .0700 4 .0967 5 .1234 6 .1500 7	366 271 305 322 352 379	.000 .0300 .0600 .0900 .1200 .1500 .1800 .2100 .2400 .2700		405 1044 1422 1646 1796 1901 1977 2038 2084 2121	.000 .0964*1 .1961 .2958 .3956 .4953	415 449 484 512 533	.9920 Clock No .000 .0698* .1362 .2027 .2691 .3356 .4020 .4685 .5349 .6014 .6678 .7343 .8007		2327 549 1552 1908 2066 2156 2210 2247 2271 2288 2301 2311 2316 2320	24 hour				
4 5 0 .000 1 .0167* 2 .0433 3 .0700 4 .0967 5 .1234 6 .1500 7 .8 9 .0 1 .2 3	366 271 305 322 352 379	.000 .0300 .0600 .0900 .1200 .1500 .1800 .2100 .2400 .2700		405 1044 1422 1646 1796 1901 1977 2038 2084 2121	.000 .0964*1 .1961 .2958 .3956 .4953	415 449 484 512 533	.9920 Clock No .000 .0698* .1362 .2027 .2691 .3356 .4020 .4685 .5349 .6014 .6678 .7343 .8007 .8672		2327 549 1552 1908 2066 2156 2210 2247 2271 2288 2301 2311 2316 2320 2323	24 hour				
4 5 Couge No. 0 .000 1 .0167* 2 .0433 3 .0700 4 .0967 5 .1234 6 .1500 7 8 9 0 1 2 3 4	366 271 305 322 352 379	.000 .0300 .0600 .0900 .1200 .1500 .1800 .2100 .2400 .2700		405 1044 1422 1646 1796 1901 1977 2038 2084 2121	.000 .0964*1 .1961 .2958 .3956 .4953	415 449 484 512 533	.9920 Clock No .0698*1 .1362 .2027 .2691 .3356 .4020 .4685 .5349 .6014 .6678 .7343 .8007 .8672 .9336		2327 549 1552 1908 2066 2156 2210 2247 2271 2288 2301 2311 2316 2320 2323 2325	24 hour				
4 5 0 .000 1 .0167* 2 .0433 3 .0700 4 .0967 5 .1234 6 .1500 7	366 271 305 322 352 379 405	.000 .0300 .0600 .0900 .1200 .1500 .1800 .2100 .2400 .2700	9	405 1044 1422 1646 1796 1901 1977 2038 2084 2121	.000 .0964*1 .2958 .3956 .4953 .5950	415 449 484 512 533	.9920 Clock No .000 .0698* .1362 .2027 .2691 .3356 .4020 .4685 .5349 .6014 .6678 .7343 .8007 .8672		2327 549 1552 1908 2066 2156 2210 2247 2271 2288 2301 2311 2316 2320 2323	24 hour				

olaw system terror of the study state

SPECIAL PRESSURE DATA

cares and carta





Cosing perfs	·····	Bottom	choke		Surf. temp*F Ticket No139167
Gas gravity		Oil gra	vity		GOR@*F
			SURING DEVICE US		
Date Time a.m. p.m.	Choke Size	Surface Pressure psi	Gos Rate MCF	Liquid Rate BPD	Remarks
1315	3/8"	1#			Opened tool with a good blow.
1320	54	5			Good blow.
1325	u	15			Good blow - no gas.
1330	u	20			f1
1335	14	23	129.20	_	Gas to the surface in 20 minutes.
1340	H	24	132.60		Flared gas.
1345	u	24	132.60		. 11
1350	n	n	11		11
1355	n	23	129.20		U
1400	ŧ	IJ	11		" Closed tool.
1530	11	2			Reopened tool with a good blow.
1535	n	28	146		Gas to flare in 3 minutes.
1545	n	43	197		Gas flare.
1600		34	166		31
1615	n	25	136		B.
1630	15	20	119		N
1645	u	17	108		u
1700		18	112		n
1730		23	129		n
1800	n	24	132		Slight increase.
1830		25	136		Closed tool.
2330		· ···			Opened bypass - pulled loose.
·····	-	a an a' think little forgeneral as a			

neuvila COMPANY MORRIS R. ANTWELL COMPANY MORRIS R. ANTWEIL - 10 - 10 COUNTY EDDY FIELD DINKUS RANCH COMPENSATED FORMATION DENSITY POROSITY LA CAMA # L WELL LA CAMA # 1 FIELD O by the customer. DINKUS RANCH COMPENSATED NEUTRON POROSITY \odot COUNTY LIME EDDY 1980 ' ENL & 1980' EWL STATE NEW MEXICO WEIL teference data were furnished Other Services: SERIAL 20 Porosity index (%) NO ISE 01 DLL 20 FANGE Permanent Datum: 18-5 Log Measured From G.L K.B 25 - F Drilling Measured From_ 3578 K.B Elev .: 15 _Ft. Above Perm. Datum Date Elev.: K.B. 3593 D.F. 3592 G.L. 3578 10-5-77 Run No. Depth-Driller ONE Depth-Logger 24 8750 1 Btm. Log Interval 8742 borehole , 8741 SURFACE 8 5/8@ 1200 Top Log Interval Cosing-Driller Casing-Logger location and i Bir Size 1203 ė â 30 Type Fluid in Hole 7 7/8 , Ţ â 30 BRINE-GEL Dens. Visc. $\overline{@}$ pH Fluid Loss 11 0.3 Source of Sample 60 name, | 10 Rm @ Meas. Temp. 6 mĨ PLT Rmf @ Meas. Temp. ml @ 36 11 well Rmc @ Meas. Temp F ml 20 @ 86 082 a Source: Rmf Rmc 100 F F CALIPER DIAM. IN INCHES ml The @ 86 16 a a Rm @ BHT GAMMA RAY API UNITS F F F Circulation Stopped 0630 â a à F F F 148 F Ø à ŵ Logger on Bottom F F Mox. Rec. Temp. 1230 (a) **@** FI °F Pquip. Location @148 F 7732 HOBBS F \widehat{a} Recorded By F F Ļ OLD HERE F 0



	RPT-ASL	314		NATURAL GAS CO Phic gas analy	
•••	RPT DATE ANAL DATE			R STATION NAME COM #1	METER STA 61894 OPER 9841
1	YPE CODE	SAMPLE D 01 21			SCALE HZS GRAINS LOCATI 000G# 1 J
	······	• • • • • • • • • • • • • • • • • • •		NOKMAL NOLS	GPM
	C D 2			00.00	0.000
	H 2 S			<u>00+00</u> ≠	Q.000
	N2			01.74	0.000
	METHANE	· · · · · ·		83.51	0.000
	ETHANE			08.93	2.387
	PROPANE	•		Q3.21	Q.883
	I SO-BUTAN	E		00.36	0.118
	NORM-BUTA	NE		01+14	0,359
	150-PENTA			00.34	0.124
	NORM-PENT	ANE		00.35	0.127
	HEXANE PL	US		00.42	0.183
		TUTALS		100.00	4-181
	SPECIF	IC GRAVIT	Γ¥	0.6	84
		E HEATING F @ 14.73		SREES, DRY) 11	87
		OF SPECIF EST SECUP		1.2 RMINATION 525 C	
			.		
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WELL NAME:	Cities 36 State #1
LOCATION:	13-185-2412
DST INTERVAL:	6544-6865

p* = 2312 psi - slope (M) = 260 psi/cycle Pc = 669 psi $\mathbf{Tc} = 377 \,^{\circ}\mathbf{R}$ = 122 + 460° = 582 °R Pwf = 116 PSiт Pavg = $\frac{P^* + Pwf}{2} = \frac{2312 + 116}{2} = 1214 \text{ psi}$ (Note 1) = $\frac{T}{Tc}$ = $\frac{582}{377}$ = 1.54 Tr $= \frac{Pavg}{Pc} = \frac{1214}{669} = 1.81$ Pr 669 ≟ 0.885 $Tsc = 520^{\circ}R$ Psc = 13.3 psiZ $= Z \cdot \frac{T}{Tsc} \cdot \frac{Psc}{Pavg} = 0.885 \cdot \frac{582}{520} \cdot \frac{13.3}{1214} = 0.0109$ (Note 1) Ba = 189 mcfd · 178.1 = 33660.9 b/d q = (1.2) (0.0114) = 0.0137 CP (Note 2) u $\frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6 (33660.9) (0.0137) (0.0109)}{260}$ kh 2603.144 md ft k'n = = 45 ft (Note 3) h $k = 0.69 \, \text{md}$

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 13-185-24E DST 6544-6		
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FLUI	D SAM	PLE	DATA		Dote			Ticket Nuritier	52044			Legul	
Scimpler Pressure			P.S.I.G	at Surface	Kind			Hallburtz				Twp	C
Recovery. Cu. Ft.	Gos1	07			of Job	OPEN HOL	<u>:</u>	District	ARTES	4		R	YT1
cc. Oil					7.000	1-1 Cut DC	SCOPERC	16/10-100	1 100	140		ē	
cc. Wat		0			Tester	ETCHARD	PLEYLES	vi iines:	30!	<u>1</u> 45		\mathbf{I}	"JG"
	uid cc				Drilling Contractor	LANDIS D	RILLING	± 4		[DR	13-	7
Grovity				۲۲.		EQLIPM	ENTE	HOLE	DATA			-18S	STATE
Gas/Oil Ratio				cu ft./bbi	Formation	Testec	Lower	Cisco				11	4 4
;	RE	SISTIVITY	CHI	LORIDE	Elevation		3651'				Ft.	24E	COMM
Recovery Water		(a	*F.	ppm	Al Depths	tive Interval Measured From	<u>. Kellv</u>	Bushing			Ft.	```	Ż
Recovery Mud		@	•F	ppm	2		6356				Ft.	1	
Recovery Mud Fili	Irate	@	•F	ppm	Main Hole	/Casing Size							
Mud Pit Sample		. e	• F.	ppm.		Length		I.D	1.25"				¥
Mud Pit Somple F	iltrate	· · · · · · · · · · · · · · · · · · ·	•F	ppm	Drill Pipe	Length	6156' 6538-6		3.826			1	N N
Mud Weight	8.	<u>к</u>	vis 2	8 se<		ith(s) er Vaive	6518'	544			F1. Ft		
TYPE	AMOUNT	<u>. </u>		Depth Boc		Surface		Batte			FL	1	
Cushion			Ft.	Pres. Volv		Choke	5/8"	Cho					-
0	AA0 6	المعمد		است. س								27	1 20
Recovered	442 7	eet of dr	<u>1111n</u>	<u>q nua</u>		<u> </u>						Area Area	
Recovered	F	eet of									From	-	
											Te		
Recovered	F	eet of										1	6544-
Recovered	F	eet of									Vol		44
											ià		-6856 T
Recovered	F	eet of	·								;		56
0t-		DODUCTI	0N TE	CT DATA	CHEFT						ŀ		stad
Remarks	SEE P	KUDULII	UNIE	ST DATA	SHEEL						i	4	Inter
												1	No.
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i 		<u> </u>										ſ	
]	
TEMPERATURE	Gouge No.	1114 6522		Gouge No.	1113 6852	Gauge	N0.			TIME			YATES
	Depthi		Ft. ur Clock	Depth	24 Hour	Ft. Depth:		Ft.	Tool			0	ES
Est. •F.	Blanked Of		UT CIOCK	Bionked O	HYes	Blanke				0080	А.М. Р.М.	βDY	1 1
					<u></u>				Opened		A.M.		FR
Actual 122 *F.	<u>Р</u>	ressures		F	ressures		Pressures			1300	P.M.		2
· · · · · · · · · · · · · · · · · · ·	Field		ffice	Field	Dffic	e Fieli	с <u>(</u>	Office	Reported	1	puted		PETROLEUM
initiol Hydrostatic	2993	290		3153	3105	i		·	Minutes	Min	utes	<u>ي</u>	
Flow Final	<u>125</u> 178	226		214	416				30	31		in the	ORF
Closed in	2300	229		285	2429				90	- 31		{	- OF
Laitini	178	395		267					- <u></u>			1	Pany
Flow Final	125	116		231	246		· · · · · · · · · · · · ·		60	60]	CORPORATION
Ciosed in	2265	26		240E	2394				120	120	3	NEW	71-2
Flow - Initial Fino!	: 	·											
Closed in	, .			:								MEX	
Final Hydrostatic	2975	295	2	3135	3099		· · · · · · · · · · · · · · · · · · ·				· · · · ·	~	: }
				10100	2222							-00	
	U.S.A.	F	ORI	MATIC	ON TE	ST DA	TA		1772E 1.125	4- 3M 2-25		يا آ	0

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					_Surf. temp*F Ticket No520451
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te ne a.m. p.m.	JIZE	Surface Pressure psi	Gos Rote MCF	Liquid Rote BPD	Remarks
0800	1/8"				Opened tool with a good blow
0805	n	18			Good blow, no gas
0810	11	28		·	u
0815	н	38			11
0820	u	49			11
0825	11	60			11
0 830	11	70			Closed tool
0834					Gas to surface
3000	5/8"				Opened tool, gas flare
1005	н	15	299		
1010	11	10	249		Gas depleating
1015	•	6	209		Gas Stabilized
1020	u	6	209		u.
1025	n	6	209		u
1030	u	6	209		li .
1035	н	e	209		Ш
1040	n	6	209		n .
1045	13	6	209		11
. 050	+1	5	199		Gas depleating
1055	13	Ų.	189		II.
100	13	- 4	189		Closed tool
300					Pulled tool loose
_				1	

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TLE 1 240

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		1114		Depth	652		1	<u> </u>		24 hour		520451		
First Flow Pe	riod	C1,	First osed in Pressu	Jre	Seco Flow	Period	C1	Second losed In Pressu		Flow	hird Period	Cie	Third osed in Pressu	
Time Deft. .000''	PSIG Temp. Corr.	Time Deli. .000**	$\log \frac{1+\theta}{\theta}$	PSIG Temp. Coll.	Time Defl. .000''	PSIG Temp Corr.	Time Defl. 000''	$Log \frac{1+\theta}{\theta}$	PSIG Temp. Core.	Time Defl. .000"	PSIG Temp. Corr.	Time Defl. 000''	$\log \frac{1+\theta}{\theta}$	Tem Tem Corr
0.000	336	.000		178 848**	.000	395 0	.000		116					
1 .0197 2 .0362	<u>89*</u> 110	.0165		1502	.0342 .0683	121 107 112	.0265 .0531		1219 1693					w
3 .0526	132	.0562		1850 1970	.1025 .1367	112	.0796		1876					
4 .0691 5 .0855	148 164	.0760 .0958	· · · · · · · · · · · ·	2057	.1709	116	1327		2018			-	· · · · · ·	
6 .1020 7	178	.1156 .1354		2125 2180	.2050	116	.1592		2186					
8		.1553	· · · · · · · · · · · · · · · · · · ·	2217 2246		······································	.2122	· · · · · · · ·	2235		and a second sec			
9		.1751 .1949		2263			.2388		2246					· · · · · · · · · · · · ·
11		.2147 .2345		2276 2284			.2918 .3184		2253 2256		-			
12	·	.2544		2250			.3449		2260	• · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·		
14		.2742		2293 2297			.3714		2263					
Gauge No.	11		- Lance	Depth	6852'		Clock N	0 43	65	hour	24			
0.000	415	000.		312	.000	382	.000		246		<u> </u>			
2.0366	244	.0167 .0367	· · · · · · · · · · · · · · · · · · ·	1033** 1643	.0332	182 237 232	.0267		1371 1807					
3.0532 4.0698	263 279	.0567 .0768		1957 2086	.0995	239 244 246	.0800		2005		.			
5.0854	296	8300.	· · · · · · · · · · · · ·	2178	. 1659	246	.1334		2244				· · · · · · · · · · · · · · · · · · ·	
6.1030 7	312	.1168		2253 2314	.1990	246	.1600		2310					
8		.1568		2355 2383			.2134 .2400	· · · · ·	2368					-
9		.1969	-	2402	H	· · · · · · · · · · · · · · · · · · ·	.2667		2383		· · · · · · · · · · · · · · · · · · ·			1
11		.2169		2411 2420	 		.2934		2385		· · · · · · · ·			
13	n an an an an Anna an Anna Anna Anna An	.2569	+	2427 2429			. <u>3467</u> . <u>3734</u>		2392 2394					
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GAS QUALITY	TEST REPORT	APLE OR STATION NAME CI	TIES "JG"		LAG 4						
COMPOUND	COMPONENT SPECIFIC GRAVITY	COMPONENT MOLE FRACTION	LIQUEFIABLE HYDROCARBONS	COMPONENT G. P. M.	MOLE FRACTION	G. P. M. CONTENT					
NITROGEN	.9672	.0126	PROPANE	27.514							
CARBON DIOXIDE	1.5195	.0019	1SO-BUTANE	32.698							
HELIUM	.1382	· · · · · · · · · · · · · · · · · · ·	N-BUTANE	31.510							
OXYGEN	7.1640	.0002	LPG								
HYDROGEN SULFIDE	1.1766		ISO-PENTANE	36.582							
WATER VAPOR	.6220		N.PENTANE	36.213	•						
	ARBON DILUENTS	. 0147 ,	HEXANES	41.111	• •						
AIDROC	ARBON DILUENTS	(, . , . ,	HEPTANES	46.126							
METHANE	.5539	. 8632	NATURAL GASOLINE								
ETHANE	1.0382	. 0710	TOTAL LIQUEFIABLE GPM								
PROPANE	1.5225	0290									
ISO-BUTANE	2.0068	.0039	WATER VAPOR CO								
N-BUTANE	2.0068	.0085	÷:	atic Pressure P lew Point ^C F		<u>_</u>					
ISO-PENTANE	2.4910	.0024		ew Point [©] F							
N-PENTANE	2.4710	.0021	X ·	or per MMCF							
HEXANES	2.9753	. 0028	Conversion Water Vapor M			X 0.000021					
HEPTANES +	3.7018	. 0020									
				der reading							
COMPOSITION		1.0000	Make or type _								
MIXTURE SPECIFI		161	SULFUR CONTENT			•••					
Calculated From		.663	S H₂S → Hydrogen S RSH → Mercacta		00 cf	.00					
Determined by To		د ١٥٥	RSR - Suifides			.24					
Jostroment Make	or Type KAX		0 0 PSSP - Residua								
MIXTURE HEATING			Total Sulfur,			.26					
(Btu/ef at 14.73 Psi			 H₂S Grains to free H₂S Mole Fraction 		rı	X 0,0000157					
Calculated From	Analysis	(140									
Determined by C	alorimeter	a tu i yana a ta ma	Critical Pressure		n A. R. S.	3715					
Colorimeter Verif	ied (Critical Pressure	OUC) / Criti	col Yemperaturi						
REMARKS											
MEASUREMENT			GAS A								
AREA 1.01	ween		GAS ANALYST F.7.1724	1		ζ)					

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WELL NAME:	Irish Hills KW	#2
LOCATION:	2-195-24E	
DST INTERVAL:	6532-6640	

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$$p* = 2440 \text{ psi} \qquad \text{slope (M)} = 2305 \text{ psi}/cycle}$$

$$Tc = 370^{\circ}R \qquad Pc = 670 \text{ psi}$$

$$T = 125 + 460^{\circ} = 585^{\circ}R \qquad Pwf = 77.4 \text{ psi}$$

$$Pavg = \frac{P* + Pwf}{2} = -\frac{2440 + 77.4}{2} = 1259 \text{ psi (Note 1)}$$

$$Tr = -\frac{T}{Tc} = -\frac{585}{370} = 1.58$$

$$Pr = \frac{Pavg}{Pc} = -\frac{1259}{670} = 1.90 \text{ (Note 1)}$$

$$z = 0.86 \qquad Tsc = 520^{\circ}R \qquad Psc = 13.3 \text{ psi}$$

$$Bg = z \cdot \frac{T}{Tsc} \cdot \frac{Psc}{Pavg} = 0.86 \cdot -\frac{586}{520} - \cdot \frac{13.3}{1259} = 0.010 \text{ (Note 1)}$$

$$q = 69.7 \text{ mcfd} \qquad 178.1 = 12414 \text{ b/d}$$

$$u = 1.20 \times 0.0114 = 0.0137 \quad cp \quad (Note 2)$$

$$kh = -\frac{162.6 \cdot q \cdot u \cdot p}{M} = -\frac{162.6 (-12414 \cdot 1) (-0.0137 - 1) (-0.010)}{2305}$$

$$kh = 0.1200 \quad md \cdot ft$$

$$h = 58 \text{ ft (Note 3)}$$

$$k = 0.0021 \text{ md (Note 4)}$$

$$1) C. S. Matthews - D.G. Russell eqn. 3.214$$

$$2) C. S. Matthews - D.G. Russell eqn. 3.214$$

$$2) c. S. Matthews - D.G. Russell Pig. G.3ABB$$

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ompiler Pressure_	69	P 5 1	G at Surfaze		EN HOLE (ET.inful/Ff	ARTES	T A	1
ecovery: Cul Ft	Gas .284				LAMAR	ADDLE Location	ARIES	18	{
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	RESIS	Charles and a state of a second second	CH. CHILL CONTENT	Elevation		3718'			Ft. r
				Net Productive in	nterval	_			Ft. 🕇
Recovery Water		ġ ↔F ā ↔F		All Depths Micasi		Kelly bush	ing(AGL)		
Recovery Mud				Total Depth		9190'		l	Ft.
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Nud Pit Sample			in n'i stêpe	Drill Pipe Length		5835' 1.D	3.340	11	
Mud Pit Somple F	Strate	۹ '۶ _		Pocker Depth(s)_					Ft.
Aud Weight	8.9		sec	Depth Tester Val		6507'		 	Ft.
TYPE	AMOUNT		Depth Back		Surface	Bot	tom		
Cushion			Ft. Pres. Valve		Choke	V/ V	ok75		<u>_</u>
Recovered	180 Fee	tof drill	ing fluid			Adj. choke			
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Recovered Remarks	Feu SEE PRODUC	512 51101	Gauge No.	113 6583 Ft	Depth:	F1	(00.00-2-	4:00 hrs.)	
Recovered Remarks TEMPERATURE	Feu SEE_PRODU(Gauge No.	512 6511 24 Hour Cle	Gauge No. Fr Depth: bek :	113 6583 гч. 24 Hour Clock	Depth	Hour Clock	(00.00-2- Tool 7	4:00 hrs.) -6-80	
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87**963**9 INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED

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	a.m. p.m.	2126 -	Surface Pressure psi	Gas Rate MCF	Liguid Rate PPD	Remorks 1
0700				-		Called out
1145						On location
1300						Picked up tools
1400						Started in hole with tools
1900						Opened with a weak blow
1905	_		Ī			Weak blow
1910						Blow increased to good
1915		3/8"	1 ¹ 2			Opened 3/8" choke
1930		11	0			Closed tool -no gas to the surface
2100		11	10			Opened tool on 3/8" choke
2105		at	12			
2106		11	11	88.4		Gas to the surface
2110		11	5 ¹ 2	69.7		Pressure dropped
2115		µ1	1/2	TSTR		t)
2130		11		TSTR		LI
2145		i1		TSTR		n
2200		11		TSTR	· · · · · · · · · · · · · · · · · · ·	Closed tool
7-7-80	0					
0100						Opened bypass and started out of hole
				TSTR = t	bo small to	record
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	····· ·				\$ - 	
FW 152-2-2283-	•••• • • • •	• : s =	<u>ن</u> ــــــــــــــــــــــــــــــــــــ	PRODUC	TION T	EST DATA

	COMPANY Yates Petroleum Corporation			000	
	WELL Irish Hills "Kw" State Com. #1	VALUE	7.875 LIME FHIX		
Parte Barry Party Party	COUNTY Eddy STATE New Mexico 1980 FNL + 1980 FEL Other Services: DLL-MSEL	НАМЕ UNIT	е INCH I	5703) 11/13)	
rmonent Datum 9 Measured From Illing Measured From	9-1 24-E	1	nd Matr Para	е РНЦВ (G/ НРН <u>Т (_</u> 2	
e No. h- Driller n-Logger	7-5-80 G.1. 3709	ARAMETERS UNIT VALUE		20795 n Tua	
cg Interval g-Driller 8 g-Logger le	9188 Surf 5/1 à 950 (a. a. a. 948 778 M. Gel, Starch	Ракаме Наме имі	FSHR FD BHS 	-0.050 2.000	
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Rmf Rmc N BHT .10 niion Stopped 070 on Bottom /4	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	UNIT VALUE	G/C3 2.71 WATE 0.0 (GAPI)		
Location 4185	49 ·F		MDEN G/ BHF DO GR <g< td=""><td>00 CALICIN GR (GAP</td><td></td></g<>	00 CALICIN GR (GAP	


GAS QUALITY		COMPANY LLER_ FIELD OR LOCATION SOURCE OR RESERVOIR_ VELL OR STATION NAME		STA. NO. <u>1397-1</u> CONTRACT NO. TEST DATE <u>03,2681</u> LAB <u>4</u>					
COMPOUND COMPONENTS	COMPONENT SPECIFIC GRAVITY	COMPONENT MOLE FRACTION	LIQUEFIABLE HYDROCARBONS	COMPONENT G. P. M.	MOLE FRACTION	G. P. M. CONTENT			
RITROGEN	.9672	.0124	PROPANE	27.514					
	1.5195	.0008	ISO-BUTANE	32.698	•				
ELIUM	.1382	•	N-BUTANE	31.510					
XYGEN	1.1048		LPG						
YDROGEN SULFIDE	1.1766	·	ISO-PENTANE	36.582	•				
WATER VAPOR	.6220	·	N-PENTANE	36.213	•				
HYDROC	ARBON DILUENTS	(.0132)	HEXANES	41.111	•				
HIDROC.	ARBON CALULATS		HEPTANES +	46.126	•				
ETHANE	.5539	. 8859	NATURAL	GASOLINE -					
E THANE	1.0382	. 0613	TOTAL LIQUEFIAB	LE GPM					
PROPANE	1.5225	. 0230							
SO-BUTANE	2.0068	.0035	WATER VAPOR CONTENT: Gas Mixture Static Pressure PSIG 610# 65°						
-BUTANE	2.0068	· 0066	Gas Mixture Sta Hydrocarbon De			- 62			
SO-PENTANE	2.4910	. 0020	ni 19 19 - Anton Anton Anton	6 C m					
PENTANE	2.4910	.0018	Water Vapor De Libs Water Vapo	r per MMCF	30#				
EXANES	2.9753	·0017	Conversion (onstant	-	X 0.000021			
EPTANES +	3.7018	. 0010	Water Vapor Mo	le Fraction		·			
OMPOSITION		1.0000	Moisture record Make or type						
SIXTURE SPECIFIC	GRAVITY:		SULFUR CONTENT:						
Calculated From A	Analysis REAL.		H ₋ S - Hydrogen	Sulfide, Gr./10	0 cf	.00			
Determined by Te	st Instrument	. 645	RSH - Mercaptan	5 H					
Instrument Make o	r Type KNX.		RSR Sulfides RSSR Residuols	**					
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Calculated From A	Analysis .	. 1109 .							
Determined by Cal									
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REASUREMENT		(GAS ANALYST GARRA	TTIPLS	Ton	27			
				• \$ \$. \$. \$					

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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

CASE NO. 7352

UUL) .381

APPLICATION OF YATES PETROLEUM CORPORATION RECEIVED 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

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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.

FXHIBIT 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 <u>currently producing</u> 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.

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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 Ant lope 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 <u>4927</u> 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 <u>6717</u> feet. The average depth to the top of the subject Permo-Penn Formation is thus 5822 feet. =

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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 64 '' 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

A J. LOSEE JOEL N. CARSON CHAD DICKERSON DAVID R. VANDIVER LOSEE, CARSON & DICKERSON, P.A. 300 American hume building P.O. DRAWER 239 ARTESIA, NEW MEXICO 88210

ARFA CODE 505 746-3508

October 2, 1981

CIL CONSERVATION DIVISION

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RECEIVED

VIA PURGLATOR

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.

uhenon Grad Chad Dickerson

CD:pvm Enclosures



LAW OFFICES

A.J.LOSEE JOEL M.CARSON CHAD DICKERSON DAVID R.VANDIVER LOSEE, CARSON & DICKERSON, P. A. 300 AMERICAN HOME BUILDING P. O. DRAWER 239 ARTESIA.NEW MEXICO 88211-0239

AREA CODE 505 746-3508

November 16, 1981

1.10 Ы VISION 1. 1 -SANTA FE OL

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.

Hewon Chad Dickerson

CD:pvm Enclosures

cc: Mr. Dave Boneau

cc w/enclosure:

United States Geological Survey 505 Marquette, N.W. Albuguerque, New Mexico 87102

WELL BAME:	Hox Canyon #4A
FOCYALON :	23-215-21E
DST HUPPRVAL:	5876-6051

p* ≈ 1904 psi slope (M) = _ 92 psi/cycle e 1. 365 [°]R Pc = 670 psiTC $130 + 460^{\circ} = 590^{\circ}R$ Pwf = 1592 psiт ы. С $\frac{P^{\star} + Pwf}{2} = \frac{1904 + 1592}{2} = 1748 \text{ psi} \text{ (Note 1)}$ Pavg 😑 $\frac{T}{Tc} = \frac{590}{1.62}$ 1.5 Tr 367 $\frac{Pavg}{Pc} = \frac{1748}{670} = 2.61$ Pr = Tsc = 520°R Psc = 13.3 psi \mathbf{z} 172 0.84 $= 2 \cdot \frac{T}{Tsc} \cdot \frac{Psc}{Pavg} = 0.84 \cdot \frac{590}{520} \cdot \frac{13.3}{1748} = 0.0073$ (Note 1) Bg = $25 \mod 178.1 = 4452.50 \text{ b/d}$ q = (0.0114) (1.3) = 0.0148 cp (Note 2) u $\frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6 (4452.5) (0.0148) (0.0073)}{92}$ kh 0.8502 alt ft kh 2.3 h = an ft (Note -) . ST WALLABLE COPY k = 0.021 md

Liz, Matthews etc., and Roep Bills
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Supplement to Exhibit ! Page 1 - 5

Cusing perfs		Bottom:			Surf. temp*F Ticket No253334				
Soec. grovity INDICATE TYP	E AND SIZE	Of GAS MEAS	URING DEVICE USER	JSED 174 x 80 PST gauge **					
Date Time a.n p.n	n. Choke Size	Surface Pressure psi	Cros Rute ANCE	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	11	53	99.96	·····	Gas to surface				
1015	l n	55	102.90						
1020	11	57	105.84		Started losing pressure				
1025	11	52	98.49						
1030	11	43	85.26		Closed tool				
1200	n	0	-		Opened tool				
1205	11	0	-						
1210	и	0	-						
1215	15	0	-						
1230	9	2	24.99		Pressure climbing				
1245	16	5	29.40						
1200	11	2	24.99						
1215	11	2	24.99						
1330	11	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 a				
			ULADIE COPI		6304'-6490', could not hook, came up				
		¥	un de la composition br>A composition de la co		and straddled section at 5876'-6051'.				
				· · · · · · · · · · · · · · · · · · ·	Get hook to set and went on with test				
	· · · · · · · · · · · · · · · · · · ·								
					-				

G	auge No.		512	: 	Depth	5864		Clock No	<u>5. 1373</u>	5	24 hour	Ticket 2 No. 2	53334		
	First Flow Per		C C	Forst L.s. 3 To Pross	ure -	flec Flow	ond Period	CI	Second lased In Pressu	(ð	Thi FLor P	rd Frited	CI	Third osed In Pressu	.ire
Î	Time Dufi.	8513 10002 1007	- provide and the second se	al. g to at	and a second second second second	Liet 2 Deffi	PSUS Fee p Core		Log L & B	PSIG Temp Corr	Time Deft. .000 '	PSIG Temp. Carr	Time Datt .000**	1031+8	Polis Yemp Carr.
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<u></u>	auge No.	113			Depth	590		Clock N	o. <u>13528</u>		hour	24		- -	
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Supplement to Exhibit 12 Page 1 - 6



رجه العبر الإدرية المتدري مماج

Box Canyon 4A

DST 5876-6051

Log footage contributing to height h:

j.

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.

Supplement to Exhibit 12 Page 1 - 8

Box Canyon #4A

DST 5876-6051

Time to Reach Pseudosteady State

A)	Average Poros	ity = 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		
		596 0–5966	0.043		
		5982-5983	0.008		
		5984– 5985	0.017		
		5994-5996	0.026		
		6016-6020	0.052		
		6030-6032	0.011		
B)	Total Compres	sibility = $S_g C_g$ $C_t = (0.7) (0.00065) = 0.00046 \text{ psi}^{-1}$			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
,		L		(Note	2)
c)	Time t =	$\frac{1136\emptyset u C_{t} r_{e}^{2}}{k}$			
	t <i>≂</i>	$\frac{1136 (0.024) (0.0148) (0.00046) (2106)^2}{0.021}$			
	t =	39,200 hr			
	t =	4.5 yr			

Porosity averaged over 40 ft of pay
 C.S. Matthews - D.G. Russell Fig. G7.A







Supplement to Exhibit 12 Page 2 - 1

WELL MADE:	Cities JG State #1
LOCATION:	13-18S-24E
DST INTERVAL:	6544-6865

p* = 2312 psi slope (M) = 260 psi/cycle Tc' = 377 R Pc = 669 psi $T = 122 + 460^\circ = 582 \circ R$ Pwf = 116 psi $\frac{P^{\star} + Pwf}{2} = \frac{2312 + 116}{2} = 1214 \text{ psi} \text{ (Note 1)}$ Pavg = $\frac{T}{Tc} = \frac{582}{377} = 1.54$ Tr --- $\frac{Pavg}{p_{c}} = \frac{1214}{1.81} = 1.81$ 22 \mathbf{Pr} 66.9 0.885 $T_{SC} = 520^{\circ} R$ Psc = 13.3 psi =: 2 $= 2 \cdot \frac{T}{Tsc} \cdot \frac{Psc}{Pavg} = 0.385 \cdot \frac{582}{520} \cdot \frac{13.3}{1214} = 0.0109$ (Note 1 Bg (Note 1) = 189 mcfd · 178.1 = 33660.9 b/d q u = (1.2) (0.0114) = 0.0137 CP (Note 2) $\frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6 (33660.9) (0.0137) (0.0109)}{200}$ kh = 260 3.144 und 1t kh ÷ ----- AVAILABLE COPY == 45 ft (Note 3) h ba 630.6 = Ł

C.S. Matthews - D.J. Subsell equ. 3.214
 C.S. Matthews - D. D. Subsell Fig. C.3A88
 B. estimated from Los



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CRAV (S)

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		and and a second se			U TE ANDATE	04,01,8
GAS QUALITY	TEST REPORT	C Cr	TIES "JG"		4	
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COMPONENTS	A E AF EL AFRAGET A	L MERTERNETION	A HELE HARDONS	G. P. M.	FRACTION	CONTEN
z 2 Junio 1990 - 1990 - 1				· · · · · · · · · · · · · · · · · · ·		
NITROGEN	.9672	0.076	NAROPANE	27.514	·	ļ
CARBON DEGETER	1.5195	004	a Alexandra Alexandra	32.678		
HELIUM	. 1202		N-SUTANE	31.510	<u> </u>	
OXYGEN	1,1048	. 0007	LPG			
HYDROGEN SOL FTOE	1.1766	1 1 1	ISO-PENTANE	36.582		
WATER MAPOR	.6225		B-PENTANE	36.213		
tik ^t ati v	A	1147	S HEXAMES	41.111	• •	
11120	**************************************		N HEPTANES +	45.126		
METHADE	-5572	8632	NATURAL	GASOLINE -		
ETHANE	1.9382	0110	8 - TOTAL LIQUEFTAL	BLE GPM		
PROPANE	1.5225	0790	Addition a constant S		**********	*********
ISO-BUT ANE	2 0068		S WATER VAPOR CO	NTENT:		
N-BUTAN:	2.0068	1800		latic Pressure P		
ISO-PENTANE	2,3910	1.002d	Water Carton D	Pew Point [⊂] F nw Point [©] F		
N-PENTANI	2.4910	0071	3	or per MMCF		
HEXANES	2.9753	- 2078	Conversion	Constant		X 0.00002
HEPTANES	3.7013	6500	S – Mater Valor M S	lule Fraction		
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COMPOSITION	1	a da anti-				
			9. 20.000.000.000.000.000.000.000 11	*********		
MIXTURE SPECIFI	C GNAVITY:	!	SULFUR CONTENT	ſ:		
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Supplement to Exhibit 12 Page 2 \sim 4

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Supplement to Exhibit 12 Page 2 \times 5

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	rii. 512e -	Cristoce Pressure psi	Gat Kati MCF	Liguid Rote PFD	Remarks						
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000	578"				Opened tool, gas flare						
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Gauge No.				Depth	652		Clock No		!8	24 hour	**************************************	52045	·	
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2 .0362 3 .0526 4 .0671 5 .0855 6 .1020	PSIG Corr 336 110 130 1464 178	1000 000 0165 0363 0562 0552 0958 0958 1156	$\left \log \frac{1+1}{4} \right $	178 178 148++ 1502 1250 1375 2057 2125	-000 -0342 -0583 -1025 -133 -1709 -2050		.000 .0155 .0155 .0196 .0196 .1051 .1327 .1327		1019 1019 1693 1876 2018 2124 2186	Time Cell Contra	PSIG Term Cerr	Time Creft CONT		FSIG Temp Core
8 9 10 11 17 13 14		1353 1553 1751 1949 2147 2345 2514 2742 2940		2180 2217 2246 2263 2276 2284 2290 2293 2293 2297			. 1857 .2122 .2388 .2653 .2918 .3184 .3449 .3714 .3714 .3980		2219 2235 2246 2251 2253 2256 2260 2263 2265					
Gauge No.	111		·•···	Depth	6852'	T	Clock N	<u>. 43</u>		hour	24			,
1.0199 2 2.0366 2 3.0532 2 4.0698 2 5.0864 2	16 18+ 44 63 79 95 12	000 0167 0367 0567 0768 1168 1368 1568 1769 2169 2369 2569 2569 2569 2970		312 1033** 1643 1557 2036 2176 2253 2314 2355 2383 2402 2411 2420 2427 2429 2429 2429	.000 .0332 .0663 .0995 .1327 .1659 .1990	382 237 232 239 244 246 246	.000 .0267 .0533 .0800 .1067 .1334 .1600 .1867 .2134 .2400 .2667 .2934 .3200 .3467 .3734 .4000		246 1371 1907 2005 2145 2244 2310 2348 2368 2383 2385 2385 2389 2392 2394 2394		LST AVAILABLE COPP			
Reading Interval			1	6		10		88	1_2394_	<u></u>				Minute
REMARKS:	<u>*-6</u> m	inutes		minutes	5 <u> </u>)uestion	able							
DSM 143.41-PRIVIED IN	105				SPEC	IAL P	RESS	JRE D	DATA				(171) * « \	NC BITS
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	, a													a • • •

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.

BEST AVAILABLE COPY

Cities JC State #1

DST 6544-6865

Time to Reach Pseudosteady State

A) Average Porosity = 0.025

(Note 1)

Porosity

0.026

0.028

0.021

0.035

0.026

0.020

0.010

Interval

6561-6583 6588-6593 6599-6601 6609-6615 6616-6618 6620-6625 6636-6639

B) Total Compressibility = $3 \begin{array}{c} 0 \\ 8 \end{array} g$

 $C_t = (0.7) (0.00090) = 0.00063 \text{ psi}^{-1}$

(Note 2)

 $t = \frac{1136 \beta u C_{t} r_{o}^{2}}{k}$ $t = \frac{1136 (0.025) (0.0137) (0.00065) (2106)^{2}}{k}$

0.069

t = 15,800 hr

t = 1.8 yr

Porosity averaged over 45 ft of pay
 C.S. Matthews - D.C. Russell Fig. G7.A



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WERE NORDE	Cities JH State #1
INVERSE:	36-21S-21E
IST COMPONE:	5900-6100

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$\mathbf{p}\star$.=	2175 poli	S) Oper (M)	2243 post/cycle
Ωe	-:	386 E) (•	e i de la construcción de la constr La construcción de la construcción d
Т	12	99 + 46	19	Pwit = 321 psi
Pavç	1 =	$\frac{\mathbf{p} \star + \mathbf{F} \mathbf{w} \mathbf{f}}{2} =$	2175 + 321 	1248 psi (Note 1)
Tr	-	TC -	559 1.45 386	
Pr		P iva Ve	1248 = 1.87 668	
Z	ä	0.81	$\operatorname{Tsc} = 520^{\circ}\mathrm{R}$	Psc = 13.3 psi
Bg		$z \cdot \frac{T}{Tsc} \cdot \frac{T}{P}$	250 = 0.81 ·5	$\frac{13.3}{1248} = 0.0093$ (Note 1)
q	27.	54 Mefd	178.1	9617 b/d
u	÷	(1,26) (0,0107	(No) = 0.0135 cp (No	te 2)
kh	22	$\frac{162.6+q+1}{8}$	1 + 11 <u>162.6</u> (961	7.4) (0.0135) (0.0093) 2243
kh	an a Carl	0.0875	ma ta	
h	Ŧ	18 St (Note	3)	·
k		0.005 ad		BEST AVAILABLE COPY
1)	c.s	. Matthews - D.G.	Russell eqn. 3.21a	

2) C.S. Matthews = D.C. Respectively, G. 3A&B
3) is estimated from the

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RP T-ASL	28 CHice	EL HASO NATURAL GAS C Ontugraphic gas analy	UMPANY PAON 3 -	ent to Exhibit 100 3
RPT DAVE 07 ANAL DATE OF	12 15	RETER STATION MARE CITLES JH STATES 17	MLIER Opek	K STA 58039 9841
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PROPANE		03.59	0.938	
ISO-BUTANE		00 <u>+</u> 54	0.209	
NDRM-BUTAME		01.22	0 • 364	
1S O-PENYANE		CQ_41	0.150	
NORM-HERLENNE		Qu) e lere	() دغ ۵	
HEXARE PLUS		3∢∎90	0.253	
TOTA	1.3	100.00	4.319	
SPECIFICS	SRAV123	ر) _{ور د} ې). ,,	
	.47200 V.49 24475 Sta	t 1997 - Marchael Sylvery († 1997) 1997 - Line	1-13-	••••••••••••••••••••••••••••••••••••••
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Recovery: Cu. Ft. ct. Oil				ofJeb OPF1 P1T1	L HOLE	Distric	ARTESI	<u>A</u>	- 33
ec. Wet				Terter DAVI		Withe	SS WILLIS	5	
cc. Mud	and the second	_		Drilling				00	
Tot Lig Gravity	uid co.	APL @	• • • • •	Contractor CAP		T & HOL	F OATA	DR	-36
os/Oil Ratio	· ••• • •		ca ft./bbl.	Formation Tester	(Cisco			12
	RESISTI	1017 CB	1 1915a 1710-18	Elevation		615' GL		Ft	-101
Recovery Water	117	÷1°.		Net Productive I	nterval <u>1</u>	6'	Puchingt	Ft	
Recovery Mult	(a)	E.	- ppin Quru	e e e e e e e e e e e e e e e e e e e	ared from <u>K</u>	<u>eriy Drive</u> 160'	e puşiring (107Fi	-
Recovery Mud Fill	trote@		ррял	Main Hole/Casir	g Size	7 7/8"		F1	·
Mud Pit Sample	dtrate @		.000 rom		·····	3001	. <u>c.</u> 2.25"	r	
Mud Pit Sample F	ilfrote (a		ppm	Drill Pipe Lengt Packer Depth(s)		300' 894'-5900	.p. 3.340		-1
Aud Weight	8.6	vis 🕤	28 vic			5877'		fi Fi	
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Remarks SE TEMPERATURE Est. 99 .F. Actual .F. nitial Hydrostatic	E PRODUCTIO	DN TEST DA	C. Sice ND. D. 15 C'ard et Ci	1113 6097 Fr 24 Hour Clock t Yes - 000 - 2745	Gauge No. Depty Blanked Ot	Hour Cloc F	Ft. Tool Opened 1 Opened 3 Sypass 2 Recorded Minutes	A.M 700 P.M A.M 300 P.M Computed Minutes	EDDY
Remarks SE TEMPERATURE Est. 99 .F. Actual .F. nitial Hydrostatic B Flow .Final	E PRODUCTIO	DN TEST DA	C. Sice ND. D. 15 C'ard et Ci	1113 <u>6097</u> Ft <u>24 Hour Clock</u> <u>t Yes</u> <u>2745</u> 91 <u>390</u>	Gauge No. Depty Blanked Ot	Hour Cloc F	tk Tool Opened 1 Opened	A.M 700 P.M A.M 300 P.M Computed Minutes 	EDDY
Remarks SE 7EMPERATURE Est. 99 .F. Actual .F. nitial Hydrostatic B Flow .F. Finitial Closed in	E PRODUCTIO	DN TEST DA	C. Sice ND. D. 15 C'ard et Ci	1113 6097 Fr 24 Hour Clock t Yes 2745 91 390 1577	Gauge No. Depty Blanked Ot	Hour Cloc F	The Tool Opened 1 Opened 1 Opened Bypass 2 Recorted Minutes 30 90	A.M 700 P.M A.M 300 P.M Computed Minutes	EDDY
Remarks SE 7EMPERATURE Est. 99 .F. Actual .F. nitial Hydrostatic Flow .F. Findl Closed in	E PRODUCTIO	DN TEST DA	C. Sice ND. D. 15 C'ard et Ci	1113 6097 Fr 24 Hour Clock t Yes 2745 91 390 1577 257	Gauge No. Depty Blanked Ot	Hour Cloc F	rt. Ti ck Tool Opened 1 Opened Sypass 2 Reported Minutes 	A.M 700 P.M A.M 300 P.M Computed Minutes 	EDDY
Remarks SE 7EMPERATURE Est. 99 •F. Actual •F. nitial Hydrostatic Flaw Final Closed in Closed in	E PRODUCTIO	DN TEST DA	C. Sice ND. D. 15 C'ard et Ci	1113 6097 Fr 24 Hour Clock t Yes 2745 91 390 1577	Gauge No. Depty Blanked Ot	Hour Cloc F	The Tool Opened 1 Opened 1 Opened Bypass 2 Recorted Minutes 30 90	A.M 700 P.M A.M 300 P.M Computed Minutes 31 90	EDDY
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where a special property of the second s

Gas gravity			. Oiligre	aty.		Suif. temp. *5 Ticket No. 253346 COR ** ** ** m Res. ** ** X 60 PS1 Gauge **
Date Time		Chuke	Surface Pressure psi	Can Rate M/F	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		u	52			Gas to surface in 11 minutes
1915		11	58	• • • • • • • • • • • • • • • •		
1917		12	59	· · · · · · · · · · · · · · · · · · ·		Peaked and dropping
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1950			25			11
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Supplement to Exhibit 12 Page 3 - 6
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Cities JH State #1

DST 5900-6100

Contributions to log height h:

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Interval	Feet
5936-5938	2
5952-5960	8
6034-6042	8
	18 ft.

Citles JH State #1

DST 5900-6100

Time to Reach Pseudosteady State

A) Average Porosity = 0.03°

L.

(Note 1)

Porosity

0.014

0.024

0.046

Interval 5936-5938 5952-5960 6034-6042

B) Total Compressibility $\begin{array}{c} \beta \in C \\ p \in \mathbb{R} \end{array}$

 $C_{t} = (0,7) (0.00093) = 0.00065 \text{ psi}^{-1}$

(Note 2)

C) Time t =

t = $\frac{1136 (0.033) (0.0135) (0.00065) (2106)^2}{0.005}$

t = 292,000 hr

 $\frac{11360 \text{uC}_{\text{t}} r_{\text{e}}^{-2}}{k}$

t = 33.3 yr

BEST AVAILABLE CODY

Porosity averaged over 18 it of pay
 C.S. Matthews - D.G. Russell Fig. G7.A





K.

Supplement to Exhibit 12 Page 4 - 1

WELL MAND:	City of Artesia EQ #1
LOCAPION:	24-17S-25E
DST INTERMALE	6435-6650

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TLIUM	.1382		N-BUYANI	31.510		
TYGEN	1.1048	-03-01	1.86		4 a	
DROGEN SULFIDE	1.1766			36.562	Ι.	
TER VAPOR	.4220	· · · · · · · · · · · · · · · · · · ·	N-PENTANE	36.213	•	
· · · ·			HEXAMES	41.111	•	
HYDROC/	ARBON DILUENTS	(0209)	NEPTAGES -	40.126		
THANE	.5539	- 8666	NATURAL	CASOLINE -	-	
HANE	1.0382	- 0664	8 - Total Edge eac	LE GPM		
OPANE	1.5225	.0257				
TO-BUTANE	2.0069	0036	WATER VAPOR CO			
BUTANE	2.0068	.0069	8 - Gus thurme Sh Hydrocarban Di			
SO-PENTANE	2.4910	5,500.	- Water Vopar Da			
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Supplement	to	Exhibit	12	
Page 4 - 5				

Casing perts	Button de Le	Sourie Comp	F. Ticket No	788048
Gas gravity	. Oil gravity.	(K)R	and a second	
Spec. gravity.	Chlorides	in in spin Pus	••••••••••••••••••••••••••••••••••••••	
INDICATE TYPE AND SIZ	E OF GAS MEASURING DEVIC	I USED		

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ne a.m. p.m.	Choke Size	Surface Pressure psi	Ciny Rote ₩C	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 1 ¹¹
835		21			· · · · · · · · · · · · · · · · · · ·
838	a	23			Gas to the surface.
840	u 	24			Closed tool
1000	u				Opened on & choke.
1010	18	65	115.83		
1020	H	60			
1030	м.	48			
1040	,1	45			
1050	u	44			
1100	11	43	33		Closed tool.
0300					Pulled tools.
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			·····	* INTERVAL =	4 MINUTES. *	** INTCOUL	A	Ainutes
			and the second			** INTERVAL = 15	MINUTES	



Supplement to Exhibit 12 Page 4 - 7

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)

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Perosity

0.032

0.010

0.047

0.021

0.017

0.048

<u>Interval</u> 6492-6494 6496-6500 6530-6541 3554-6560 6568-6571 6595-6601

$$Ct = 0.7 (0.00090) = 0.00063 \text{ psi}^{-1}$$

(Note 2)

C) Time t =
$$\frac{1136 \# UC_t r_e^2}{k}$$

 $t = \frac{1136 (0.034) (0.0135) (0.00063) (2106)^2}{0.066}$

t = 22,100 hr

t = 2.5 vr

i) Porosity averaged over 32° ft of pay-

2) C.S. Matthews - D.G. Russell Fig. G7.A

FURMATION DENSITY 1111 **M** The second COMPANY YATES PETROLEUM CORPORATION Story A with OCATION S. C. 41925 WELL City of Arresia "Eq" #1 FIELD WILD CAT M COUNTY EDDY STATE New Mexico 1650 FS1 \$ 1930 FEL Other Services: NINON FIRD. API SERIAL NO 11 S-Dac/Rro SEC 24 ANGE 17-5 25-E ent Datum: 6.1. Drilling Measured From K. B. ; Elev .: 3450 15 Ft. Above Perm. Datum Elev .: K.B. 3465 . ian No. Iapth-Driller 9-6-75 D.F._ G.L.3450 ONE epth-Logger 8350 hm. Log Interval 8399 op log Interval asing-Driller caing-Logger it Size Vpe Fluid in Hole 8397 Swaface 8312 @ 262 CISCO 6400 1266 (a) 77/2 ype Fluid in Hole (a) ELasa. Daiseak 8.9 36 11.0 8.0 mi Dens. Visc. pH Fluid Loss \mathcal{Q} Source of Sample Am @ Meas. Temp. D LINEWIDER mĪ Rmf @ Meos. Temp. @ 75 F 21 @ 76 'F @ 76 'F 74 'F ml Rmc @ Meas. Temp. 195 **@** ۴F ml Source: Rmf Rmc 315 @75 a @ °F Rm @ BHT @ F m \widehat{a} 6 ٩ Girculation Stopped 9-6 @134'F Q °F F Logger on Bottom 9-6 a °F 0300 CX. Bec. Iscay. FF 0900 (a) F

6



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WELL NAME:	Federal BZ #12
LOCATION:	21-178-25E
DST INTERVAL:	€380-6600

2322 psi slope (M) = 242 psi/cycle P* ≈ 380 [°]R Fc = 679 psi \mathbf{T}_{C} $115 + 460^\circ \approx 575 ^\circ R$ Pwf = 60 psiT = $\frac{P^{\star} + Pwf}{2} = \frac{2322 + 60}{2} = 1191 \text{ psi (Note 1)}$ Pavg ≈ $\frac{T}{Tc} = \frac{575}{380} = 1.51$ Tr = $\frac{Pavg}{Pc} = \frac{1191}{679} = 1.75$ Pr = Tsc = 520°R Psc = 13.3 psi z 0.84 $Bg = Z \cdot \frac{T}{Tsc} \cdot \frac{Psc}{Pavg} = 0.84 \cdot \frac{575}{520}$ 13.3 $\frac{13.3}{1191} = 0.010$ (Note 1) = 29 Mcfd · 178.1 = 5165 b/d q v = (1.21) (0.0112) = 0.0136 cp (Note 2) $\frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6 (5165) (0.0136) (0.010)}{242}$ kh ---0.472 md • ft kh = h = 30 ft (Note 3)k = 0.016 md (Note 4)

1) C.S. Matthews = D.G. Russell eqn 3.21a2) C.S. Matthews = D.G. Russell Fie G.3A&B

3) It estimated from for 4) k = 0.005 for $p^2 = 2722$ and M = 642 psi/cycle



≤ 12
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2992 93

St	St		.		plement to e 5 - 3	Exhibit 1
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BUTANE	2.0068	. 0092.	£	ater Pressure P	я	
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The second second Supplement to Exhibit 12 Page 5 - 5

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2ate 9-28-75 Time o.m. p.m.	Choke Size	Surface Pressure psi	Gais Rate MCF	Liquid Rute BPD	Romarks
0630					Openel rool, fair blow.
0635		1 1/2	н 1		cood blow.
0640		2			Good blow.
0645		2			Strong blow.
0650		3			
0655		4			
0700	1	4 1/2			Closed tool.
0830				· · · · · · · · ·	Opened tool with a strong blow.
	1/4	13 1/2		-	Pressure climbed, put on choke.
0841	11	13			Cas to surface in 11 minutes
0845		12		-	into final flow period.
0900	11	. 8			Decreased,
0915		6 3/4			· · · · · · · · · · · · · · · · · · ·
0930	1 11	5			Decreased.
0945	-	4 3/4		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Êr.
1000	11	4 3/4			SEST AVAILABLE CODY
1015		4 3/4	<u>}</u>		MBLE COPL
1030	11	4 3/4	29,000		Closed tool.
1430					By-passed tool.
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	l		1912C B M	· · · · · · · · · · · · · · · · · · ·	

Cauge No.	1114		Depth	6359	Clock No.	11955	1 24 hour	Ticket No.	773844		
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Time Deft. .000"	nsig Temp, Carr,	Time Deft. Log $\frac{t+4}{H}$	1 - PS13 - Lomp.	Corr. PS-G Corr. Temp. Corr.	Time Cell. Lo.	$\frac{t+\theta}{\theta} = \begin{bmatrix} p_{S1G} \\ r_{em,n} \\ c_{Str} \end{bmatrix}$	Time Deft, .023''	PSIG Temp. Corr.	Time Defi.	$Lcg \frac{1+\theta}{\theta}$	PSIG Tema, Corr.
0000		0000	13				•• •••••••				
	43	.0195	475	.0710** 62	0329						
2		0391	782		.1059	1621	· · · · · · · · · · · · · · · · · · ·				
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151		.2930	2279	· · · · · · · · · · · · · · · · · · ·		2279	11			1	
								·			
Gauge No.			Depth	6597	Clock No.		24 hour			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
	149		142	.,0000 139	.0000	151			مري العامة المرجو		
0134*	139		479	.0703** 154	.0535	1052					·
2.0301	140		793	.1372 153	,1069	1702					
31.0468	140		1091	,2042 153	.1504	2097	ا با با با با با با با با با ا با		مرضوعين والمراجع		
- 0635	142		1360	.2711 151	.2138	2255				-•	
3 .0803	142		1589_	.3:30 151	.2673	2308			-	1	
<u> </u>	142	.1212	1796	.4050 151	.3208	2327				1	
7		1414	1972	1	.3742	2340		مرديني مريس المراجع	&		
8		1.1616	2109		.4277	2347			Š	1	
9		1818	2206		4811	2352	1		A A A A A A A A A A A A A A A A A A A	1	
:0		2020	2275		,5346	2359	1		8		
12		.2222	2315		.5881	2363			R	1	
12:		2424	2343		.6415	2366			<i>N</i>		
13		2626	2359		. 6950	2368		· ' -	3	1	
14		2828	2370		,7484	2371			j.		
15		3030	2377		.8020	and the second sec	1		3	1	
Reading Interval	<u>15</u>	6		20		16	<u> </u>		<u> </u>		Minut

Second Alexandra Content and Alexandra

and a second



Federal BZ #12

DST 6380-6600

J.

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.

lederal BZ #11

DST 6380-6600

Time to Reach Pseudosteady State

.

A) Average Porosity = 0.018

(Note 1)

Interva!	Porosity
6380-638 2	0.010
6387-6396	0.024
6401-6404	0.009
6471-6472	0.019
64766479	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 =
$$S = C = \frac{1}{35} \frac{1}{5}$$

$$C_t = 0.7 (0.00099) = 0.00069 \text{ psi}^{-1}$$

(Note 2)

 $\frac{1136\text{@uC}}{k}r_{c}^{2}$ C) Time t = $1136 (0.018) (0.0136) (0.00069) (2106)^2$ t = 0.016 ι. ε 53,200 hr t == 6.1 yr

Porosity averaged even 30 bit of pay
 C.S. Matthews - D.C. Barnell 142, 67.A

Schlumberger

COMPENSATED NEUTRON-FORMATION DENSITY

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	COMPANY	YATES PETROL	LEUM	
7	, an to a structure in the			
			····~··	
0	WELL	FEDERAL 182	1212	· · · -
"BZ"	FIELD	WILDCAT		
		 Source and the article 		
EDDY WILDCAT FEDERAL	COUNTY	EDDY S	TATE NEW	MEXICO
HLDC YATI	3 10501 101	10501		Omer Science
	ğ. 1960' ISL	1960 ¹ ry	limp .	
2 2		• _ •		DLL
COUNTY EL	ar general er, iver			
	21	17-5	25-E	
	G.L.		2672	2507
Permanent Datum:		Elev		E-ev. K.B. 3587
Log Measured From Drilling Measured Fr	22 5	15_Ft. Above	Perm, Datura	D.F G.L. 3572
Date	10-7-75		and a second construction of the second	
Run No. Depth—Driller	ONE			
Depth-Logger	8180 8179			a An ann anns an an an a suis an
Btm. Log Interval	81 78			
Top Log Interval	100			
Casing-Driller	85/8' 1102	a	â	4
Casing-Logger	1100			
Sit Size	1100			
Sit Size Type Fluid in Hole	7 7/8 FLOSAL DRIS	РАК		
It Size Type Fluid in Hole Dens. Visc.	7 7/8 FLOSAL DRIS 9-1 39	1		
Site Type Fluid in Hole Dens. Visc. pH Fluid Loss	7 7/8 FLOSAL DRIS 9.1 39 11 7.6 ^{ml}	PAK		ml n
Size Type Fluid in Hole Dens. Visc. pH Fluid Loss Source of Sample	7 7/8 FLOSAL DRIS 9.1 39 11 7.6 ^{ml} CIRC.	ml		· · · · · · · · · · · · · · · · · · ·
Site Type Fluid in Hole Dens. Visc. pH Fluid Loss Source of Sample Rm (@ Meas. Temp.	7 7/8 FLOSAL DRIS 9.1 39 11 7.6 ^{ml} CIRC. .24 @ 76 F	ml	<u>u</u>	··F :
Site Type Fluid in Hole Dens. Visc. pH Fluid Loss Source of Sample Rm (@ Meas. Temp. Rmf (@ Meas. Temp.	7 7/8 FLOSAL DRIS 9.1 39 11 7.6 ^{ml} CIRC. .24 a 76 F		â	F 'α F 'α
Site Type Fluid in Hole Dens. Visc. pH Fluid Loss Source of Sample Rm (@ Meas. Temp. Rmf (@ Meas. Temp. Rmc (@ Meas. Temp.	7 7/8 FLOSAL DR1S 9.1 39 11 7.6 ^{ml} C1RC. .24 a 76 F .22 a 76 F a F	ml		F ·α F ·α
Image: State Stat	7 7/8 FLOSAL DRIS 9.1 39 11 7.6 ^{ml} CIRC. .24 26 76 F .22 26 76 F a F M		â	F 'ω F 'α
Image: Source of Sample Rm @ Meas. Temp. Rmf @ Meas. Temp. Source: Rmf Rmc Rm @ BHT	7 7/8 FLOSAL DRIS 9.1 39 11 7.6 ^{ml} CIRC. .24 26 76 F .22 26 76 F a F M .13 26 136 F	() F () F () F () F () F		F ·ω ĉ ·α F ·α I ·α
In Size Image: Specific Stress Dens. Visc. DH Fluid Loss Source of Sample Rm (@ Meas. Temp. Rmf (@ Meas. Temp. Rmc (@ Meas. Temp. Source: Rmf Rmc	7 7/8 FLOSAL DRIS 9.1 39 11 7.6 ^{ml} CIRC. .24 26 76 F .22 26 76 F a F M .13 26 136 F	() F () F () F () F () F		F ·α f ·α f ·α F ·α I ·α















Supplement to Exhibit 12 Page 6 - 1

WELL NAME:	Griffin JJ Com #1
LOCATION;	4-18S-25E
DST INTERVAL	6560-6643

$$P^{*} = 2405 \text{ psi} \qquad \text{slope (M)} = 3545 \text{ psi/cycle}$$

$$Tc = 377^{\circ}R \qquad Pc = 670 \text{ psi}$$

$$T = 121 + 460^{\circ} - 591^{\circ}R \qquad Pwf = 120 \text{ psi}$$

$$Pavg = \frac{P^{*} + Pwf}{2} = \frac{2495 + 120}{2} = 1307.5 \text{ psi (Note 1)}$$

$$Tr = \frac{T}{Tc} = \frac{581^{\circ}}{177^{\circ}} = 1.54$$

$$Pr = \frac{Pavg}{Pc} = \frac{1307.5}{1.70} = 1.95$$

$$Z = 0.84 \qquad Tsc = 520^{\circ}R \qquad Psc = 13.3 \text{ psi}$$

$$Bg = Z \cdot \frac{T}{Tsc} \cdot \frac{Psc}{Pavg} = 0.84 \cdot \frac{581}{520} \cdot \frac{13.3}{1307.5} = 0.010$$

$$q = 27 \qquad \text{Mefd} \qquad 178.1 = 4,809 \qquad \text{b/d}$$

$$u = 1.23 \times 0.0112 = 0.014 \qquad cp (Note 2)$$

$$kh = \frac{162.6 \cdot q \cdot u + B}{M} = \frac{162.6 (4809 + 1) (-0.014 - 1) (-0.010)}{3545}$$

$$kh = 0.031 \qquad \text{nd fft}$$

$$h = 20 \text{ ft (Note 3)}$$

$$k = 0.002 \text{ md (Pote 4)}$$

...

1) C.S. Matthews - D.G. Eussell eqn 3.21a 2) C.S. Matthews - D.G. Eussell Fig G.3A&B 3) h estimated from log 4) k = 0.209 md for q = 100 Metd and h = 24 ft.



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to Exhibit 12 Page 6 -MATES PET. Cd. 1239-1 IVAILAELE COPY -IN- ATIONS R. KNOB 3694 PERM PENH TEST DAT 01 23 79 GRIFFIN Com GAS QUALITY TEST REPORT COMFOUND COMPONENT COMMOND BY LIQUEFIABLE COMPONENT MOLE G. P. M. COMPONENTS SPECIFIC GRAVITY MOLESPRACTION HYDROCARBONS G. P. M. FRACTION CONTENT 0070 NITROGEN .9672 PROPANE 27.514 CARBON DIOXIDE 1.5195 0009 ISO-BUTANE 32.698 N-BUTANE HELIUM .1382 31.510 LPG . 0007. 1.1043 OXYGEN HYDROGEN SUL FIDE 1.1766 **ISO-PENTANE** 36.582 WATER VAPOR .6220 N-PENTANE 36.213 HEXANES 41.111 1800.1 HYDROCARBON DILUENTS **HEPTANES** 46.126 - 8660 NATURAL GASOLINE -ME THANE .5539 .0-768 1.0382 TOTAL LIQUEFIABLE GPM ETHANE 1.5225 .0303 PROPANE WATER VAPOR CONTENT: .0040 ISO-BUTANE 2.0063 Gas Mixture Static Pressure PSI___ -0083 N-BUTANE 2.0068 Hydrocarbon Dew Point "F _ 1503. 2.4910 **ISO-PENTANE** Water Vapor Dew Point "F N-PENTANE 2.4910 .0019 Lbs Water Vapor per MMCF Conversion Constant X 0.000021 2.9753 HEXANES .0011 Water Vapor Mole Fraction 3.7018 0000 HEPTANES + Moisture recorder porting VUIDAT Make or type 1,000 COMPOSITION ---a a chuir an tha an MIXTURE SPECIFIC GRAVITY: SULFUR CONTENT: 617 .00 His - Hydrogen Sulfide, Gr./100 cf Calculated From Analysis RSH - Mexcapteris 50 ... 612 Determined by Test Instrumy 04 RSR - Sulfades KAN Instrument Moke or Type UJ RSSR: Residuals Total Sulfur, Gr./100 cf. 11 H₂S Groups to fraction conversion X 0,0000157 H₂S Mole Fraction MIXTURE HEATING VALUE: (Biu/cf of 14.73 Psia, 40°F, Sot.) 1141 Colculated From Analysis Determined by Calcington Colorimeter Verified (Critical Temperatur REMARKS MEASUREMENT GAS . KNOWEN zd ANALYST

Supplement to Exhibit 12 Page 6 = 4

JOHNSTON Schlumberg

				Octilianiaers
SURFACE INFO	RMATION	4	· · · · · · · · · · · · · · · · · · ·	EQUIPMENT & HOLE DATA
Description (Rate of Flow)	tin e	Persture PSTG-	Surface Choke	Type Tell M.F.E. SELECTIVE ZONE STRADDL
Description (Rote of Flow,	The	15115	Choke	formation ferred CISCO /OPEN HOLE (INFLATA'
Opened Tool	1433		-	Elevotion 3567 K.B.
GOOD BLOW, INCREASING TO				Net Productive Interval
STRONG BLOW	· ·		1	Estimated Porosity
	1437	. 2	CLOSED	All Depths Measured from KELLY BUSHING
CLOSED FOR INITIAL SHUT-IN	1438		11	Total Depth 8505
FINISHED SHUT-IN	1608	·		7 7/8''
RE-OPENED TOOL	1609		1/411	Main Hale/Casing Size Rat Hale/Liner Size Drill Callar Length
STRONG BLOW, SLOWLY				Rat Hole/Liner Size 663 ¹ 1.0. 2.25 ¹ Drill Callor Length 663 ¹ 1.0. 2.25 ¹
DECREASING DURING FLOW	; ·	•		Drill Callor Length 663' 1.0. 2.25'' Crill Pipe Length 5843* 1.0. 3.8**
PERIOD	:			
	1624	3.17	11	Packer Depth(s) 0300 G 0043
an a	1641	1 1/	•	
	1654	1 1	- - 11	MULTI-FLOW EVALUATOR
GAS TO SURFACE	1710	, 1 273	11	FLUID SAMPLE DATA
CLOSED FOR FINAL SHUT-IN	•	c./ 3	••	20.0
FINISHED SHUT-IN	2010	. –	•	Sampler Pressure 70.0 P.S.I.G. at Surf
PULLED PACKER LOOSE	2011		. –	Kachvery: Co. m. Odi
	à			cc. Oil
			1	cc. Water
	•	•	ŧ	cc. Mud 1020
				Tot. Liquid ce 1020
	•	•	•	Gravity
	,		•	Gas/Oil Ratio
		•	•	
	1			RESISTIVITY CHLORIDE
	•			RESISTIVITY CHLORIDE CONTENT
	l	·		
Cushion Type Amount	Pressur	1	Bottom Choke	Recovery Water @ *F P.
		Siz	, 5/8''	
MUD DA	TA			Recovery Mud *F.
المحجر بالتركي المحاجب والمراجع المحاج المحاج والمحاج المحاج المحاجي والكفي والمحاج وال		10.3		Recovery Mud Filtrate . 06 @ 72 .F. 115.000r
Mud Type DRISPAC - PERMALOID				
Viscosity	Water Lo		C.C. 7	Mud Pit Sample
	f Filtrute	.06 _{.0}	72 °r	Mud Pit Sample Filtrate . 06 @ 72 . 116.000
Chloride Content 116,000			PPA1	
RECOVERY DESCRIPTION	FEET	BARRELS	% OIL 1% WAT	TER % OTHERS API GRAVITY RESISTIVITY CHL. 27
SLIGHTLY GAS CUT DRILLING MU	0.000	6		6 °F06 @ 72 °F. 115,00
		0.98		
	0 200	0.98	•	
		0.98	· •	@ °F. @ °F.
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		0.98	· · ·	@ * F. @ * F. @ ° F. @ • F. @ ° F. @ • F. @ ° F. @ • F.
	· · ·		79336	@ *F. @ *F.
Remarks: Address P.O. DRAWER ''A''; LEV Address ANOCO PRODUCTION COMPA	EDE ANDA,	н н н н н н н н н н н н н н н н н н н		@ °F. @ °F. @
Remarks: Address P.D. DRAWER 'A''; LEV Company ANOCO PRODUCTION COMPA GRIFFIN COM. #1	EDE ANDA,	н н н н н н н н н н н н н н н н н н н		@ *F. @ *F. @
Remarks: Address P.D. DRAWER 'A''; LEV Company ANOCO PRODUCTION COMPA GRIFFIN COM. #1	EDE ANDA,	н н н н н н н н н н н н н н н н н н н	totation 16501	@ *F. @ *F. @
Remarkt: Address P.D. DRAWER 'A''; LEV Address AMOCO PRODUCTION COMPA GRIEFIN COMPA	EDE ANDA,	н н н н н н н н н н н н н н н н н н н		@ °F. @ °F. @
Remarks: Address P.D. DRAWER 'A''; LEV Address ANOCO PRODUCTION COMPA GRIFFIN COM. A1 Well GRIFFIN COM. A1 Test Interval EDCY	Ele Arak,	н н н н н н н н н н н н н н н н н н н	$\frac{1650^{1}}{161}$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Remarks: Address P.D. DRAWER 'A''; LEV Company ANOCO PRODUCTION COMPA GRIFFIN COM. #1 Well GRIFFIN COM. #1 Test Interval (1000000) County EDCY County EDCY	EDE ANDA,		$\frac{1650^{1}}{161}$	@ °F. @ °F. @

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				6 - 5
	1991 1992 1997 1997 1997 1997 1997 1997			Schumberger
INSTRUMENT NU.: J-09.				EPTH: 6522 FT.
PORT OPENING: INSIDE	un Res HO	LE TEMP.:	121	PAGE I OF 2
DESCRIPTION INITIAL HYDROSTATIC MUD INITIAL FLOW(!)	CAD: 111P 201818 1 2	PRESSURE (P.S.I.) 3473.8 54.0		CUMPUTED
INITIAL FLOW(2) INITIAL SHUT-IN	۲ .۱	52.8 1909.9	5 90	5 91
FINAL FLUW(1) FINAL FLUW(2) FINAL SHUT-IN FINAL HYDROSTATIC MUD	5 8 7 8	71.8 120.0 2015.3 3475.1	61 180	58 182
	INCREMENTAL	READINGS		
LABEL DELTA PRESSURE POINT TIME (P.S.I.)	T + DUDT		PW - PF (P.S.I.)	COMMENTS
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2.000 1.500 1.333 1.256 1.200 1.147 1.143 1.143 1.143 1.143 1.143 1.143 1.143 1.143 1.143 1.143 1.143 1.143 1.143 1.143 1.143 1.143 1.143 1.144 1.143 1.144 1.147 1.001 1.001 1.001 1.001 1.001 1.007 1.0057 1.0057 1.0057 1.0057 1.0057	0.301 0.176 0.125 0.097 0.079 0.067 0.058 0.051 0.046 0.041 0.038 0.035 0.032 0.032 0.030 0.025 0.025 0.023 0.023	286.9 487.4 646.1 784.5 907.6 1019.3 1124.7 1223.7 1315.1 1396.3 1471.2 1538.5 1603.3 1661.6 1715.0 1764.5 1808.9 1850.8 1857.1	HYDROSTATIC MUD INITIAL FLOW(1) INITIAL FLOW(2) STARTED SHUT-IN INITIAL SHUT-IN FINAL FLOW(1)
REPORT PAGE 20. 3			FIELD REP	ORT NO. 05873D

			,			pplement to Exhibit 12 ge 6 - 6
						PAGE 2 OF 2
LABEL POINT	DFUTA FTME	PRESSURF (P.S.E.)	$v \mapsto 01 \times 01$	LOG	PW - PF (P.S.I.)	CUMMENTS
К б 7 8	$\begin{array}{c} 58\\ 0\\ 1\\ 2\\ 3\\ 4\\ 5\\ 6\\ 7\\ 8\\ 9\\ 10\\ 12\\ 14\\ 16\\ 18\\ 20\\ 24\\ 28\\ 30\\ 40\\ 50\\ 60\\ 70\\ 80\\ 90\\ 100\\ 120\\ 130\\ 140\\ 150\\ 130\\ 140\\ 150\\ 160\\ 182\\ \end{array}$	120.6 120.5 144.7 205.1 240.6 268.6 297.8 325.7 353.6 381.5 406.9 433.6 486.9 535.1 580.8 626.5 669.7 712.8 754.7 794.1 832.2 870.3 1044.2 1196.5 1331.0 1449.1 1549.4 1635.7 1709.3 1771.5 1826.1 1871.2 1908.6 1940.4 1991.1 2011.4 2015.3 3475.1	54,000 22,000 15,750 13,600 11,500 10,000 8,875 3,000 7,300 5,250 5,500 4,937 4,500 4,150 3,864 3,625 3,423 3,250 3,100 2,575 2,260 2,050 1,900 1,787 1,700 1,630 1,573 1,525 1,485 1,450 1,394 1,310 1,346	$\begin{array}{c} 1.806\\ 1.512\\ 1.342\\ 1.224\\ 1.134\\ 1.061\\ 1.000\\ 0.948\\ 0.903\\ 0.863\\ 0.796\\ 0.740\\ 0.694\\ 0.694\\ 0.653\\ 0.618\\ 0.587\\ 0.559\\ 0.534\\ 0.512\\ 0.491\\ 0.411\\ 0.354\\ 0.512\\ 0.491\\ 0.411\\ 0.354\\ 0.512\\ 0.279\\ 0.252\\ 0.252\\ 0.230\\ 0.212\\ 0.197\\ 0.183\\ 0.172\\ 0.161\\ 0.159\\ 0.144\\ 0.137\\ 0.130\\ 0.129\end{array}$	24.1 85.0 120.6 148.5 177.7 205.6 233.6 261.5 286.9 313.5 366.9 415.1 460.8 506.5 549.7 592.8 634.7 674.1 712.1 750.2 924.1 1076.5 1211.0 1329.1 1429.3 1515.7 1589.3 1651.5 1706.1 1751.8 1788.6 1820.3 1847.0 1871.1 1891.4 1895.2	FINAL FLOW(2) STARTED SHUT-IN FINAL SHUT-IN HYDROSTATIC MUD

REPORT PARA MAL 4

FIELD REPORT NO. 05873D

			FAGE N	0. 5		Page (nt to Exh: 7 JOHNSTON chlumberger]
		BOTICH : Et:	RESSU	RE AND T	IME DATA	N		
INSTRUMENT NO.:	T-971	05-5011	Ύ(P.S.	1.):	7000#	DEPTH	6645	FT.
PORT OPEN (See	OUTSTOE	19(1) (1 - C).	P. 49. ;	121°	F.	FIELD RE	PORT NO.	05873 [
DESCRIPTION INITIAL HYBROSTA 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	TIC MUD				} 3	GIVEN TIME	COMPU T I M	
FINAL HYDROSTATI REMARKS: BELOW S		3 2		3492. 3546.9				



Section of the section of the

Griffin JJ Com #1

DST 6560-6643

Contributions to log height h:

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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 = $S = C = \frac{B}{B} = \frac{B}{B}$

$$C_t = 0.7 (0.00087) = 0.00061 \text{ psi}^{-1}$$

(Note 2)

C) Time t =

ς.

 $t = \frac{1136 \ (0.028) \ (0.014) \ (0.00061) \ (2106)^2}{0.002}$

t = 602,000 hr

 $\frac{1136 \text{ØuC}_{l} r_{e}^{-2}}{k}$

t = 68.7 yr

Porosity averaged over 20 ft of pay
 C.S. Matthews - D.G. Russell Fig. G7.A







Å

WELL NAME:	<pre>Irish Hills KW #2</pre>
LOCATION:	2-198-24E
DST INTERVAL:	6532-6640

= 2440 psi slope(M) = 2305 psi/cycleP* 370°R Pc = 670 psiТС 27 125 + 460° = 585°R Pwf = 77.4 psiт = $\frac{P^* + Pwf}{2} = \frac{2440 + 77.4}{2} = 1259 \text{ psi} (Note 1)$ Pavg ≈ $\frac{\mathbf{T}}{\mathbf{Tc}} = \frac{585}{370} = 1.58$ Tr ≈ $\frac{Pavg}{Pc} = \frac{1259}{120} = 1.90$ Pr ŧ $\mathbf{P}\mathbf{C}$ 670 0.86 $Tsc = 520^{\circ}R$ Psc = 13.3 psiZ = $z \cdot \frac{T}{Tsc} \cdot \frac{Psc}{Pavg} = 0.86 \cdot \frac{585}{520} \cdot \frac{1}{520}$ 13.3 --- = 0.010= Bg 1259 (Note 1) = 69.7 mcfd \cdot 178.1 = 12414 b/d q $1.20 \times 0.0114 = 0.0137$ cp (Note 2) 22 u $\frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6 (12414) (0.0137) (0.010)}{2305}$ kh 22 0.1200 md · ft kh = = 58 ft (Note 3) h = 0.0021 md (Note 4) k 1) C. S. Matthews - D.G. Russell eqn. 3.21a 2) C. S. Matthews - D.G. Russell Fig. G.3A&B3) n estimated from Log 4) k = 0.0026 md for T=192°F

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LA L LA CALLER & ESSER COL MISCARCE MAGE - SEAR-FORMARIANIC - GACKER J SINIE SAR

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-, Page-7 Villes Fr. Co. STA NO. 1397-1 FE 1353
 Contract CONTRACTNO. TPRN . toan e titsterice T DATE 03126:81 STATISTICS JETSH 1/2115 "KW" #2 GAS QUALITY TEST REPORT COMPONENT COMPONENT ETOTA FLADE COMPOUND COMPONENT MOLE G. P. M. INT REPORT MOLT + RACTION COMPONENTS SPECIFIC GRAVITY G. P. M. FRACTION CONTENT 0124 PROPAN **TROGEN** .9672 27.511 0008 ARBON DIOXIDE ISO-BUTANE 1.5195 32.698 N-BUTANE ELIUM .1382 31.510 XYGEN 1.1048 LPG -YDROGEN SUL FIDE 1.1766 ISO-PENTANE 36.582 ATER VAPOR .6220 N-PERFARE 36.213 HEXANES 41.111 0.0132 HYDROCARBON DILUENTS HEPTAHES I 46.126 - 8859 .5539 NATURAL GASOLINE ETHANE 1.6382 - 0613 TOTAL EQUE HABLE GPM THANE ROPANE 1.5225 .0230 WATER VAPOR CONTENT: SO-BUTANE 2.0059 .0035 Gar Mixture Stutic Pressure PSIG 610 # 650 -BUTANE 2.0063 . 0066 Hidros arbon Dew Point "F SO-PENTANE 2.4910 . 0020 Water Mapor Dew Point ^OF 2.4910 LBs. Water Vopor per MMCF PENTANE .0018 Conversion Constant X 0.000021 EXANES 2.9753 · 0017 Water Value Mole Fraction 3.7018 EPTANES + · 0010 Multicre recorder reading Make or type THPOSITION - -1 0000 IXTURE SPECIFIC GRAVITY: SULFUR CONTENT: 443 Colculated From Analysis KEAL. 00 His Hy hogen Sulfide, Gr./100 el RSH Mercortons ζ / ζ Determined by Test Instrument Sulfides RSR Instrument More or Type 2559 Residents 1.4^{-1} Selfer, Gr./100 cf XTURE HEATING VALUE: ensity fraction conversion 11.5 X 0.0000157 solef at 14.73 Pais, 20 F. Sot.) ef u con ۲. . Coloulated fairs during Determine , E. R. C. Lerter ature 369.7 . 367,4 Colorimeter Vendied 1 TRUTIPL DEL TMARK5 ASUREMENT APPOTT MASTON 27 2 F A

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Supplem	ent	to	Exhibit	12
Page 7	- 5	_		

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Date Firme	a.m. <u>p.m.</u>	Coltana Gairte Sairte	Turtane Fressure pos	•	Logard Rate EPD	Remarks
0700						Called out
1145		1				in 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			ì.	·	· · · · ·	Opened 3/8" choke
1930		-1 -1	Ŋ	-	· · · · · · · · · · · · · · · · · · ·	Closed tool -no gas to the surface
2100		4	10	а а 	• • • • • • • • • • • • • • •	Opened tool on 3/8" choke
2105			12	-	8 <u></u> .	
2105		•	11	영전, 4	• a smart	Gas to the surface
2110			51,	5a 1) }	Pressure dropped
2115		• · · · · · · · ·	1/2	7577	· · · · · · · · · · · · · · · · · · ·	u
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2200		ξ		7.371	• ···· ••••	Closed tool
7-7-8		• • • •	· · • • • • • • • • • • • • • • • • • •		· · · · · · · · ·	
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5



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.

Trish Hills KW St #2

PST 6532-6640

Time to Reach Pseudosteady State

Interval

A) Average Porosity = 0.020

(Note 1)

Porosity

0.015

0.005

0.020

0.026

0,023

	6536-6 538
3	6540- 6552
	6568-6 570
	6578-65 92
	66116619
	6620~6640

B) Total Compressibility = $S = C = \frac{C}{R + E}$

$$C_{t} = 0.7 (0.00087) = 0.00061 \text{ psi}^{-1}$$

(Note 2)

C)

 $t = \frac{1136 \ (0.020) \ (0.0137) \ (0.00061) \ (2106)^2}{0.0021}$

t = 401,000 hr

t = 45.8 yr

Porosity averaged over 58 ft of pay
 C.S. Matthews - D.G. Russell Fig. 67.A

TURMATIUN DENSITY COMPANY Mates Petroleum Corporation G WI WELL Irish Hills "Kw" state Com. #2 FIELD Wildcat COUNTY Eddy STATE New Mexico 1980 FNL ; FIELD FOCATION + 19 80' FEL COUNTY OMPANY Other Services: WE L DEG-Mig 10.00 SIE 2 19-5 Permanent Dotum:___ ZY-E ţ, GL Log Measured From____ li Drilling Measured From KB KB : Elev. 3709 . 4. SFt. Above Perm. Datum Date Elev : K.B. 3720.5 Run No. 7-5-80 D.F._ Depth-Driller G.1. 3709 ONE Depth-Logger 9190 Btm. Log Interval 9189 Top Log Interval 6500 9188 Surf Surf 85/1 @ 950 948 778 S.w. Gel, Starch Cosing-Driller Casing-Logger Bit Size a Type Fluid in Hole Ũ a 03 Dens. Visc. a pH Fluid Loss 9.0 38 Source of Sample 10.0 9.4 ml Rm @ Meas. Temp. Circulated mi Rmf @ Meas. Temp. -17 @89 F -13 @89 F -25 @89 F Rmc @ Meos. Temp. ml a F ml Source: Rmf Rmc 25 a â; Rm @ BHT °F `F M a a Girculation Stopped ¢ °F M °F F .10 @149 F 0703 7-5 a 0 °F F 0700 a a °F °F 1130 10 7-5 a F a ç . 3



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Supplement to Exhibit 12 Page 8 - 1

WELL DAME:	Ia Cama #!
LOCATION:	20-188-25E
DST INTERVAL:	6812-7000

slope (M) = 392 psi/cycle p* = 2418 psi 374°R PC = 677 psiTc = $T = 128 + 460^\circ = 588^\circ R$ Pwf = 551 psi $\frac{P^* + Pwf}{2} = \frac{2418 + 551}{2} = 1484.5 \text{ psi (Note 1)}$ Pavg = $\frac{T}{Tc} \approx \frac{588}{27.4} = 1.57$ Tr = 374 - $\frac{Pavg}{Pavg} = 1484.5 = 2.23$ Pr = Pc 667 $Tsc = 520^{\circ}R$ Psc = 13.3 psi Z = 0.84 $z \cdot \frac{T}{Tsc} \cdot \frac{Psc}{Pavg} = 0.84 \cdot \frac{588}{520} \cdot \frac{13.3}{1484.5} = 0.0085$ (Note 1 Bg = (Note 1) 390 mod 178.1 = 69459 b/d (Note 2) q = (1.26) (0.0112) = 0.0141 CP (Note 3) u = $\frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6 (69459) (0.0141) (0.0085)}{392}$ kh ~ 3.45 Ed • ft kh ≈ = 38 ft (Note 4) h k = 0.091 md

i) C.S. Matthews - D.G. Tonssell e.m. 3.21a

2) Plow rate is notwell flow the more ported on Drilling Report.

Plow during DST was estimately less.
C.S. Muthows - 1.11 currell liq. 0.3A8B
4) h estimated from Eq.



. . 3395.98 ~



1.25-1		Supplement to Exhibit Parts 8 - 3
RPT-ASL 310 CONT	THE MASO NATURAL GAS COM Movem Tradhic Gas Analys	
RPT UATE 02 03 01 ANAL UATE 01 29 61	HELER STATION NAME E.C. FAMA COM #1	METER STA 61894 OFER 9841
TYPE CODE SAMPLE DATE 00 01 21 83	02 03 81 06	SCALE H2S GRAINS LOCATIO 0000* 1 J 1
	NORMAL MOL3	GPN
C () 2	00.00	0.000
H 2 S	00.00*	Q • Q Q Q
N2	01.74	0.000
METHANE	83.51	0+900
ETHANE	08.93	2.387
- PRUPANE	(73.21	0.883
I SO-BUTANE	00.36	0.118
NORH-BUTAUE	C1.14	0,359
Ι SO-Ρεντωνί	00.34	0.124
NORM-POOLARE	00~35	0.127
BULF BRAXEF	09 = 42	Q.183
THEAL S	200.00	4.181
SPECIES GRAVIEY	0.68	\$
NINDUC HEATTHE TAL TUTUES OF 14,73 PT	299 1997 - 1997 - 1997 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1996 - 1997 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 - 1998 -	?
RATIO OF SPECIFIC D	CLARK 1.28 Demonstration H2S CG	

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Sampler Pressure Recovery: Cu. Et		P 1	al Contonation (turd ur Job	OPEN HOL	E TEST	Hol Dist	liburton rict	ARTESI	IA	P R	ecotion
cc. Or cc. Wate	- 1-1			Lester	RAINES		Wit	ness	J. MC	DONAL	D s	
ee Ator Tet Lig		**	•	Dristing Cuntra	tor MORAN	ROTHER	RS DRIL	LING		r Pi	N R	3
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Gas/Oil Ratio	FES:	TIVEY	्र हो कि 2510 - रिस्ट्र स्थार - जिल्ह्यान्त्र	Eievotio	ion Tested		Cisco 3578'					0
Recovery Water	(ia 17	Settin a set		oductive Intervi oths Measured	··	15' Kelly B	uchin	a. AGI			
Recovery Mud		(a	• · · · · · · · · · · · · · · · · · · ·		Depth		7000'		y- nuc		Ft.	
Recovery Mud Filt Mud Pit Sample	irgte (ā •F			Hole/Casing Si ollar Length	and the second s	7 <u>7/8"</u> 379'?	1.D.	2.250	i.		
Mud Pit Sample F	siterate ((i)	par.	Drill P	ipe Length	(6448'	1.0.	3.340	1	<u> </u>	
Mud Weight		9.3 vis			Depth(s) Teste: Valve		6800'- 6775'	6806'	- 6812		Ft.	
TYPE	AMOUNT	·	Depth Bo	ack	Surf	ace		Batton				
Cushion			Ft Pres. Vo	1VC	Cho	4C	3/8"	Choke	.7	<u>o"</u>	┍┼	
Recovered	1383 Fee	<u>it of</u> dr	illing mud	- 500	' of wate	<u>.</u>					¥ a	Field
Recovered	Fre	et of									a. From	5
B	<u>.</u>											197
Recovered	hee	et of	·· <u>·</u>						·····		1/1	
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Recovered	Fee	et of							_		1	ב
Remarks												
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	Gauge No.	1114	Couge N Et Seets	 1113 6844 24 H 	Ga Ft. Dej lour Clock		Hour (Ft. Llock T	(s) pened	А. 1315 р.	M. M.	C D D V
<u>Est.</u> •F.	Gauge No. Signth Blanke : Off	1114 6784 24Ност С No	Gauge M Et Crote Dect Glassert	 1113 <u>6844</u> <u>24</u> H <u>900 no</u> 	Ft. Der lour Clock Bic	nked Off		F1. Clock T C	col pened pened	A. 1315 p. A.	M. M.	ENNY
Est. •F.	Gauge No. Signth Blanke : Off	1114 6784 24Hour С	Gauge N Fri Secta Joch Slauked	 1113 6844 24 H 911 no Prossures 	Ft. Der lour Clock Bic	nked Off	Hour C ssures Office	F1 Clock T C C B	col pened pened	А. 1315 р.	м. <u>м.</u> м.	C D D V
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Supplement to Exhibit 12 Page 8 - 5 .75* Casing perfs _____Bottom choile Ges grovity_____Od gravity_____ Spec_gravity_____Chlorides GOR_ Res. INDICATE TYPE AND SIZE OF GAS MEASURING DEVICE USED_ Date a.m. | Choke Surface Pressure psi Gas Rote MCF Liquid Rate BPD Time Remarks p.m. 3/8" 1315 1# Opened tool with a good blow. 11 5____ 1320 Good blow. n 1325 15 Good blow - no gas. i n \$1 1330 20 н 1335 23 129.20 Gas to the surface in 20 minutes. н 1340 24 132.60 Flared gas. в н 1345 24 132.60 u 0 11 11 1350 · · · · ----п 81 1355 23 129.20 ---ŧi. 41 " Closed tool. п 1400 н 2 Reopened tool with a good blow. 1530 *1 Gas to flare in 3 minutes. 146 1535 28 ----11 43 Gas flare. 1545 197 n н 1600 34 166 11 11 1615 25 136 11 11 1630 20 119 11 н 1645 17 108 п n 1700 18 112 n н 1730 23 129 _U 1800 24 132 Slight increase. 53 1830 25 136 Closed tool. Opened bypass - pulled loose. 2330 LITTLE'S HITT IM 1/24

FORM HELES PRINTED IN 2.5 A

PRODUCTION TEST DATA

Ga	uge No.)	114	·····	Depth	6784'		Clock No	o. 4365		24 hour	Ticket No.	139167		•
	First Flow Per	boi	<u> </u>	First		Sect Flow I	Period	<u></u>	Second level In Pressi	ure	Thi Flow F	Period	CI CI	Third oved In Press	
τ	ime Deff. .00071	FSIG Terric Corr	Trine Ceff.	Lot 1 M	PS1G Temp Corr	Time Cell 010 1	PSP3 Temp Corr.	7:me Dett. 000''	$Log = \frac{1}{R} + \frac{R}{R}$	PSIG Temp Corr	Time Defi.	FSIG Temp Cerr	T. 56 D. 55 (00 T	1.02 + 6	рунд Temp. Con
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7			.2100		2038			.4685		2271			[[
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12			<u> </u>			11		.8007		2320					
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			inute int		** =	29 minut	e interv	/a]. *	** = 21	minute i	nterval.				
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SPECIAL PRESSURE DATA

200 million services and

Page 8 - 6

Supplement to Exhibit 12 Page 8 - 7

La Cama #1

DST 6912-7000

Log footage contributing to height h:

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Interval	Feet
6896-6901	5
6919-6932	13
6933-6937	4
69 39-6946	7
6947-6955	8
6960-6961	_1
	38 ft.

Lo Cama #1

DST 6812-7000

Time to Reach Pseudosteady State

A) Average Porosity = 0.045

(Note 1)

Porosity

0.020 0.065 0.072 0.036 0.025 0.035

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6896-6901
6919-69 32
6933- 6937
6939-6946
6947-6955
6960-6961

Interval

B) Total Compressibility = S = CS = R

 $C_t = 0.7 (0.00077) = 0.00054 \text{ psi}^{-1}$

(Note 2)

C) Time t =

• . *

 $\frac{1136\emptyset u C_{t} r_{e}^{2}}{k}$

 $t = \frac{1136 \ (0.045) \ (0.0141) \ (0.00054) \ (2106)^2}{0.09I}$ 19,000 hr t =

• .

2.2 yr t =

Porosity averaged over 33 ft of pay
 C.S. Matthews - D.C. Russell Fig. C7.A

		Schlu	mberger		NSATED I											
			COMPANY	MORRIS R. AN	TWELL	•••		W	M	mA	Ann	M	M		WW	
	EDDY DINKUS RANCH			LA CAMA # 1 DINKUS RANCH												
	11	MOR	COUNTY	<u>5 1980'</u> Fwl	STATE NE	Other S										
	Log M	nent Datum: easured From. g Measured From.	G.L. K.B.	0 <u>18-S</u>	25-E elev.: <u>3578</u> ve Perm. Datum	Elev.;	к.в. <u>3593</u> d.f. <u>3592</u> g.i. <u>3578</u>			A A	▲ # 		5			
). Driller Logger	10-5-77 ONE 8750 8742 8741						100		4					
	op Log Casing- Casing- Lit Size	i Interval -Driller -Logger	SURFACE 8 5/8@120 1203 7 7/8	0 @	<u>(</u> <u>a</u>)		a			M,	M					
Ē	Dens. pH Source Rm (a Rmf (i	Visc. Fluid Loss of Sample Meas. Temp. Meas. Temp.	PIT 11 @ 86 082 @ 86	F @	ml	ml ·F ·F	 @ @	ml °F				W				
	Rmc (Source Rm ()	@ Meas. Temp. e: Rmf Rmc	16 <u>@86</u> M <u>IC</u>	F @	F @	°F	(a) (a) (a) (a) (a) (a) (a) (a) (a) (a)	F		••••••						







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WELL MAME:	Murphy NW Fed #1
LOCATION:	3-183-25E
DST INTERVAL:	6540-6661

2505 psi slope (M) = 513 psi/cycle $\mathbf{p}\star$ 377 [°]R Pc = 670 psi (Note 1) TC == 120 + 460° = 580 °R Pwf = 196 psiт Ξ $\frac{P^{\star} + Pwf}{2} = \frac{2505 + 196}{2} \approx 1350.5 \text{ psi} (Note 2)$ Pavg = $\frac{\mathbf{T}}{\mathbf{Pc}} = \frac{580}{377} = 1.54$ Tr = $\frac{Pavg}{Pc} = \frac{1350.5}{(70)} = 2.02$ \mathbf{Pr} PC 670 Tsc = $520^{\circ}R$ Psc = 13.3 psi Z C.84 = $z \cdot \frac{T}{T_{SC}} \cdot \frac{P_{SC}}{Pavg} = 0.84 \cdot \frac{580}{520} \cdot \frac{13.3}{1350.5} = 0.0092$ Bg (Note 2) 221 Mcfd · 178.1 = 39360 b/d = \mathbf{q} (1.25) (0.0111) = 0.0139 cp (Note 3) = U. $\frac{162.6 \cdot q \cdot u \cdot B}{M} = \frac{162.6 (39360) (0.0139) (0.0092)}{513}$ к'n = 1.60 md • ft kh = 46 ft (Note 1) h **2**10 0.035 md (Note 5) k 12 1) To ϵ (c from gas analyses for Griffin JJ

C.S. Matthews - D.J. Lausell eqn 3.24a C.S. Matthews - G.J. Lausell Vig 0.3A&B2) 3)

4) h estimated from 1.0 . 5) Also k > 0.035 as for 1.3 0 put and 1.4 S0 ft.

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Supplement	te	Exhibit	12
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g perfs provity pravity CATE TYPE	AND SIZE		choke 20625 20625 URING DEVICE U	SED 6" POS	Surf. temp
a.m. p.m.	Choke Size	Surface Pressure psi	Gas Rote MCF	Liquid Rate BPD	Remarks
1-29-80 530					On location.
630					Rigged up test tools.
215					Opened tool with a weak blow.
220	3/8	10	-		Opened on choke.
225	n	19			No gas.
227	н	26	139.4		Gas to surface in 13 minutes.
230	n	28	146.2		
235	11	32	159.8		
240	u	35	170		
245	11	36	173.4		Closed tool.
015	11				Opened tool - gas flare.
020	25	50	221		
025		65	272		
030	n	60	255		
035	<u> </u>	60	255		
040	11	50	221		Pressure decreasing.
045		50	221		Stabilized.
100	11	50	221		0
115			1- 		
130	41	13	- N		a
145	- IL	54 	::: 		Closed tool.
445	 				Opened bypass and pulled loose.
1+30-80 900	-		· · · · ·		Pig tast tools down.
100			• # · · ·	-	left location.

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C	Couge No.	513			Depth	6522		Clock No	o. 7282		24 hour	Ticket	984704	}	1
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7	Time Defl.	PSIG Temp. Corr	Time Defl.	$Log \frac{1+A}{B}$	PSIG Temp. Cott.	Time Defl.	PSIG Temp. Corr.			PSIG Temp. Corr.	Time Defl.		Time Dell. .000''		FSH Tem Cori
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<u><</u>	Couge No.		.0000			6657	1364.4	Clock No		196.0	24 hour				
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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.

Supplement to Exhibit 12 Page 9 - 7



Time to Reach Pseudosteady State

A) Average Porosity = 0.027

Interval 6545-6554 6562-6567 6582-6594 6600-6607 6608-6610 6632-6636 6648-6653 6659-6661

Porosity

0.035 0.027 0.030 0.028 0.005 0.008 0.025 0.035

.

B) Total Compressibility = S C g g

 $C_t = 0.7 (0.00084) = 0.00059 \text{ psi}^{-1}$

(Note 2)

 $\frac{1136 \phi u C_t r_e^2}{k}$ $\frac{1136 (0.027) (0.0139) (0.00059) (2106)^2}{0.035}$ t = 31,900 hr t = 3.6 yr t =

Porosity averaged over 46 ft of pay
 C. S. Matthews - D.G. Russell Fig. G7.A

(Note 1)

DST 6540-6661

C) Time t =





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WELL TRUE	Powell DC #1
1. 67491 - 117	35-178-25E
DSP INTERMAL	6445-6653

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2760 pri slope (N) = 6240 pri/cycle $\mathbf{p}\star$ 379 [°]R Person 671 Fall 'TC 1.2 115 4 East 575 °R - Pwf = - 378 psi \mathbf{T} =: $\frac{P^* + Pwf}{2} = \frac{2760 + 378}{1569}$ (Note 1) Pave = 575 1.52 $-\frac{T}{Tc}$ Tr -2 379 = 2.34 Paver 1569 Pr fe -671 Tsc = 520° R Psc = 13.3 psiZ = 0.81 $= 2 \cdot \frac{1}{2^{10}} \cdot \frac{100}{100} = 0.81 \cdot \frac{575}{600} = 0$ 13.3 $\frac{13.3}{1569} = 0.0076$ (Note 1) Bq 178.1 = 8549 b/d (Note 1) q = 48 Mcfd (1.32) (0.011) = 0.0145 op (Note 2) .= u
 362.6 · 4 · 8 · 6
 402.6 (8549) (0.0145) (0.0076)

 M
 6240
 kh 44 kh 2 h 40 ft (Note 3) 9 0.001 md (Note 4) k 1) C.S. Matthews = D.G. Bussell eqn 3.21a 2) C.S. Matthews = D.G. Bussell Fig C.3A&B 3) Is estimated from low 4) k = 0.009 ad for $P^{2} = 1696$ and M = 596 pai/cycle

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Supplement to Exhibit 12 Page 10 - 7

Powell DC #1 DST 6445-6653

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Contributions to log height h:

Interval	Feet
6491-6493	2
6494-6496	2
65 00-6502	2
6536-6537	1
6539-6544	5
6574-6580	6
6581-6583	2
6593-6594	1
6610-6622	12
6637-6644	7
	40 Et.

Powell DG #1

DST 6445-6653

١ Time to Reach Pseudosteady State

A)	Average Porosity = 0.021	(Note 1)
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Interval	Porosity
6491-6493	0.028
6494-6 496	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 =
$$S C g g$$

$$C_t = 0.7 (0.00075) = 0.00052 \text{ psi}^{-1}$$

(Note 2)

C) Time t =

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t =	$\frac{1136\phi_{u}c_{t}r_{e}^{2}}{k}$
t =	$\frac{1136 (0.021) (0.0145) (0.00052) (2106)^2}{0.001}$
t =	798,000 hr
t =	91.0 yr

Porosity averaged over 40 ft of pay
 C.S. Matthews - D.C. Russell Fig. G7.A
COM	COMPANY VAN	TURMATION	DENSITY	
INTEDDY WILDCAT VION POWELL "DG" "1 ANY YATES PETR. COR	WELL POWE	ES PETROLLUM CORP LL DG I COM. CAT STATE NEW LSL I CL,		
Fermanent Datum: Log Measured From Drilling Measured From Date Run No. Depth-Driller Depth-Logger Btm. Log Interval Ron Log Interval	<u>G.L.</u> <u>K.B.</u> <u>15</u> <u>7-16-74</u> <u>200</u> <u>74</u>	17-9 25-E : Elev. 3490 -Ft. Above Perm. Datum	Elev. K.B. 3505	
Dons. Visc. B_9 pH Fluid Los* 10 Source of Sample P11 Rm @ Meas. Temp. 23 Rmf @ Meas. Temp. 17 Rmc @ Meas. Temp. 17 Rmc @ Meas. Temp. 24 Source: Rmf Rmc	@ 85 F @ 88 'F @ 88 'F M	$ml \qquad ml$ $F \qquad a \qquad F$ $F \qquad a \qquad F$ $F \qquad a \qquad F$	mi a F a F	
27 Aug 2 44 20 20 20 20 20 20 20 20 20 20 20 20 20				



	Location 23-215-21E 13-185-24E 36-215-21E 24-175-25E	Date of DST 02-04-78 11-14-78 04-07-78 03-31-75	<u>DST Interval</u> 5876-6051 6544-6865 5900-6100 6435-6650	<u>Feet of Pay</u> 40 45 18 32	Calculated Permenbility (md) 0.021 0.069 0.005 0.066	Vears to Reach Pseudo-Steady State 1.8 33.3 2.5
《外世》:《《《》《代史》:"我有一些故事,""我们不是是一个人,不是是一个人,不是是一个人,不是一个人,不是一个人,不是一个人,不是一个人,不是一个人,不是一个人,不是一个人,不是一个人,不是一个人,	24-17S-25E	03-31-75	6435-6650	ی ۲۹	0.066	
	21-17S-25E	09-28-75	6330-6600	30	0.016	6.1
	4-18S-25E	03-2678	6560-6643	20	0,002	68.7
Irish Bills AR St 42	2-19S-24E	07-07-80	6532-6640	58	0.002	45.8
	20~1 8S-25 E	10-09-77	6812-7000	38	0.091	10
भग्निम् २९३ अ. भिर्मम् म	3~183-25E	11-29-80	6540-6661	46	0.035	3.6
Powell DG ol	35-17S-25E	07-03-74	6445-6653	40	0.001	91.0
						26 0 vog •
AVERAGE					0.031 md	26.0 years

Calculated Permeabilities From Drill Stem Tests (DST) After Corrections in Supplement

AVERAGE MEDIAN

0.018 md

5.3 years

S.4

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

V a

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 the average depth to the top of the designated Permo-Penn interval is 5827 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:

- Permeability calculation from pressure buildup data taken during drill stem tests.

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 $\underline{T+ \Delta T}$ on semilog paper and the slope of the straight-line ΔT

portion of this plot is measured. Here T is the length of time the well was allowed to flow and Δ T is the variable time since the well was shut-in. The average permeability is calculated from the equation $k = \frac{162.6 \text{ g B} \text{ u}}{\text{mh}}$ where

k = average permeability (millidarcys)

 $\omega^{j} \mathcal{U}^{ij} q = gas flow rate before shut-in (barrels per day)$

 $\int_{M} U U = gas$ formation volume factor (reservoir ft³/standard ft³)

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 (g) was measured during the flowing phase of the drill stem test. The formation volume factor (B_g) and the gas viscosit⁴ (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.

EXHIBIT NO. 12 No southance

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 pseudosteady state, flow is

 $t = \frac{1136 \, \phi \, uc_t \, r^2}{c}$

fill for for each well to and figure & from log- to and figure Frailet # 12 papers

where

- t = time to stabilize (hours)
- ø = porosity of pay zone (fraction)
- u = viscosity of gas (centipoises)
- $c_{+} = total compressibility of the rock fluid system (psi⁻¹)$
- r = radius to reservoir boundary (feet)
- k = permeability (millidarcys)

In the calculation, the porosity (\emptyset) 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 ($C_t = S_c$). 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 new) 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.

EXHIBIT NO. 13

The second procedure for obtaining institu permoability 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 effects of the actual overburden pressure. The results of these special tests, performed

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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.

EXHIBIT NO. 15

Exhibit No. 15 tabulates the permeabilities of the core material from the Permo-Penn pay section in the Nurphy 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 Nurphy 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 cil 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 harrels 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

$$Q (1 \text{ atm}) = Q (\text{actual}) \times \frac{p_f^2 - p_s^2}{p_f^2 - p_s^2}$$

$$p_f^2 - p_s^2 (1 \text{ atm})$$

$$p_f^2 - p_s^2 (1 \text{ atm})$$

wh.e

 $P_r = r^2 \text{ servoir pressure (2294 psia on average)}$

 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 wichin 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.

WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

TOWNSHIP 17S RANGE 24E

Pubco No. ST #1	State DF #1	Marathon ST #1	Catclaw ST #1	Mesa Federal #1	Cass North #1	Federal GR #1	Niles KA #1	McCaw #1	Hanlad #1	Federal U #1	Hagstrom #1	Divide Fed. JW	Well
ī		F		Ţ								v #1	
1980S	660N	660N	1980N	1980S	660S	2050N	660 S	1980N	1980N	1980S	1983S	1980S	I S-N
1650E	660W	6 60E	1980 E	1980W	1980E	660E	1980W	1980E	660W	M086 T	1992W	1980W	Location E-W
36	35	33	31	30	29	25	24	18	17	Q	8	4	Sec.
Yates	Yates	Carper	Mesa	Estroil	Pubco	Yates	Yates	Beard	Beard	Socony & Mobil	Beard	Yates	Operator
05-16-80	10-15-63	02-15-64	11-16-78	08-28-74	02-11-72	10-31-76	10-20-78	06-13-78	07-08-78	02-14-65	01-23-78	0731-76	Spud Date
8370	3269	7020	7675	7700	0068	8200	8186	7140	7220	8200	7200	7160	Total Depth
Eagle Creek Permo-Penn	Undesignated Abo	Р & А А	Gopher Abo	D & A	P & A	Eagle Creck Strawn Eagle Creek Permo-Penn	Undesignated Wolfcamp	High Hope Atoka, East	High Hope Atoka, East High Hope Abo, East	D & A	High Hope Atoka, East	Undesignated Wolfcamp	Field
530	55,860		22,850	1	215	54,736 2,342	59,426	115,246	30,724 17,184	1 1	43,981	28,851	Production (Mcf) To 1-1-81

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WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

TOWNSHIP 17S RANGE 25E

Federal BZ #16	Morley EW #1	Ingram Jackson 3Y #7	Gossett EU #1	Flint #2	Flint #1	Jackson EM #1	City of Artesia EQ #1	Jackson GM #1	Mitchell IN #2	Jackson Estate BY #9	Federal BZ #12	Achen-Frey DM #3	Jackson AT #9	Artesia Airport CF #1	Artesia Airport CF #2	Sasha CA Fed #1	Eagle Federal #1	Well
1980N	660s	1980N	1650S	660s	1980s	660S	1650S	660S	20305	1980S	1980s	660S	660S	3308	1650s	330S	1980N	N-S
660E	660E	1980E	M086 T	2310W	660W	1980E	1980E	1650W	660E	M066	1980W	1980W	660W	M066	860E	1750E	1980E	Location E-W
28 .	27	26	26	25	25	25	24	24	23	22	21	13	13	11	10	9	8	Sec.
Yates	Yates	Yates	Yates	Western	Western	Yates	Yates	Yates	Yates	Yates	Yates	Yates	Yates	Yates	Yates	Yates	Pubco	Operator
09-29-76	01-15-76	01-19-79	09-18-75	06-13-75	02-04-74	06-15-75	08-16-75	08-27-76	08-09-77	02-09-80	09-12-75	05-10-74	610-29	11-02-71	10-12-74	07-31-73	03-08-72	Spud Date
8302	8443	843C	8420	10243	8507	8530	8406	8383	9500	8295	8180	8430	8400	6608	8080	7950	7840	Total Depth
Eigle Creek San Andres	Eigle Creek Permo Penn	Eagle Creek Atoka-Murrow, East	Engle Creek Strawn Engle Creek Permo-Penn	Engle Creek Atoka-Morrow, East Engle Creek Permo-Penn	Eigle Creek Permo-Penn	Engle Creek Atoka-Morrow, East	Eagle Creek Atoka-Morrow, East Eagle Creek Permo-Penn	Eagle Creek Atoka-Morrow, East	Eagle Creek Atoka-Morrow, East	Eagle Creek Atoka-Morrow, East	Eagle Creek Strawn Eagle Creek Permo-Penn	Eagle Creck San Andres	Eagle Creek Atoka-Morrow, East	Eagle Creek Atoka	D & A	P & A	Р & А	Field
7,704 50	175,000	48,935	251,851 209,181	170,975* 199,378	347,524	5,225,365	28,011 55,974	829,029	70,510	36,742	24,905 1,267	6,697 BO	108,453	471,878	1	8 8 1	8 8 1	Production (Mcf) To 1-1-81

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WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

TOWNSHIP 17S RANGE 25E

Arco EC ST #2	Arco EC ST #1	Powell DG #1	Manseau EK #1	Sowers FB #1	Federal CR #4	Federal GC #1	State CY #1	Federal EF #2	Federal CR #1	Gable FV #1	Well
198L3 1100E	660N 2310E	660S 1980E	660N 1980E	1980N 660W	1980S 1980W	660S 660E	1,980S 1980W	1980S 660W	660S 660W	1980N 660E	Location N-S E-W S
36	36	30 5	35	34	ω ω	32	32	31	29	29	n Sec.
Yates	Yates	Yates	Yates	Yates	Yates	Yates	Yates	Yates	Yates	Yates	Operator
10-16-75	03-20-75	06-14-74	05-21-75	11-14-75	12-26-78	06-07-76	11-26-73	03-07-80	07-31-73	03-24-76	Sr.Jd Date
8590	8678	8700	8455	8515	8476	. 8400	8330	8440	8340	0618	Total Depth
Eagle Creek Strawn	Eagle Creek Atoka+Morrow, Fas Eagle Creek Strawn Eagle Creek Permo-Penn	Atoka Morrow, West Eagle Creek Peimo-Penn	Eagle Creek Strawn Eagle Creek Permo-Penn	Eagle Creek Permo-Penn	Richard Knob Ateka-Morrew	Richard Knob Atoka-Morrow Eagle Creek Strawn Eagle Creek Permo-Penn	Richard Knob Atoka-Morrow Eagle Creek Strawn Eagle Creek Permo-Penn	Rishard Knob Atoka-Morrow Eagle C∽eek Permo-Penn	Richard Xnob Atoka-Morrow Eagle Creek Strawn Eagle Creek Permo-Penn	Eagle Creek Permo-Penn	Field
321,680	4,668,718 46,723 73,798	45,490 175,839	179,660 110,664	175,891	<i>\$</i> 6,793	53,785 33,955 95,579	56,663 29.310 131,358	3, 144 3, 230	85,563 4,018 144,538	67,314	Production (Mcf) To 1-1-81

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* NO 1980 PRODUCTION

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WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

TOWNSHIP 17 S, RANGE 26 E

Ton Brown GO #1	Siegenthaler IS #2	Siegenthaler IS #1	Hombaker HW #1	John ST #1	Armstrong KS ST #1	Caffal FD #1	Hunter FL #1	Blaine #1	Haldeman OU #1	Holden DE #1	Holt DL #1	Haines #1	Bolton CU #1	Coll LD #1	SNY #1	State CK #1	Bowman NA #1	Haldeman DA #1	Well
835 N 1980 W	1460 S 1980 W	1980 S 660 E	510 S 1680 E	2180 S 2180 E	1980 S 560 E	660 S 1980 E	1980 N 1940 W	660 N 1980 E	1980 S 1980 W -	1980 S 1980 E	1980 N 1980 W	760 S 1980 E	660 N 2180 E	660 S 660 E	1650 N 2310 V	660 N 2180 W	1980 S 1980 W	660 S 2040 W	Location N-S E-W
22	21	21	20	. 16	16	15	15	14	14	12	12	11	9	Q	տ	4	4	ω	Sec.
Yates	Yates	Yates	Arco	Coquina	Yates	Yates	Yates	Coquina	Yates	Yates	Yates	Coquina	Yates	Yates	Hondo	Yates	Yates	Yates	Operator
12-10-76	02-14-78	11-07-77	0 6- 20-66	05-15-74	03-06-79	12-15-75	02-26-76	04-09-74	12-13-80	11-13-71	05-19-74	01-29-74	08-02-73	06-14-80	07-03-75	06-03-66	03-29-80	12-29-73	Spud Date
8725	8627	8670	8755	6998	8580	8670	6597	8803	8734	0006	0968	0088	9040	8480	8053	8150	8200	8420	Total Depth
Kennedy Farms Morrow	Kannedy Farms Upper Penn	Kennedy Farms Morrow Kennedy Farms Atoka	DEA	D & A	Kennedy Farris Morrow	Kennedy Farms Atoka Kennedy Farms Upper Penn	Kennedy Farms Morrow	D & A	P&A	Riverside Atoka	D & A	Undesignated Morrow	5 S A	י א אי א	DRA	POW MORTOW	Wildcat Canyon	Ρ & A	Field
																			~ ·
1,168,104	20,255	879,061 37,384			802,688	22,353* 87,068	110,485	,	\$ \$	248,915	1 9 7	29,594*	;	1		856,242	146 50	8 2 3	Production (Mcf) To 1-1-81

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WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

TOWNSHIP 17S KANGE 26E

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Kennedy Farms #1	Kennedy JQ #1	Patterson EL #2	Patterson EL #1	Haldeman EN #1	Goat Roper LP #1	Caskey EV #1	Nellor EO #1	Martin #1	Johnson JT	Big Buck Pounds	JH Ansley #1	Glenn Farmer	Hnulik EJ #1	Sweet Yates	Berry E2 #1	KD #1	Tidwell ED #1	well
ns #1	₩ 	t #2	L #1	#1	LP #1	1	د م			unds #1	1	r #1	1	FM #1			Ĩ	4
1980 N	2510 N	660 S	S 088	1980 N	1130 S	660 S	1980 N	1980 S	2016 N	1980 S	660 N	1980 S	1315 N	1980 N	S 066	660 S	S 066	N-S-N
2310 W	660 E	2310 W	660 W	660 W	13 00 E	1400 W	660 W	660 W	660 E	660 E	660 E	1980 W	660 W	1980 E.	M 066	1980 E	660 E	Location E-W
34	33	31	31	31	30	30	30	29	28	27	27	26	26	25	23	23	22	Sec.
Hanson	Yates	Yates	Yates	Yates	Yates	Yates	Yates	Maddox	Yates	Hanson	Sun Texas	Sun Texas	Yates	Yates	Yates	Antweil	Yates	Operator
07-11-73	05-22-78	12-28-78	08-15-75	07-12-75	02-08-80	11-19-75	01-15-76	02-10-77	07-25-78	05-22-74	11-24-74	06-24-77	06-11-75	02-17-76	02-21-75	12-20-78	01-19-75	Spud Date
8860	8732	8942	8640	8595	8610	8570	8477	8600	8732	8821	9088	8881	8850	8997	8807	0888	8830	Total Depth
Kennedy Farms Morrow	Kennedy Farms Morrow Kennedy Farms Upper Penn	Eagle Creek Atoka-Morrow, East	Eagle Creek Strawn	Eagle Creek Atoka-Morrow, East	Eagle Creek Atoka-Morrow, East	Eagle Creck Atoka-Morrow, East Eagle Creek Strawn	D & A	P&A	Kennedy Farms Upper Penn	Kennedy Farms Morrow	Kennedy Farms Morrow	Kennedy Farms Morrow	Kennedy Farms Morrow Kennedy Farms Atoka	Kennedy Farms Atoka	Kennedy Farms Morrow	D & A	Kennedy Farms Morrow Kennedy Farms Atoka	Field
193,262	8,897 156,399	802,012	637,043	1,865,969	120,204	52,438 165,851			91,170	399,106	1,228,506	43,616	1,522,461 17,139*	616,312	1,109,752	1	1,153,683 39,592*	Production (Mcf) To 1-1-61

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Production (Mcf) To 1-1-81

253,003

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WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

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TOWNSHIP 17S RANGE 26E

Big Boggy ST #1X	Bradshaw IY #1	Blevins IK #1	Marjorie Naylor	Clyde Guy #1	well
S 066	660 S	N 096	ູ S 066	1980 S	N-S
2080 E	660 W	M 069	990 S 1650 E	1980 5 660 E	Location E-W
36	35	35	35	34	Sec.
HEYCO	Yates	Yates	Fasken	Hanson	Operator
01-27-77	01-25-78	09-13-77	03-14-75	06-29-74	Spud Date
9185	8992	8925	9056	8975	Total Depth
D & A	D & A	Kennedy Farms Morrow	DŻA	D & A	Field

* NO 1980 PRODUCTION

WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

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TOWNSHIP 18S RANGE 24E

Rio ST #2	Rio ST #1	Eddy 35 #1	State GP #1	State 32 #1	Maralo ST #1	Federal AA #1	Four Mile ST #1	Cass ST #1	State JM #1	Lincoln ST #1	Weed ST #1	State HZ #1	Federal J #1	Anderson ST CS #1-Y	Cities JG ST #1	Spearman KQ #1	Federal CH #2	well
1980s	1980S	1980N	1980N	1980S	660N	660S	660S	1980S	660N	2030N	1980N	1980N	660S	1980N	660S	1980S	1980N	N-S L
1980 E	1980W	1980E	1980E	660E	1980W	660E	1980E	198CW	660E	660E	1880W	1980E	660W	1800E	660E	1980W	1980W	Location E-W
36	36	35	33	32	28	27	26	25	25	24	24	22	21	14	13	13	щ	Sec.
Mesa	Mesa	Gulf 1	Атосо	Maddox	Estroil	Yates	Mesa	Pubco	Yates	Mesa	Mesa	Yates	Midwest	Yates	Yates	Yates	Yates	Operator
06-09-79	03-13-79	11-07-79	02-11-79	04-01-78	09-15-75	08-28-61	12-09-79	05-26-72	10-29-78	03-17-78	08-06-78	05-03-77	09-11-70	03-15-68	10-28-78	03-05-80	10-26-73	Spud Date
8955	8935	8974	0888	8565	8540	8673	8744	8770	9016	8636	8524	8536	8750	7160	0068	8800	8376	Total Depth
Penasco Draw Morrow	Penasco Draw Morrow	Undesignated Group 1	D & A	Antelope Sink Morrow	ዮ & ች	Undesignated Group 1	Undesignated Group 3	D & A	Penasco Draw Morrow Penasco Draw Permo-Penn	Penasco Draw Morrow	D & A	Undesignated Cisco	P & A	Penasco Draw Permo-Penn	Undesignated Mississippian Penasco Draw Permo-Penn	Richard Knob Atoka-Morrow	Ϋ́Α.	Field
1,538,808	399,590	2,593 BO		61,178*	1 9 1	0G 055	1,235 EO	1	2,141 119,995	395,543		NOL		206,550	43,844 11,755	62,707		Production (Mcf) To 1-1-81

* NO 1980 PRODUCTION

		WELLS
1-1-81	Eddy County,	PENETRATING CISCO
18	County, New Mexico	PORTION OF PERMO-PEN
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TOWNSHIP 18S RANGE 25E

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Pennzoil 13 Fed. #1	Hare #1	Hoffman #1	Clancy #1	Johnson #1	Yates Fed B #7	Federal CZ #1	Federal CX #3	Federal CX #2	Federal CX #1	Federal EF #1	Federal AB #2	Grynberg A Fed. #1	Pipkin HE #1	Griffin JJ #1	Morris MC #1	Murphy NW #1	Johnson #1	Superior Fed. #2	Superior Fed. #1	<u>Well</u>
660 S	660s	660N	660S	1980N	660S	660N	1980S	1980S	1980N	660S	660S	660N	660S	1650N	1980N	19 80S	20805	1980s	NC861	N-S I
1980E	6 60E	1980E	1980E	660E	1980E	1980E	2310W	660W	660E	1980E	1980E	1980E	66.0W	1980W	1980E	1980W	660E	M0861	1980E	Location E-W
13	12	11	11	10	Q	æ	7	7	7	δ	თ	ហ្	4	4	ω	ω	2	1	щ	Sec.
Fasken	Coquina	Coquina	Coquina	Атосо	Атосо	Yates	Yates	Yates	Yates	Yates	Yates	Gulf	Yates	Yates	Yates	Yates	Superior	Coquina	Coquina	Operator
07-08-71	04-12-74	08-18-73	03-23-73	01-28-78	05-04-78	12-29-73	02-16-79	07-12-77	09-22-73	04-23~75 *	10 -1 4-77	10-21-77	02-17-77	02-28-78	10-26-79	11-10-80	0906-73	12-06-73	06-26-73	Spud Date
8920	8871	8635	8700	8700	8700	8671	8750	8417	8625	8413	8555	8400	8560	8500	8630	8630	8650	8677	8700	Total Depth
Atoka Morrow, West	Atoka Morrow, West	5 S N	Atoka Cisco, West	Atoka Morrow, West	۲ A A	Richard Knob Atoka-Morrow Bagle Creek Permo-Penn	Bagle Creek Permo-Penn	Eagle Creek Permo-Penn	Eagle Creek Permo-Penn	Richard Knob Atoka-Morrow Eagle Creek Permo-Penn	Richard Knob Atoka-Morrow Bagle Creck Permo-Penn	Fichard Knob Atoka-Morrow Eagle Creek Fermo-Penn	Lagle Creek Permo-Penn	Eagle Creek Permo-Penn	Fagle Creek Permo-Penn	Richard Knob Atoka-Morrow	Atoka Morrow, West	Atoka Morrow, West	Atoka Morrow, West	Field
137,538	104,322		32,664*	91,358	1	308,377 272,752	34,881	7,943	194,259	63,673 89,086	475,907 115,552	108,919 14,490	73,408	239,587	78,103	NOL	792,432	114,054*	. 1,151,339	Production (Mcf) To 1-1-81

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WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

NMCCD Case 7352 Exhibit No. 9 Fage -9-

TOWNSHIP 18S NANGE 25E

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Scout EH #4	Scout EH #2	Sederal AY #2	Hornbaker BA #2	Yates AS #2	Kinuaid BI #2	Linck #1	Brown-Yates #1	No. Penasco MG #1	Federal AB #5	La Cama #1	Penasco #1	Eddy GK ST #2	Eddy GK ST #1	Gulf KC ST #1	Eddy GX ST #1	Four Dinkus IE ST #1	Four Dinkus GV #1	Upham KV #1	Five Mile Unit #1	Vandiver #2	Vandiver =1	<u>well</u>
1980s	1980S	1490N	1980N	2310S	NC:09	1980S	1650s	660S	1980 S	1980N	660S	2310N	1980S	660N	860S	1980S	660S	1980s	198CN	1930N	1980N	N-S L
660W	660E	1650W	660E	M066	620E	1980W	3066	660E	660W	1980W	1980E	1980W	660E	1980W	2310E	1980E	1980E	1980W	660E	660E	1980W	Location E-W
27	27 .	25	25	25	25	24	24	23	21	20	20	19	19	18	18	17	16	14	14	13	13	Sec.
Yates	Yates	Yates	Yates	Yates	Yates	Read & Bates	Fasken	Yates	Yates	lates	Antweil	Gulf	Gulf	Yatès	Gulf	Yates	Yates	Yates	Coquina	Brunson	Pennzoil	Operator
08-19-79	07-11-75	03-24-71	03-15-72	03-03-67	10-16-72	11-03-71	12-20-70	01-19-80	03-11-78	09-11-77	03-30-77	11-25-77	09-16-77	11-26-78	04-08-78	06-07-77	02-11-77	02-03-79	12-05-72	05-26-73	69-80-60	Spud Date
9063	0606	0906	9150	5917	9029	9050	0006	9040	8894	8700	8830	8708	8825	8800	8680	8700	8810	8880	8790	8912	6583	Total Depth
Penasco Draw Morrow	Penasco Draw Atoka	Penasco Draw SA Yeso	Penasco Draw SA Yeso	Penasco Drew SA Yeso	D & A	D & A	At.oka Morrow, West	P & A	Penasco Draw Atoka Ur.designated Upper Penn Penasco Draw Permo-Penn	Penasco Draw Permo-Penn	Penasco Draw Morrow	Penasco Draw Morrow	Penasco Draw Morrow	Richard Knob Atoka-Morrow	Penasco Draw Permo-Penn	D&A	D & A	Atoka Morrow, West	Atoka Cisco, West	Atoka Morrow, West 🤟	Atoka Morrow, West	Field
41,404	34,871*	29,017 BO	11,263 50	41,130 EO	1		10,308,027		3,253 1,623* 13,871	463,762	4,526,487	765,552	707,827	813,113	172,924			144,057	14,100×	469,510*	447 - H 4 C X	Production (Mcf) To 1-1-81

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WELLS PENETPATING CISCO PORTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

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TOWNSHIP 18S RANGE 25E

Kincaid Q #1	Eddy ST AC #1	Gushwa DR #3	Gushwa DR #1	Rio Penasco JX #1	Scout EH Fed. #3	State BI #1	Lone Tree #1	Penasco IW #1	Penasco ST #1	Federal AB #4	Rio #1	Dinkus #1	Well
\$066	19805	1980N	1980N	660S	660N	1980N	660N	1980s	1980S	660N	1930N	1980S	N-S
1980E	660W	1980W	660W	1980W	1980E	1980W	1980W	1980E	1980E	1980E	1980E	1980w	Location E-W
36	36	35	35	35	34	33	32	31	30	30	29	28	Sec.
Monsanto	Gulf	Yates	Yates	Yates	Yates	Scoggins	Bennett	Yates	Mesa	Yates	Antweil	Antweil	Operator
04-30-65	12-31-58	09-23-80	11-05-73	08-16-78	12-08-73	08-06-67	08-10-77	07-04-77	06-06-78	02-11-78	06-02-77	08-13-76	Spud Date
9303	9283	9160	9220	9265	9150	10130	8915	£973	8850	8800	8868	9034	Total Depth
D&A	4 & 4	Boyd Morrow	Penasco Draw SA Yeso	Boyd Morrow	Penasco Drzw SA Yeso	P & A	Penasco Draw Morrow	Penasco Draw SA Yeso	Penasco Draw Permo-Penn	Penasco Draw Morrow	Penasco Draw Morrow	Undesignated Morrow Undesignated Atoka	Field
	4 1 1	NOL	14,531 50	1,124,423	1,890 80	a 	131,554	5,515 30	69,351	1,610,439	469,821	7,457* 119,595	Production (Mof)

+ NO 1980 PRODUCTION

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WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

TOWNSHIP 19S RANGE 23E

W. Antelope Sink Unit #1	Siegrest Draw Unit #2	Siegrest Draw Unit #1	Siegrest ST #1	Runyan Fed. #2	Tres Ranchos Unit #1	Good Hope Unit #1	Tres Amigos	Gardner State #1	Frank State #1	South Hope ST #1	Red Tank #1	Well
1980s	1650S	1980N	1980N	1980N	660S	460S	1980s	1980s	21305	S 066	1980N	N-S-N
660E	1650E	1980W	3066	660E	660E	810E	6 60W	1980W	660E	1980E	1 980E	Location E-W
35	34	28	25	18	10	Q	9	6 0	۲ `	л	2	Sec.
Tom Brown	Tom Brown	Tom Bijown	Mesa	Mesa	Magnolia	Sweeny	McClellan	Mesa	Mesa	Pubco	Green	Operator
02-12-64	03-12-64	06-18-63	01-13-80	06-22-79	08-21-56	02-16-64	02-02-80	10-09-78	01-18-79	04-18-72	08-25-72	Spud Date
8790	8700	8695	8660	7796	10034	8122	7921	7785	7700	7792	8200	Total Depth
Р & A	ΡεΑ	P&A	Wildcat Wolfcamp	Runyan Ranch Morrow	ΤA	д ч ч	Runyan Ranch Abo	Runyan Ranch Morrow	Runyan Ranch Morrow Runyan Ranch Abo	P & A	10 A A	Field
		7	NOL	40,944	3 - 1		6,651	714,223	23, 130 () H 03 () H 0		I 1	Production (Mcf) To 1-1-81

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WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

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TOWNSHIP 19S RANGE 24E

Cone Fed #1	Roden GD Fed #1	Allison Fed CQ #1	Yates Fed A #1	Antelope Sink Unit #1	Allison C2 Fed #3	Molly #1	Allison CQ Fed #5	Irish Hills JE ST #1	Allison CQ Fed #2	Davis NC #1	State DQ #1	Sullivan Fed #1	State IL #1	Irish Hills KW #2	SRC KZ ST #6	SRC K2 ST #2	Federal CW #1	Well
660N	1980s	6 60 S	660N	1890N	6 60S	S 066	660N	1980N	1980S	1930S	2310N	66JS	1980N	N0861	660N	660N	7205	N-S L
660E	660E	2099	660E	2070E	2310W	390E	1980W	1980E	660W	660E	860W	660W	1980E	1980E	M086T	1980E	1830W	Location E-W
24	23	22	21	18	15	£	13	12	12	11	9	ហ	w	N	1	Ľ	1	Sec.
Arco	Yates	Yates	Amoco	Sun	Yates	Hanks	Yates	Yates	Yates	Yates	Yates	Superior	Amoco	Yates	Yates	Yates	Yates	Operator
07-13-62	01-22-71	01-05-70	03-08-78	07-08-63	12-08-77	08-22-76	01-25-80	12-03-78	06-09-79	11-14-80	08-18-74	11-29-70	06-04-80	06-04-80	03-05-80	09-14-79	09-28-73	Spud Date
7950	91 52	9200	8905	8685	8931	8020	9320	9093	9260	9300	8830	8615	8967	9190	9200	9140	9321	Total <u>Depth</u>
Dagger Draw Upper Penn, North	Hoag Tank Morrow Hoag Tank Strawn	Hoag Tank Morrow Undesignated Abo	ر ھ ل بر ھ ل	Antelope Sink Upper Penn	Wildcat Wolfcamp	Dagger Draw U-P, North	Boyd Morrow	Boyd Morrow	Boyd Morrow	Boyd Morrow	1) & A	Wildcat Morrow	Hoyd Morrow	Fenasco Draw Permo-Penn	Fenasco Draw Permo-Penn	Fenasco Draw SA Yeso	Undesignated GP 2 Fenasco Draw SA Yeso	Field
4,168*	198,805 170,012	27,842 11,544*		1,760,758	NOL	2,594 50	8,931	938,744	787,741	TON		NOL	NOL	LON	92,154	CE 580, 0	302*50 18,439 50	Production (Mef) To 1-1-81

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WELLS PENETRATING CISCO PROTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

TOWNSHIP 19S FANGE 24E

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A DESCRIPTION OF THE OWNER OWNER OW

	State CO #1 19	Dee ST #1 19	Siegrest JS ST #1 6	Amoco Fed QT #1 19	CC Tank Unit #1 19	Oakason NV #1 6	Well N-S
1850N 1	1980S 1	1980S 1	660N 1	1980N 1	1980N 1	660S 2	8
1980E	1980W	1980E	1980W	1980W	1980W	2310E	1
36	36	36	30	29	28	27	Sec.
Yates	Yates	Conoco	Yates	Yates	Yates	Yates	Operator
01-01-78	06-27-73	09-18-76	05-31-78	12-31-80	04-26-76	08-23-80	Spud Date
9427	9400	9360	9360	8850	8947	9260	Total Depth
Cemetary Atoka, North	Ρ&A	Cemetery Morrow	Siegrest Draw Morrow	Siegrest Draw Atoka	Eoay Strawn, West	Hoag Tank Morrow	Field
113,098		2,784,963	451,837	NCL	5,691	NOL	Production (Mcf) To 1-1-81

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WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy (.ounty, New Mexico 1-1-81 a "

TOWNSHIP 19S RANGE 25E

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Cotton MX Federal #1	Federal 11 #1	Rio Penasco MF Federal #1	Arco 10 Federal #2	Arco 10 Federal #1	Arco 9 Morrison #1	John 9 Federal #1	Johnson BE #1	Trudy #1	Mobil CI Federal #11	Arco 4 Matlock #1	Arco 3 Federal #1	Federal AX =1	Rio Penasco KD #2	, Rio Penasco KD #1	Alley #1	BH Matlock #1	Well
810N	1980s	1980N	1980N	1980s	660N	1980S	NOEE	1980S	1980S	1980s	N0861	1980s	1680N	660S	2080N	660S	N-S
2180W	1980W	M086T	1980E	1980E	1980E	M086T	330E	1980E	1980E	1980E	1699W	660E	1980W	1980W	860W	1980W	Location E-W
14	11	11	10	10	Q	9	3	7	6	4	ω	ω	N	N	Ļ	1	Sec.
Yates	Cotton	Yates	Fasken	Fasken	Fasken	Fasken	Yates	Conoco	Yates	Fasken	Fasken	Yates	Yates	Yates	Amoco	Pan Am	Operator
05-16-80	08-18-79	12-05-79	07-12-72	09-23-70	12-10-71	06-10-72	05-05-67	07-03-75	06-17-80	05-10-72	05-06-71	04-20-60	07-10-80	04-06-80	04-25-80	01-30-59	Spud Date
9480	0056	9363	9293	9292	5250	9320	9222	9095	9360	9235	9222	6100	0056	9260	9362	9400	Total Depth
Boyd Morrow	Boyd Morrow	Boyd Morrow	Eoyd Morrow	Boyd Morrow	Boyd Morrow Boyd Cisco	Boyd Morrow	Boyd Morrow Penasco Draw SA Yeso	Boyd Morrow	Penasco Draw Morrow	Undesignated Canron	ט א א	Penasco Wolfcamp	30yd Morrow	Boyd Morrow	.3oyd Morrow	5 & A	Field
4,065	13,835	335,297	2,622,187	522,548*	1,671,083 150,902	2,109,711	343,542 4,374*80	37,045	27,726	1,600 BO	1 1 1	32,977 BO	351,867	857,227	76,582	8	Production (Mcf) To 1-1-81

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WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

TOWNSHIP 19S RANGE 25E

Ross IZ #1	Aikman #1	Parino Com. #1	B & B #1	Osage #1	Ross EG Federal #1	Barbara Federal #2	Barbara Federal #6	Barbara Federal #1	Barbara Federal #5	Barbara Federal #4	Barbara Federal #7	Julie #1	Barbara Federal #3	Воуд Х #1	Kincaid ST #1	Osage-Boyd #1	Boyd BN #1	Well
1980N	660S	1980s	1980N	1930N	1980S	19805	1930S	N086 T	N086 T	1980S	1980s	N086T	1980N	N066	2080N	1980N	1980N	N-S
1980W	MO86T	660E	1980E	1980E	1980W	N086T	1980E	660E	1980W	660W	1980E	3066	1980w	3066	1780W	660W	660E	Location E-W
28	27	23	22	21	20	18	18	18	18	17	17	17	17	16	16	15	15	Sec.
Yates	Coquina	Amoco	Antweil '	Coquina	Yates	Conoco	Conoco	Conoco	Hanks	Conoco	Conoco	Conoco	Conoco	Coquina	Hanks	Hondo	Yates	Operator
03-11-78	01-10-74	11-07-79	04-01-78	07-12-73	04-30-75	08-17-72	06-20-76	05-22-71	04-12-76	12-12-75	11-18-76	07-20-76	10-09-73	03-11-74	06-07-77	09-29-74	07-16-68	Spud Date
9460	9544 /	0996	9484	9410	9450	7954	8170	9040	9183	8070	8054	8052	7905	9370	9354	9428	9420	Total Depth
Cemetery Morrow Cemetery Atoka, North	D & A	D & A	D&A	د ۵ D ۲	Undesignated Mississippian Undesignated Morrow	Dagger Draw U-P, North	Dagger Draw U-P, North	Dagger Draw U-P, North	Dagger Draw U-P, North	Dagger Draw U-P, North	Dagger Draw U-P, North	Dagger Draw U-P, North	Dagger Draw U-P, North	Boyd Morrow	Dagger Draw U-P, North	しゃン	Boyd Morrow	Field
50,085	1	*	1 4		36,989 52,624*	93,533 EO	204,524 BO	262,063 20	14,331*30	201,837 EO	31,182 EO	65,425 50	199,910 BO	502,071	.5,594 * 50	1	410,642	Production (Mof)

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WEILS PENETRITING CISCO PORTICA OF PERMO-PENN Eddy County, New Mexico 1-1-81

TOWNSHIP 195 HANGE 25E

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Gulf Federal #1	Lakewood Unit #1	Irami Federal Com. #1 (Pan Canadian	State B #1	State K 6096 B #1	Albert Federal #1	Albert ST #1	Kathy Eyre Federal #1	Foster Federal #1	Dagger Draw #1	Dagger Draw #2	State K 6096 A #1	Well
1980N	19805	660S	1980N	660N	1650N	6 60 S	1980N	660N	600s	660N	19695	660s	N-S
1980W	660E	1980W	1980W	1980E	1980E	1980E	1980W	M0861	1980W	660W	629E	1980W	Location E-W
35	34	34	34	ω ω	32	32	32	31	31	30	30	28	Sec.
Hilliard	Stanolind	Huber	Coquina	Newbourne	Getty	Monsanto	Monsanto	Conoco	Monsanto	Conoco	Hanks	Getty	Operator
01-30-74	09-25-52	03-14-74	10-25-73	01-15-74	10-23-75	11-05-76	08-23-77	09-15-64	07-01-76	05-07-70	10-09-58	02-21-75	Spud Date
9835	10486	9500	9640	9451	9450	9566	9628	9300	9420	7860	368	9410	Total Depth
Cemetery Morrow	D & A	D & 7	Cemetery Mcrrow Cemetery Atoka, North	Cemetery Atoka, North	D & A	Cemetery Morrow	D & P	Dadger Draw U-P, North	Cometery Morrow	Dagger Draw U-P, North	Jagger Draw U-P, North	Cemetery Morrow	Field
187,673			2,463,278 22,567*	364,511		345,959	1 1 1	23,107*BQ	1,955,038	53,748 50	52,832*80	1,349,125	Production (Mcf) To 1-1-81

* NO 1980 PRODUCTION

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WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

TOWNSHIP 20S RANGE 21E

	н	Location			Spud	Total		Production (Mcf)
<u>well</u>	N-S	E-W	Sec.	Operator	Date	Depth	Field	To 1-1-81
Government AJ #1	2310N	M086T	8	Cities	08-04-79	7968	Indesignated Morrow	NOL
Deer Canyon Unit #1	2180N	660W	14	Hilliard	10-21-73	8767	L & A	
Wildernhel #1	1720S	920W	24	Wilson	08-23-79	8700		1
Big Sky #1	1980S	1980E	29	Wilson	03-13-73	7915	D&A] 8 9
Crooked Canyon Fed B #1	1980N	990E	35	Exxon	12-27-80	8200	L & A	3 1 1

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NMOCD Case 7352 Exhibit No. 9 Fage -18-

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WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

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TOWNSHIP 20S RANGE 23E

NW Indian Basin #1-Y	Long Draw Unit #1	Buzzard Fed #1	CC Tank Unit 1 #3	Kevin Wildernh el Fed #1	Langley Fed #1	Kewanee ST #1	Rell
1-Y				Fed #1		<i>*</i> .	•
2030 S	1880 S	2310 S	1650 S	506 N	N 066.	660 N	N-S
19 80 W	860 E	1980 W	19 80 E	1980 W	198 0 W	660 W	Location E-W
28	25	17	12	б	4	8	Sec.
C. Dean	Pan Am.	Mesa	Y-tes	Wilson	Beard Oil	Sun	<u>Grazator</u>
08-21-73	04-28-64	35-14-80	07-30-76	07-05-79	07-25-78	10-25-63	Spud Date
3030	9056	0698	0806	0993	3430	8780	Total Depth
Indian Basin Morrow, NW	D & A	D & A	D&A	D & A	D & A	Cass Ranch Morrow	Field
149,042		1		1	N 1	234,087*	Production (Mcf) To 1-1-81

* NO 1980 PRODUCTION

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NMOCD Case 7352 Exhibit No. 9 Page -19-

WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

TOWNSHIP 20S RANGE 24E

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State AX #1	Long Box Unit #1	Huber 29 Federal #1	Vickie Federal #1	Robin Federal #1	R. S. Federal #1	Charolette McKay Fed #1	Federal Hobbs	Len Mayer #1	Penny Federal #1	Foster Ranch #1	Monsanto Federal #1	Foster #1	State D #1	Nix IT Com #1	CC Tank Unit #4	Gulf Federal #1	Cass Ranch Unit #1	Poster 22 #1	Lloyd Foster AN #1	Well
660S	1980N	20805	1980N	198 0N	660N	1980N	660S	660N	660S	1650S	660N	2130 S	660S	630S	18.305	1930N	15:30N	19305	6/50N	N- 5
660E	660E	1980E	1980E	1980W	1980W	660E	660E	1980W	M086T	2220W	660W	1980E	1980W	990E	1980E	1980W	1930W	1980E	660W	Location E-W
32	30	29	26 26	26	25	25	24	24	23	22	21	21	16	13	00	6	ω	Ţ	ц	Sec.
Bell	Inexco	Tesoro	Conoco	Conoco	Coquina	Sun Oil	Western	Monsanto	Conoco	Hillard	Carper	Newbourne	Mark	Yates	Yates	Allied	LaRue	Yates	Yates	Operator
01-25-64	07-30-78	09-10-73	07-01-71	03-11-71	06-14-75	12-13-79	11-29-49	06-24-77	04-17-71	€ 14-68	05-16-60	03-07-75	06-26-75	01-30-78	02-21-69	11-21-70	06-11-53	12-19-75	02-04-65	Spud Date
9253	9375	9462	7820	7820	9810	0696	11580	9550	7936	0966	9290	9200	9100	9500	9275	9175	9950	9485	8240	Total Depth
D&A	Wildcat Atoka	1) & A	Dagger Draw U-P, South	Dagger Draw U-P, South	D & A	Undesignated Atoka	F&A	Cemetery Morrow	Lagger Draw U-P, South	ר אַ א	L & A	Foster Ranch Morrow	D & A	A 3 C	Dagger Draw Morrow, West	D&A	Dagger Draw Atoka	Cametery Morrow	Dagger Draw Wolfcamp	Field
4 2 1	NOL		10,790 EO	12,590 SO	1 8	13,575	1 	232,946	5,643 BO		1	122,829		1 1	26,663*		243,783	28,216	217,698	Production (Mcf) To 1-1-81

NMOCD Case 7352 Exhibit No. 9 Page -20-

WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

TOWNSHIP 20S RANGE 24E

Indian Hills ST #2	Indian Hills ST #1	FIESTON FEAGIAT #+		Shifer I profest ar		State C #1	9.915	Well
660S	1650N		2000 I	ا د	16505	1980S		N-N I
660E	TORGI	-	850W		165úe	M0861 S0861		Location E-W Sec
36	50	70	35		34	32		Sec.
Texas O & G	10703 0 6 0	mayae O & G	Conoco	of TX	Standard	Mark Prod.		Operator
10-07-78		03-19-78	11-23-70		09-15-68	01-17-75		Spud Date
9947		9640	7800		7845	9225))]	Total Depth
Composery Software		Cemetery Morrow	Dagger Draw U-P, South		D&A		J 	Field
	34,207	1,059,063					t 1 1	Production (Mcf) To 1-1-81

* NO 1980 PRODUCTION

LocationSpudWellN-SE-WSec.OperatorDateDateFederal 34 #1990S990E34tandard TX10-09-65	TOWNSHIP 2015 RANGE 23E	WellLocationSpudN-SE-WSec.OperatorDateDate940S1980E35Yates01-31-74	TOWNSHIP 204S RANGE 21E TOWNSHIP 204S RANGE 21E TOWNSHIP 204S RANGE 21E	
Total Depth Field 7736 D&A		Total Depth Field 8920 P&A	ICO PENN	
Production (Mof) To 1-1-81		Production (Mof) To 1-1-81		Page -21-

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NMOCD Case 7352 Exhibit No. 9 Page -21-

NMOCD Case 7352 Exhibit No. 9 Page -22-

WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

TOWNSHIP 21S RANGE 21E

Cities	Federa	Harvey	Box Ca	Texas	Huber IA #1	Huber IA #2	Box Cai	Box Ca	Box Cai	Little	Little	Fl Pas	Armstru	
Cities JH ST #1	Federal 28 #1	Harvey JI Federal #1	Box Canyon #4 A	Texas Hill KM #1	CA #1	LG #2	Box Canyon #3	Box Canyon GJ #1	Box Canyon Unit #2	Little Box Canyon Unit #2	Little Box Canyon Unit	Fl Paso CS #1	Armstrong Fed. #1	well
		#1							N	Unit #2	Unit #4			
2205N	N086 T	1780S	660N	183EN	2310N	660 S	1980S	21305	2080N	660 S	1980N	1930S	1780N	N-S I
660W	1980E	1980e	1980E	915E	1980E	1220E	1980E	1650E	1980W	1980E	1950E	2080E	1730E	Location E-W
36	28	23	23	21	15	15	14	13	13	12	12	11	9	Sec.
Yates	Pennzoil	Yates	Yates	Yates	Yates	Yates	Yates	Yates	Yates	Cities	Cities	Yates	Wilson	Operator
03-18-78	08-14-69	05-04-78	12-23-77	08-30-77	11-21-77	07-18-77	06-02-77	07-30-76	01-13-77	08-12-77	11-02-77	11-27-76	04-23-73	Spud Date
8895	9370	8365	8400	7385	8125	3050	8450	8585	2658	8370	8320	8448	8300	Total Depth
Box Canyon Permo-Penn	A & A	Undesignated Circo	Jox Canyon Perme-Penn	D & A	D&A	Box Canyon Strawn Box Canyon Permo-Penn	Box Canyon Permo-Penn	Little Box Canyon Morrow Box Canyon Wermo-Penn	Little Box Canyon Morrov	Little Box Canyon Morrow	реч	Box Canyon Permo-Penn	ኮ ድ ች	Field
110,142	1	NOL	1,229,185		-	65,159 18,535	440,316	163,105* 2,031	1,410,376	181,400	- []	91,916*		Production (Mcf) To 1-1-81

* NO 1980 FRODUCTION

NMOCD Case 7352 Exhibit No. 9 Page -23-

WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy County, New Maxico 1-1-81

TOWNSHIP 21S RANGE 22E

Arroyo Fed #2	Majors Fed #2-Y	WIB Unit #1	Loafer Draw A #1	Loafer Draw B #1	Burro Hills Unit #1	Hilliard BF Fed #1X	Hilliard IE Fed #1	Stinking Draw Fed #1	NW Indian Basin #1	Searle ML Fed #1	Stinking Draw #1	Little Box Canyon #1	Little Box Canyon #3B	Federal H2 #1	NW Indian Basin #1	Well
660N	20805	2080N	1980S	1980N	660S	1650N	NOEE	1980N	1885s	19805	13635	16505	660N	S066	23105	N-S
2280W	810E	860W	1980 E	860W	1980E	630E	2310W	660W	2060W	2030W	695 E	1980E	1980E	1980W	2450W	Ic sation E-W
24	23	23	17	17	16	14	14	13	12	11	10	7	۲	ហ	2	Sec.
Pet. Dev.	Inexco	Gt. Western	Cities	Cities	Magnolia	Yates	Yates	Durham	Yates	Yates	Yates	Cities	Cities	Yates	Moralo	Operator
05-11-79	06-20-78	05-02-73	11-19-73	12-15-75	08-04-48	05-27-67	05-26-79	01-27-80	12-23-76	06-30-30	03-30-78	07-04-75	09-20-77	04-14-77	09-16-79	Spud Date
9300	9950	9463	8873	8591	11312	9350	9350	9710	9353	9330	9464	8350	8390	8679	9302	Total Depth
Indian Basin Morrow, West	Indian Basin Morrow, West	D & A	TA	D & A	۵ ک ۳	Indian Basin Morrow, West	Indian Basin Morrow, West	U & A	D & A	П & А	I) & A	Little Box Canyon Morrow Eox Canyon Permo-Penn	Undesignated Cisco	Little Box Canyon Atoka Undesignated Canyon	Undesignated Morrow	Field
62,394	197,728	Ĺ 1 8		2	8 	2,310,608	869,829	4	t ;			409,254* 44,068	174,668	12,348 12,766	4,931	Production (Mcf) To 1-1-81

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NMOCD Case 7352 Exhibit No. 9 Page -24-

WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

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TOWNSHIP 21S RANGE 22E

<u>Well</u> Loafer Draw A #1 Majors Fed #1	N-S 1650S 1980S	· (Sec. 24	<u>Operator</u> Kerr-McGee Inexco	Spud Date 05-09-66 11-23-74	Total <u>Depth</u> 7805 9100	D & A D & A	Production (Mc [±]) To 1-1-81
Majors Fed #1	1980S	M086T	25	Inexco	11-23-74	0016	DAA	9 6
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	1
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	A & C	8
Little Indian Basin ES #1	660S	1980E	36	Yates	10-13-75	9521	D & A	

*NO 1980 PRODUCTION

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NMOCD Case 7352 Exhibit No. 9 Page -25-

WELLS PENETRATING CISCO PORTION OF PERMO-Penn Eddy County, New Mexico 1-1-81

TOWNSHIP 22S RANGE 21E

Box Canyon Unit #1	HW Bass Fed. #1	Continental Fed. #1	Brainerd Fed. IO #1	<u>well</u>
560N	470S	66US	660N	N-S L
660W	850E	660E	660N 1980E	Location E-W
12	ரு	Ч	1	Sec.
Marathon	Continental	Brainerd	Yates	Operator
08~29-63	07-10-51	06-20-53	11-09-77	Spud Date
9435	5889	10596	6806	Total Depth
D & A	с А	A & C	Box Canyon Permo-Penn	Field
	1	1	61,797	Production (Mcf) To 1-1-81

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NMCCD Case 7352 Exhibit No. 9 Page -26-

WELLS PENETRATING CISCO PORTION OF PERMO-PENN Eddy County, New Mexico 1-1-81

TOWNSHIP 22S RANGE 22E

LA Federal #2	LA Federal #1	Flanigan Fed. #1	Rocky Arroyo A #1	Rocky Arroyo C #1	Rocky Arroyo #1	Rocky Arroyo E #1	Rocky Arroyo D #1	Cawley Draw #1	Rocky Arroyo D #2	Cawley Draw #1	Well
660N	1980s	2080S	1980N	1980N	1980S	1980N	660S	837N	1980S	1980S	N-S L
1980W	660E	1980W	660W	1980W	198 0E	2130E	2180E	2157E	660W	1980E	Location E-W
12	11	9	9	œ	¢,	7	თ	4	4	ω	Sec.
Inexco	Inexco	Summit	El Paso	El Paso	El Paso	El Paso	El Paso	Gt. Western	El Paso	Inman	Operator
03-26-79	10-04-78	04-07-76	12-28-71	10-06-73	08-27-71	02-27-73	11-02-73	03-18-73	02-25-74	04-24-€-	Spud Date
9650	9760	6200	9160	9225	9380	9258	9157	9456	9325	9515	Total Depth
D & A	D & A	D & A	5 S A	Rocky Arroyo Morrow Rocky Arroyo Canyon	Rocky Arroyo Morrow Rocky Arroyo Wolfcamp	Rocky Arroyo Wolfcamp	Rocky Arroyo Morrow	Rocky Arroyo Morrow	Rocky Arroye Canyon	P & A	Field
8 ș - 1	3 5 1	5 S I		27,566 * 149,306	170,697* 388,016	264,618	240,502	281,983	122,842	1 1 1	Production (Mcf) To 1-1-81

* NO 1980 PRODUCTION

NMOCD Case 7352 Exhibit No. 10 Page -1-

WELLS COMPLETED IN DESIGNATED PERMO-PENN INTERVAL

EDDY COUNTY, NEW MEXICO

JANUARY 1, 1981

1930

1980 Cum Gas Cum Oil

Federal AB #2	El Paso GS #1	Eddy GX ST #1	City of Artesia EQ #1	Cities JH ST #1	Cities JG State #1	Brainerd IO	Box Canyon GJ #1	Box Canyon #4A	Box Canyon #3	Arco 9 Morrison #1	Arco EC State #1	Antelope Sink Unit #1	Anderson ST CS #1Y	Well
5-18S-25E	11- 21 S -21E	18-16S-25E	24-17S-25E	36-21S-21E	13-18S-24E	1-22S-21E	13-21-21E	23-215-21E	14-21S-21E	9-195-25E	36-175-25E	18-19S-24E	14-18S-24E	Location
Yates	Yates	Gulf	Yates	Yates	Yates	Yates	Yates	Yates	Yates	Fasken	Yates	Sun	Yates	Operator
Eagle Creek P-P	Box Canyon P-P	Penasco Draw P-P	Eagle Creek P-P	Box Canyon P-P	Penasco Draw P-P	Box Canyon P-P	Box Canyon P-P	Box Canyon P-P	Box Canyon P-P	Boyd Cisco	Eagle Creek P-P	Antelope Sink U-P	Penasco Draw P-P	Field
10-14-77	11-27-76	04-J8 - 78	08-16-75	03-18-78	10-28-78	11-09-77	07-30-76	12-23-77	06-02-77	12-10-71	03-20-75	07-08-63	03-15-68	Spud Date
6447-6632	0609-0809	6772-6818	6530-6600	5851 -6173	6564-6619	6212-6230	5754-6480	5886-6020	6008-6034	, 7138-7200 ,	6534-6692	6148-6366	6351-6388	Completion Interval
8555	8448	8680	8406	8895	0068	6806	8585	8400	8450	9250	8678	8685	7160	Total Depth
04-05-78	05-23-77	10-12-78	01-21-77	06-06-79	08-08-79	03-07-78	08-15-73	03-16-78	03-08-78	05-15-72	04-02-75	12-27-68	03-09-77	Date of 1st Prod.
147	last prod lo	223	40	255 5	44	49	14	761	276	σι	193	31	274	Gas Rate <u>Mcf/D</u>
0.4	10/79	1.5	0.1	0.1	0.1	0.0	0.1	0.9	0.2	0.0	J.9	0.1	0.7	Oil Rate BOPD
115552	91916	172924	55974	110142	11755	61797	2931	1229185	440316	150902	73798	1760758	206550	to 1-1+81 (Mcf)
527	495	1456	117	041	65	75	477	2559	1071	674	348	4273	675	to 1-1-81 (BBLS)

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WELLS COMPLETED IN DESIGNATED PERMO-PENN INTERVAL

NMOCD Case 7552 Exhibit No. 10 Page -2-

1980

1980

Cum Gas Cum Oil

Irish Hills KW #2	Huber IA #2	Grynberg A Fed #1	Griffin JJ #1	Gossett EU #1	Gable FV #1	Flint #2	Flint #1	Federal GR #1	Federal GC #1	Federal EF #2	Federal EF #1	Federal CZ #1	Federal CX #3	Federal CX #2	Federal CX #1	Federal BZ #12	Federal AB #5	<u>well</u>
2-198-24E	15-21S-21E	5-18S-25E	4-18S-25E	26-17S-25E	29-17 5- 25E	25-17S-25E	25-17S-25E	25-17S-24E	32-17S-25E	31-17S-25E	6-18S-25E	8-18S-25E	7-185-25E	7-18S-25E	7-18S-25E	21-175-25E	21-185-25E	Location
Yates	Yates	Gulf	Yates	Yates	Yates	Western	Western	Yates	Operator									
Penasco Draw P-P	Box Canyon P-P	Eagle Creek P-P	Eagle Creek P-P	Eagle Creek P-P	Eagle Creek P-P	Eagle Creek P-P	Eagle Creek P-P	Eagle Creck P-P	Eagle Creek P-P	Penasco Draw P-P	Field							
06-04-80	07-18-77	10-21-77	02-28-78	09-18-75	03-24-76	05-13-75	02-04-74	10-31-76	06-07-76	03-07-80	04-23-75	12-29-73	02-16-79	07-12-77	. 09-22-73	09-12-75	03-11-78	Spud Date
6548-6635	5977-5982	6485-6600	6526-6624	6624-6644	6485-6663	6512-6567	6480-6534	6214-6226	6276-6280	6306-6495	6412-6568	6554-6576	6562-6578	6492-6664	6545-6768	6823-6836	6528-6568	Completion Interval
06 16	8050	8400	8500	8420	8190	10243	8507	8200	8400	8440	8413	8671	8750	8417	8625	8180	8894	Total Depth
03-26-81	08-10-78	11-12-80	01-24-79	01-22-77	03-05-77	08-26-77	05-17-74	01-24-79	05-28-77	0-15-80	03-04-77	03-01-77	10-10-80	08-30-79	03-01-77	03-05-77	06-05-79	Date of 1st Prod.
	20	485	298	111	43	128	30	20	107	43	44	195	4 0 0	13	156	N	21	Gas Rata <u>Mcf/D</u>
8	0.3	1.1	1.2	0.2	0.3	0.6	0.0	0.1	1.2	0.2	0.1	0.6	1.6	0.5	2.1	0.0	0.0	Oil Rate BOPD
8 8 1 1	18535	14490	239587	209181	67314	199378	347524	2342	95579	3230	980 68	272752	34881	7943	194259	1267	13371	to 1-1-81 (Mcf)
2 8	232	ເວ ເວ	955	783	6 - 1 - 1	C S S	60 11	C1 TU	420	11	194	1032	121	ស ភ្លូ ស	3865	ا⊷ا	ω	to 1-1-81 (28LS)

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NMOCD Case 7352 Exhibit No. 10 Page -3-

WELLS COMPLETED IN DESIGNATED PERMO-PENN INTERVAL

7105-7124873210-26-791766.27220-7246873209-07-79680.5691.9-6954870002-04-783441.35864-6089835006-22-79830.15875-6061839003-13-781360.4	8455 01-28-77 l	6561-6645 8443 02-15-77 96	6544-6600 8630 03-28-80 237		6498-6664 8850 04-30-80 11 6	6498-6664 8850 04-30-80 6618-6674 8560 07-14-78	8850 04-30-80 116 8560 07-14-78 76 8700 02-15-77 1.6	6498-6664 8850 04-30-80 6618-6674 8560 07-14-78 6539-6683 8700 02-15-77 7355-7367 8370 10-15-80	6498-6664885004-30-801166618-6674856007-14-78766539-6683870002-15-771367355-7367837010-15-80336563-6600938011-05-73159
8732 1C-26-79 8732 09-07-79 8700 02-04-78 8350 06-22-79 8390 03-13-78		01-28-77	8455 01-28-77 8443 02-15-77	8455 01-28-77 8443 02-15-77 8€30 03-28-80	8455 01-28-77 8443 02-15-77 8630 03-28-80 8850 04-30-80	6618-6636 8455 01-28-77 6561-6645 8443 02-15-77 6544-6600 8630 03-28-80 6498-6664 8850 04-30-80 6618-6674 8560 07-14-78	-75 6618-6636 8455 01-28-77 -76 6561-6645 8443 02-15-77 -79 6544-6600 8630 03-28-80 -78 6498-6664 8850 04-30-80 -77 6618-6674 8560 07-14-78 -74 6539-6683 8700 02-15-77	6618-6636 8455 21-28-77 6561-6645 8443 02-15-77 65544-6600 8630 03-28-80 6498-6664 8850 04-30-80 6618-6674 8560 07-14-78 6539-6683 8700 02-15-77 7355-7367 8370 10-15-80	6618-6636 8455 21-28-77 6561-6645 8443 02-15-77 6544-6600 8630 03-28-80 6498-6664 8850 04-30-80 6618-6674 8560 07-14-78 6539-6683 8700 02-15-77 7355-7367 8370 10-15-80 6563-6600 9380 11-05-73
		1 1 1	.36 1	.36 1 96 237	.36 1 96 237	.36 1 96 237 216			
ω on N	0 0	0 0 0	0 0 0 0	· · · · · ·		· · · · · · · ·	I 4 4 O K M M II L	Ч 4 0 0 0 0 U 4 0	1 44068 4 174668 0 110664 2 175000 2 78103 8 69351 5 73408 1 175839 1 175839 3 386016

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NNOCD Case 7352 Exhibit No. 10 Page -4-

WELLS COMPLETED IN DESIGNATED FIRMO-PENN INTERVAL

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	State CY #1 / State JM #1	Sowers FB 🎘	Siegenthaler IS #2	<u>Wel</u> 1
147 - COT - CAL	32-17S-25E	34-177-25E	21-17S-26E	Location
rates	Yates	Yates	Yates	Operator
Penasco Draw P-P	Eagle Creek P-P	Eagle Creek PP	Kennedy Farms U-P	Field
10-29-78	11-26-73	11-14-75	02-14-78	Spud Date
6520-6592	6380-6437	6773-6777	7690-7696	Completion Interval
9016	8330	8515	8627	Total Depth
04-15-80	03-05-77	02-03-77	05-17-78	Date of 1st Prod.
471	130	108	24	1980 Gas Rate Mof/D
1.1	1.2	0.5	0.1	1980 Oil Rate EOPD
119995	131358	175891	20255	Cum Gas to 1-1-81 (Mcf)
293	1817	618	~]	Cum Oil to 1-1-01 (BBLS)

≠0-₽ a−d# Upper Penn Permo Penn

*WC Wolfcamp

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NMOCD Case 7352 Exhibit No. 11

WELLS PRODUCING FROM DESIGNATED PERMO-PENN

INTERVAL THAT WERE SPUDDED OR RECOMPLETED AFTER

July 16, 1979

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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	28-175-26E	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	36-175-24E	05-16-80	07~29-80
State JM #1	25-18\$-24E	10-29-78	04-15-80

NMOCD Case 7352 Exhibit No. 12

CALCULATED PERMEABILITIES FROM DRILL STEM TESTS (DST) ۰.

<u>,</u>*

Powell DG #1 ~ 35-17S-25E 07-03-74 6445-6653 40	Murphy NW Fed. #1 3-185-25E 11-29-80 6540-6661 50	La Cama 20-18S-25E 10-09-77 6812-7000 38	Irish Hills KW ST. #2 2-19S-24E 07-07-80 6532-6640 58	Griffin JJ Com #1 4-18S-25E 03-26-78 6560-6643 24	Federal BZ #12 21-17S-25E 09-28-75 6380-6600 30	City of Artesia EQ #1 24-17S-25E 08-31-75 6435-6650 45	Ciries JH ST. #1 36-21S-21E 04-07-78 5900-6100 18	Cities JG ST. #1 13-18S-24E 11-14-78 6544-6865 45	Box Canyon #4A 23-21S-21E 02-04-78 5876-6051 40	Well Location Date of DST DST Interval Feet of Pa
07-03-74	11-29-80	10-09-77	07-07-80	03-26-78	09-28-75	08-31-75	04-07-78	11-14-78	02-04-78	Date of DST
6445-6653	6540-6661	6812-7000	6532-6640	6560-6643	6380-6500	6435-6650	5900-6100	6544–6865	5876-6051	DST Interval
40	5()	38	35	24.	3()	45	18	4 <u>5</u> ,	, 40	Feet of Pay
600 ° C	0.035	0.091	0.003	0.009	0.005	0.066	0.005	0.069	0.021	Calculated Permeability (md)
14.1	<u>2</u> .8	2.2	32.9	13.3	12.5	1.9	21.2	1.5	4.5 • •	Years To Reach Psoudo-Steady State
<u>}</u> \$	11	ЭС	06	36	77	сн С	51	139	えいれいわ	

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Summary of Core Analysis Report Murphy NW Federal #1

Routine Analysis (200 psi overburden) 3300 psi Overburden

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		Full Diame	eter Core		Core Plug
Sample	Depth	Perm (md)	Perm (md)	Perm (md)	Perm (md)
Number	(Test)	Maximum	90 Deg	Horizontal	Horizontal
1	6551-52	0.02	∢ 0.01	0.015	40.001
2	6552-53	0.03	0.03		
3	6553-54	0.07	0.04		
4	6554-55	∢ 0.01	٥.01	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	X 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	4 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		
34 35	6585-86	0.40	(0.01	0.034	0.003
35 36	6586-87	< 0.01	20.01		
	6587-88	< 0.01		0,039	0.005
37	6588-89	2.1	\$ 0.01	0.037	< 0.001
38	6589-90	0.05	0.03	0.037	
39			0.03		
40	6590-91	0.02	0,02		
41	6591-92	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		

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6596-98

LOST CORE

Summary of Core Analysis Report Murphy NW Federal #1

Routine Analysis (200 psi Overburden)

3300 psi Overburden

		Full Diame	eter Core		Core Plug
Sample	Depth	Perm (md)	Perm (md)	Perm (md)	Perm (md)
Number	(Test)	Maximum	90 Deg	Horizontal	Horizontal
NUILDEL	(16307				
4 6	6598-99	0.08	0.03		
40	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		
52	6605-06	0.23	0.04		
55	6606-07	0.02	0.02		
55	6607-08	0.02	∢ 0.01		eu
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		
63 64	6616-17	0.09	0.05	/	
65	6617-18	0.20	0.03		
65 66	6618-19	<0.01			
67	6619-20	< 0.01	· · · · · · · · · · · · · · · · · · ·		
68	6620-21	〈 9.01			
	6621-22	0.40	0.09		
69 70	6622-23	0.03	0.03		
	6623-24	0.04	(0.01		
71	6624-25	0.05	0.05		
72	0029-23	0.0			

6625-61

LOST CORE



K, Permeability Under 200psi Overburden (md)

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<u>Core From Murphy NW Federal #1</u> <u>Permeability of Pay Section</u>

Core Sample Number	Core Depth (Fcet)	Correlative Log Depth (Fcet)	Maximum Routine Perm (md)	Perm under 3300 psi Overburden (md)
10	6560	6562	0.01	3.001
11	6561	6563	0.017*	0.001
12	6262	6564	1.0	0.480
13	6563	6565	0.07	0.009
14	6564	65 66	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
AVDI:AG	E (31 Feet)		0.116	0.035

* Plug permeability

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PRODUCTION RATES FOR TWO-YEAR OLD WELLS

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· · · ····· · · · · · · · · · · · · ·	Producing Pate	
	Producing Rate Two Years After Initial	
Well		
WELL	Gas (Mcf/D)	Oil (BOPD)
Anderson ST CS #1Y	SI	
Antelope Sink Unit #1	458	SI
Arco EC ST #1	400 ·	0.4 *
Arce 9 Morrison #1	SI	
Box Canyon #3	159	SI
Box Canyon #4A	655	0.0
Box Canyon GJ #1	9	1.2
Brainerd IO #1	46	0.0
Cities JG ST #1	*	0.2
Cities JH ST #1	a.c.	
City of Artesia EQ #1	96 ₃₂ . 55 <u>s</u>	0.0
Eddy GX ST #1	227	0.5
El Paso GS #1	69	1.7
Federal AB #2	263	0.2
Federal AB #5		0.2
Federal BZ #12	10 2 3 7	0.0
Federal CX #1		0.0
Federal CX #1 Federal CX #2	278 *	4.1
	*	
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 2004	1.7
Little Box Canyon #1	*	*
Little Box Canyon #3B	121	0.6
Manseau 🐄 #1	1	0.0
Morley EN C	124	0.3
Morris MC #1	*	*
Penasco ST #1	*	*
Pipkin HE #i	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 pressur	e 146	

*Well has produced for less than two years

NMOCD Case 7352 Exhibit No. 17

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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.



