BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
MAY 4, 1961

EXAMINER HEARING

IN THE MATTER OF:

CASE 2261 Application of Continental Oil Company for two non-standard gas proration units. Applicant, in the above-styled cause, seeks the establishment of a 480-acre non-standard gas proration unit in the Eumont Gas Pool consisting of the S/2 and the NE/4 of Section 24, Township 20 South, Range 37 East, Lea County, New Mexico. Said unit is to be dedicated to the SEMU Eumont Well No. 67, located 1980 feet from the South and West lines of said Section 24.

Applicant further seeks the establishment of a 480-acre non-standard gas proration unit in the Eumont Gas Pool consisting of the NW/4 of Section 24, and the SE/4, the SW/4 NE/4, the S/2 SW/4 and the NW/4 SW/4 of Section 13, all in Township 20 South, Range 37 East, Lea County, New Mexico. Said unit is to be dedicated to the SEMU Eumont Well No. 69, located 1980 feet from the North and West lines of said Section 24.

BEFORE:

Daniel S. Nutter, Examiner.

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

MR. NUTTER: We will call next Case 2261.

MR. MORRIS: Application of Continental Oil Company for two non-standard gas proration units.

MR. KELLAHIN: Jason Kellahin, Kellahin & Fox, Santa Fe, representing the applicant, and we will have one witness we would like to have sworn.

(Witness sworn)

RONALD McWILLIAMS,

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Would you state your name, please?

A Ronald McWilliams.

Q By whom are you employed and in what position?

A I am employed by Continental Oil Company in Hobbs, New Mexico as district engineer.

Q Have you testified before the Oil Commission as a petroleum engineer and had your qualifications made a matter of record?

A Yes, I have.

MR. KELLAHIN: Are the witness' qualifications acceptable?

MR. MUTTER: Yes, sir. Please proceed.

Q (By Mr. Kellahin) Are you familiar with the application of Continental Oil Company in Case 2261?

A Yes, sir.

Q Would you state briefly what is proposed in this applica-

tion?

A Section 24, 20, 37, Lea County, New Mexico is presently a standard 640-acre gas proration unit in the Eumont Gas Pool, and it is assigned jointly to our Wells, SEMU Eumont 67 and 69. We also have a non-standard gas proration unit in the south half of the southeast quarter of Section 13, which is assigned to our SEMU Permian No. 41 Well.

Q Do you have a plat showing that area, Mr. McWilliams?

A Yes, sir.

(Whereupon, Applicant's Exhibit No. 1 was marked for identification)

Q Referring to what has been marked as Exhibit No. 1, will you discuss the information shown on that Exhibit?

A Exhibit No. 1 shows the proration units that now exist out there. In Section 24, the dotted green line shows you the present standard proration unit jointly assigned to our SEMU Eumont 67 and 69 Wells. The dotted brown line shows the proration unit now presently assigned to the SEMU Permian No. 41 Well.

We would like to reassign this acreage in the manner shown on the plat. We would like to assign the east half and the southwest quarter of Section 24, to our SEMU Eumont No. 67 Well, and on our SEMU Eumont 69 we would like to assign the south or the northwest quarter, and the acreage shown in Section 13 outline on our plat. We would like to have the present proration units cancelled.

Q What would you do, then, with your Well No. 41 in Section

13?

A We plan to abandon No. 41 in the Eumont Pool.

Q Is that well capable of producing gas?

A Yes, sir, it is, but not in commercial quantities.

Q In your opinion, is all of the acreage you propose to dedicate in the two units productive of gas?

A Yes, sir, I think it is.

Q Will the No. 67 Well produce an allowable in excess of the allowable to be assigned to a 480-acre unit?

(Whereupon, Applicant's Exhibit No. 2 was marked for identification)

A Yes, sir. I have here a copy of the back pressure tests on SEMU Eumont 67 Well. From this test the accumulated deliverability at 250 pounds per square inch is 1280 MCF a day from this well. The average 1960 Eumont gas allowable for 480 acres NSP during 1960 was 699 MCF a day, so I believe the well is capable of supporting a 480-acre unit.

Q How about the ability of the SEMU Eumont No. 69 Well?

A I also have a back pressure test taken on the SEMU Eumont 69.

(Whereupon, Applicant's Exhibit No. 3 was marked for identification)

Q That is marked as Exhibit No. 3?

A No. 3.

Q From the information on this test, the deliverability at

250 PSI is 750 MCF a day. Again, the Eumont gas allowable during 1960 for a 480-acre unit averaged 699 MCF a day, so the well is capable of producing in excess of the allowable for the proration unit size we're requesting.

Q Mr. McWilliams, in order to avoid the type of unit you are proposing to dedicate to your Well No. 67, would it be possible to complete one of the wells in Section 13 as a dual completion for Eumont gas production?

A Yes, sir, it would.

Q What is your reason for doing that?

A Well, we have instigated a water flood in the Skaggs Pool, and, of course, the wells in Section 13 are presently completed in the Skaggs Pool, and present somewhat of a mechanical problem when the flood is expanded up into that area if the wells are dually completed.

Q Your Exhibit No. 1,in addition to the other information, does show the offsetting units, does it not?

A Yes, sir.

Q In your opinion, would the granting of this application be in the interest of preventing waste and the protection of correlative rights?

A Yes, sir.

Q Would it result in the recovery of gas which would not otherwise be recovered?

A Yes, sir.

Q Were Exhibits 1, 2 and 3 prepared by you or under your supervision?

A Yes, sir.

MR. KELLAHIN: We would like to offer in evidence Exhibits 1, 2 and 3.

MR. NUTTER: Continental's Exhibits 1 through 3 will be admitted in evidence.

(Whereupon, Continental's Exhibits 1 through 3 were received in evidence)

MR. KELLAHIN: If the Commission please, that completes our testimony in regard to this. I am sure the Commission will have some questions as to the dedication of the acreage of some of the wells in addition to the two that have been mentioned. I would like to point out that all the wells in Section 24, presently dedicated for production, the gas unit being the entire section at the present time, and the oil wells in the area, each having a 40-acre unit dedicated to them, so there is no change in that section. There will be some changes in Section 13. I'm sure the Commission will want some information on that.

MR. NUTTER: Does anyone have any questions of Mr. Mc Williams?

MR. MORRIS: Yes, sir, I do.

MR. NUTTER: Mr. Morris.

CROSS-EXAMINATION

BY MR. MORRIS:

Q Mr. McWilliams, now, at this time, is the acreage dedicated to your Well No. 41 in Section 13, as outlined here in brown?

A Yes, sir.

Q And yet that is classified, now, as a gas well, is that correct, or is that an oil well?

A It is a gas well. However, it is not connected. Although it has a proration unit, we have never produced it. It doesn't have substantial deliverability to go into El Paso's line.

Q You have never sought more than an 80-acre unit for that particular well?

A At one time the No. 41 had a proration unit which also comprised the south half of the southwest quarter, and the northwest quarter of the southwest quarter, that 120 acres over there, but we've reduced that acreage previously.

Q No attempt was made to dedicate the north half of the southeast quarter or the southwest quarter of the northeast quarter of 13 to your Well No. 41?

A I'm not sure. I don't think that there has been. However, I can't definitely state.

Q Do you feel that that 120 acres that I mentioned at the last there is productive of gas in the Eumont?

A Yes, I think that it is.

Q On what do you justify that opinion?

A Well, there's not much structural relief in this area,

and, so, therefore, since the 41 is definitely gas productive, although it is not capable of producing it at a commercial rate, I see no reason not to believe that this acreage to the north is gas productive.

Q Do you feel that your Well No. 69 will drain a proration unit of this unusual size where, for instance, up here in the southwest of the northeast of the 13, do you feel that your Well No. 69 is going to have any effect on draining that acreage, or, in fact, any of that 120 acres that we have been talking about?

A Well, the Commission has already established that a 640-acre unit in the Eumont Pool will or is sufficient to drain or is the standard proration unit, so, evidently, they feel that one well can efficiently drain 640 acres. Now, you will notice that there are no offsetting gas units to this acreage, and gas is a mobile fluid, and it will flow in the direction where you have a pressure differential, so I would presume that although it might take some time, that gas up there could be recovered by these wells.

Q The acreage to the north of the unit that we're considering here in Sections 13 and 24, shown to be owned by Texaco, is that embraced in a unit, has that been dedicated to any well up there?

A No, sir, not in Section 13, although I understand informally that Texaco is planning to dually complete one of their wells in Section 13.

Q As a Eumont gas --

A As a Eumont gas well.

Q Do you know which well that might be?

A Well, this is hearsay, but I understand it's their Well No. 5, the one that they were looking at. I guess it would be their Kershaw 5.

Q Mr. McWilliams, has any attempt been made to communitize with Texaco to form a standard 640-acre unit in Section 13?

A No, sir.

Q No attempt has been made?

A No.

MR. MORRIS: I have no further questions.

MR. NUTTER: Any other questions of Mr. McWilliams?

BY MR. NUTTER:

Q Mr. McWilliams, these oil wells which are shown in the east half of Section 24 are completed in what pool?

A They're completed in the Skaggs Pool.

Q And the oil wells in the Continental acreage in the east half of Section 13 are completed in what pool?

A They are also completed in the Skaggs Pool.

Q And the oil wells in the southwest quarter of Section 13?

A Skaggs Pool.

Q Are any of these wells open in the interval, which is within the vertical limits of the Eumont gas Pool?

A Yes, sir, they are. However, I would like to point out one or two things along that line. In the first place, most of these wells were drilled prior to September 1954, which is when the Eumont Pool was established by the Commission. Now, at the time also that these wells were drilled, it was our policy to set casing above the pay, and then to drill into the Skaggs pay with oil as a circulating medium. In the SEMU Permian No. 14, which was the discovery well of the Skaggs Pool, we took several drill stem tests as we drilled this well, and we found that the top part of the Penrose to be gas productive, and the base of the Penrose proved dry. All we recovered on drill stem test through that interval was drilling fluid. To further support the fact that the lower Penrose is not productive, even though it is open, the initial completion on our SEMU Permian 37, which is the direct offset to our SEMU Eumont 67 gas well, it has gas-oil ratio too small to measure. So, I don't think that although the Penrose is open, I doubt that it is productive.

Q What zones are the Nos. 67 and 69 producing from?

A They are completed in the Penrose. I think that the 67 is perforated in the lower Penrose, although I am not so sure that it's producing from there. It's generally our policy when we do complete a well to shoot everything that might be possibly pay because perforations are cheap, and although it may be perforated there, it doesn't necessarily mean it's producing from there.

Q Well, you wouldn't perforate a zone that was not produc-

tive, would you, intentionally?

A If we had information to the contrary, no, we wouldn't, but if it's doubtful, then we might possibly go ahead and perforate it.

Q Now, the Well No. 41 never has produced, is this correct, although you have had the 80 acres dedicated to it?

A Yes, that's right. El Paso's line pressure in that area at the time the 41 was completed, was around 600 pounds, and the well did not have sufficient deliverability to produce any appreciable amount of gas at that pressure, so it was never connected.

Q What kind of a gas-oil ratio did that well have when it was originally completed?

A As a Eumont gas well?

Q The No. 41, yes, sir.

Q It never did make oil except the frac oil. I think that it had a calculated open flow potential somewhere around 300 MCF a day on initial completion.

Q But it didn't produce liquids?

A No. It might have produced frac oil some, but it doesn't produce liquids, to my knowledge.

Q Now, these wells which are on your acreage in the east half of Sections 13 and 24, and are classified as Skaggs Wells, are all of these wells open in the Penrose sand?

A All of them are open and have at least a portion of the lower Penrose open. However, again, I would like to say that al-

though it's open, I don't consider it to be productive. At one time we were considering additional gas development in this area. As you know, this is Federal acreage, and the Government presses for development of all possible acreage, so we were looking for gas development in Section 19. Now, we made a study at that time; I would like to show you here.

MR. KELLAHIN: Do you want to mark that an Exhibit?

A I could offer it as an Exhibit.

MR. KELLAHIN: Would you like to have this marked as an Exhibit?

MR. NUTTER: It depends on what it is.

MR. KELLAHIN: It's a structural plat of the area.

A This is a sample log taken on wells shown on that plat, and you will note that the Penrose, as you go to the east, becomes progressively shaly and anhydritic. I think there's a permeability and porositypinchout occurring at about the area shown on the map.

MR. MORRIS: Could we have this marked as an Exhibit at this time?

(Whereupon, Continental's Exhibit No. 4 was marked for identification)

Q (By Mr. Nutter) That is a contour map on the top of the Queen, is that correct?

A Yes, sir.

Q And you have contoured the top of the Yates on Exhibit No. 1, is that correct?

A Yes.

Q And it's your testimony that the Queen sand pinches out along the dark line that runs north-south across Exhibit 4?

A The Penrose member of the Queen sand.

Q Are there any gas wells located in this general vicinity which are east of the mid line of Sections 13 and 24, with the exception of your No. 41?

A Not in the immediate area.

Q Are there any gas units to the east of the north-south mid line of Sections 13 and 24; gas proration units?

A Not in the immediate area. However, as you go south, the pool swings and does continue to the east.

MR. NUTTER: Are there any further questions of Mr. Mc Williams? He may be excused.

(Witness excused)

MR. KELLAHIN: Do you want the sample log as an Exhibit, too, Mr. Nutter?

MR. NUTTER: I don't think I need this one, Mr. Kellahin.

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. McWilliams, was Exhibit No. 4 prepared by you or under your supervision?

A No, sir.

Q Have you examined the information contained on Exhibit No. 4?

A Yes, sir.

Q In your opinion, does it accurately reflect the information depicted thereon?

A Yes, sir.

MR. KELLAHIN: At this time we would like to offer in evidence Exhibit No. 4.

MR. NUTTER: Is this a map that was prepared by geologists of Continental Oil Company, or who was it prepared by?

A I believe it was prepared by an engineer in our Roswell office.

MR. NUTTER: In the employ of Continental, though?

A Yes, sir.

MR. NUTTER: Exhibit No. 4 will be admitted in evidence.

(Whereupon, Continental's Exhibit No. 4 was received in evidence)

MR. NUTTER: Do you have anything further, Mr. Kellahin?

MR. KELLAHIN: That's all I have.

MR. NUTTER: Does anyone have anything they wish to offer in Case 2261? We will take the case under advisement.

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

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

WITNESS my Hand and Seal this, the 5th day of May, 1961, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

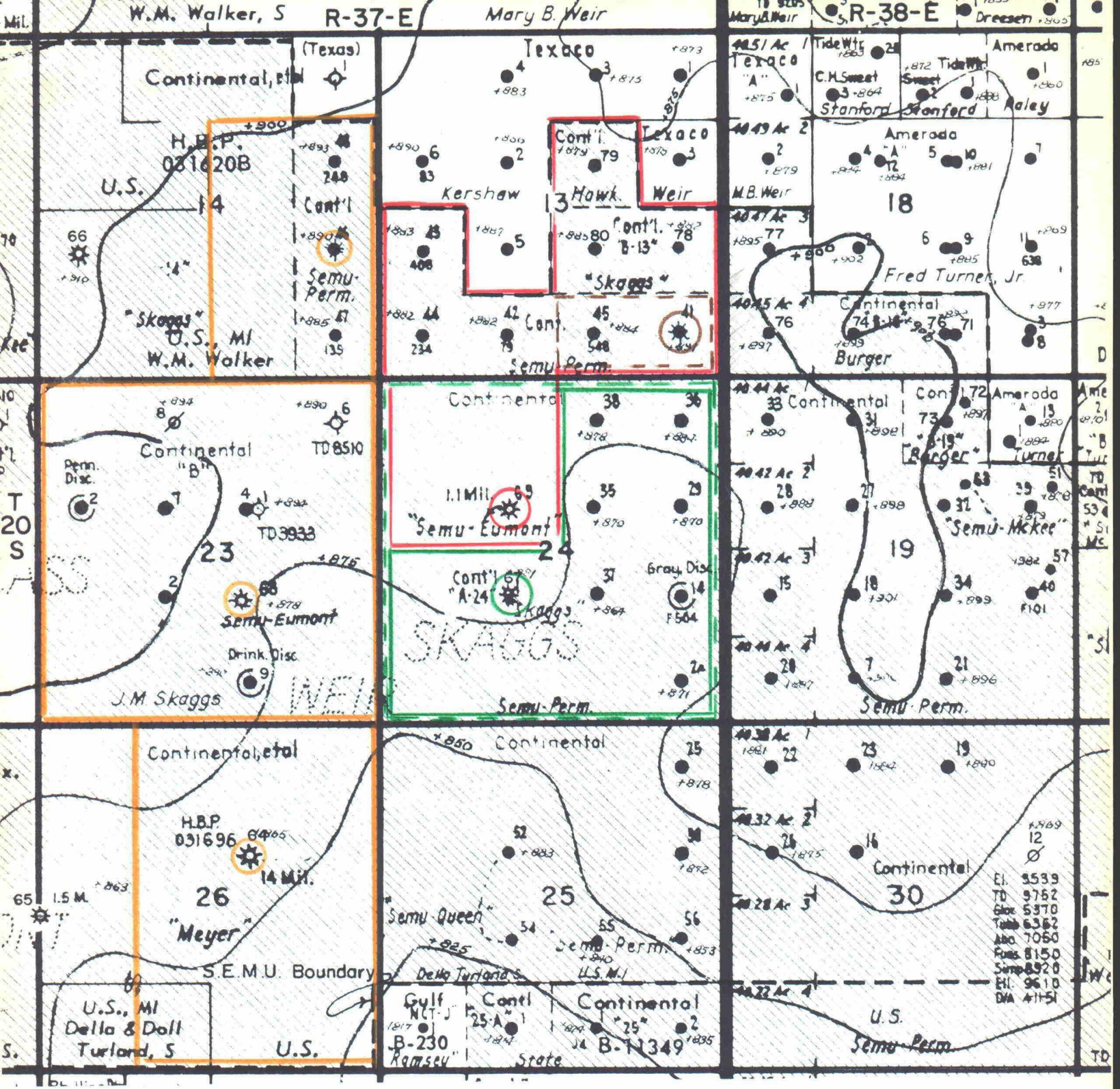
Ada Dearnley
NOTARY PUBLIC

My Commission expires:

June 19, 1963

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2261, heard by me on 5-4, 1961.

....., Examiner
New Mexico Oil Conservation Commission



STRUCTURE MAP - EUMONT AREA

Contoured On Top Of Yates

Contour Int: 25' Scale: 1"=2000'

LEGEND

Existing Gas Wells No's. 67 ○ 69 ○ 41 ○

Existing Gas Unit for Wells 67 & 69 ----41----

Proposed Gas Unit for 67 ——— 69 ———

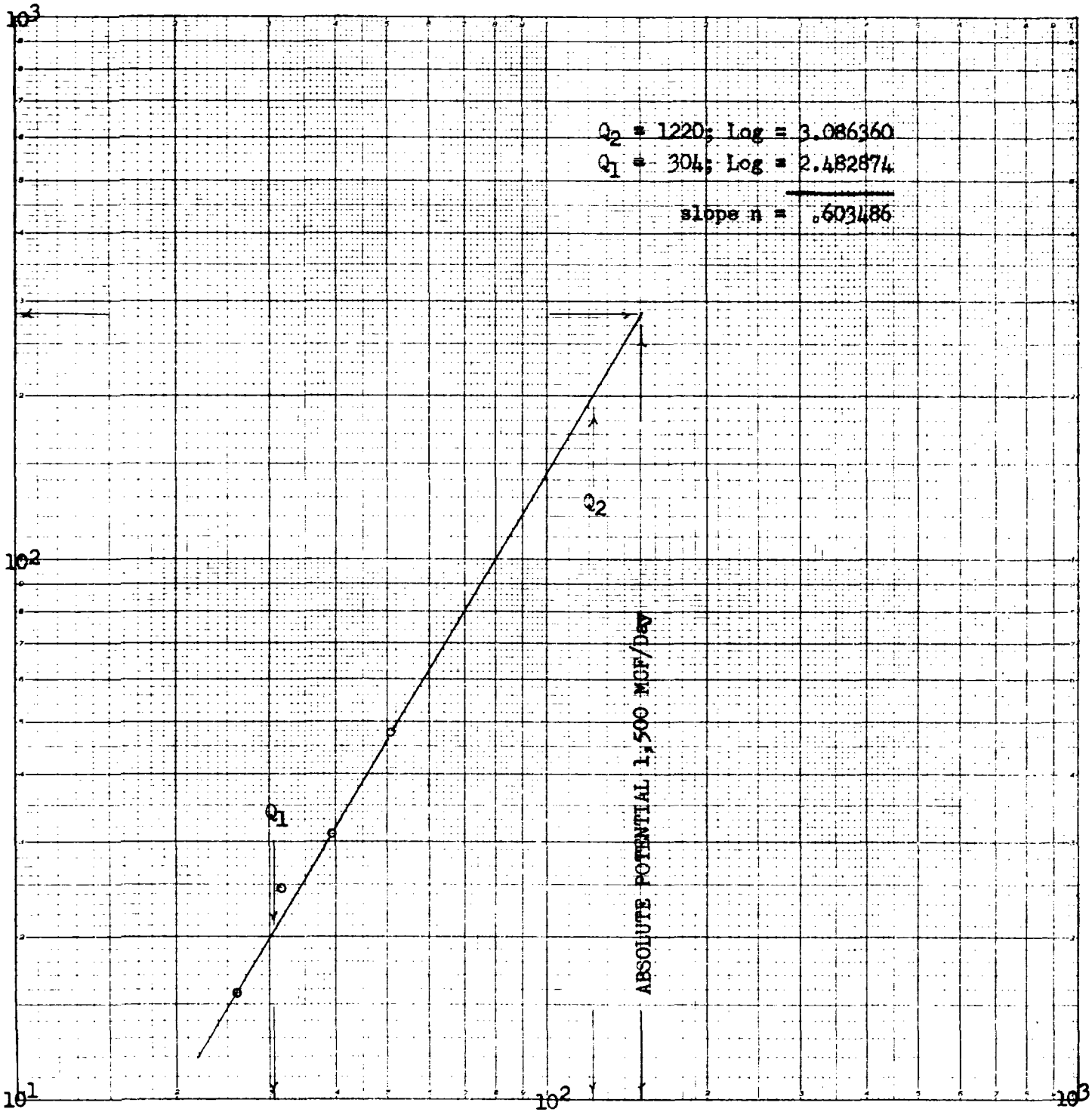
Offset Gas Wells ○ Offset Gas Units ———

Continental Oil Co.

March 20th, '61.

EXHIBIT I

COMPANY	Continental Oil Co.
WELL	SEMU-Eumont No.67
LOCATION	K Sec. 24-20S-37E
COUNTY	Lea
DATE	1-27-61



MCFD - 15.025 psia.

NEW MEXICO OIL CONSERVATION COMMISSION

Form C-122
Revised 12-1-55

MULTI-POINT BACK PRESSURE TEST FOR GAS WELLS

Pool Eumont Formation Queen County Lea

Initial ____ Annual ____ Special X Date of Test 1-27-61

Company Continental Oil Company Lease SEMU Eumont Well No. 67

Unit K Sec. 24 Twp. 20S Rge. 37E Purchaser E.P.N.G.

Casing 5 1/2 Wt. 14 I.D. 5.012 Set at 3900 Perf. 3608 To 3736

Tubing 2 Wt. 4.7 I.D. 1.995 Set at 3610 Perf. - To -

Gas Pay: From 3608 To 3736 L 3608 xG .671 -GL 2421 Bar.Press. 13.2

Producing Thru: Casing ____ Tubing X Type Well Single
Single-Bradenhead-G. G. or G.O. Dual

Date of Completion: 5-31-57 Packer None Reservoir Temp. 90°

OBSERVED DATA

Tested Through ~~(Prover)~~X~~(Choke)~~X(Meter) Type Taps Flange

No.	Flow Data (Line) Size	(Orifice) Size	Press. psig	Diff. h_w	Temp. °F.	Tubing Data Press. psig	Tubing Data Temp. °F.	Casing Data Press. psig	Casing Data Temp. °F.	Duration of Flow Hr.
SI						519		519		72
1.	4	.750	203	27.04	42	430		504		24
2.	4	.750	212	39.69	52	435		495		24
3.	4	.750	291	44.89	52	439		489		24
4.	4	.750	270	79.21	53	433		472		24
5.										

FLOW CALCULATIONS

No.	Coefficient (24-Hour)	$\sqrt{h_w p_f}$	Pressure psia	Flow Temp. Factor F_t	Gravity Factor F_g	Compress. Factor F_{pv}	Rate of Flow Q-MCFPD @ 15.025 psia
1.	3.435	76.46	216.2	1.0176	.9427	1.024	258.0
2.	3.435	94.54	225.2	1.0078	.9427	1.025	316.2
3.	3.435	116.86	304.2	1.0078	.9427	1.033	393.9
4.	3.435	149.77	283.2	1.0068	.9427	1.030	502.9
5.							

PRESSURE CALCULATIONS

Gas Liquid Hydrocarbon Ratio - cf/bbl. Specific Gravity Separator Gas -

Gravity of Liquid Hydrocarbons - deg. Specific Gravity Flowing Fluid -

P_c 3.936 $(1-e^{-s})$ 0.153 P_c 532.2 P_c^2 283.2

No.	P_w ~~P_c~~ (psia)	P_t^2	F_cQ	$(F_cQ)^2$	$(F_cQ)^2$ $(1-e^{-s})$	P_w^2	$P_c^2-P_w^2$	Cal. P_w	$\frac{P_w}{P_c}$
1.	517.2					267.5	15.7		.97*
2.	508.2					258.3	24.9		.95
3.	502.2	- - - -	-CALCULATED- - -			252.2	31.0		.94
4.	485.2					235.4	47.8		.91
5.									

Absolute Potential: 1,500 MCFPD; n .803

COMPANY Continental Oil Company

ADDRESS Box 427, Hobbs, New Mexico

AGENT and TITLE W. D. Howard, Test Engineer

WITNESSED E. B. Murray

COMPANY El Paso Natural Gas Company

REMARKS

*Insufficient drawdown due to tendency to freeze off at chokes.

cc: NMOCC (2) [illegible] (4) Well File

INSTRUCTIONS

This form is to be used for reporting multi-point back pressure tests on gas wells in the State, except those on which special orders are applicable. Three copies of this form and the back pressure curve shall be filed with the Commission at Box 871, Santa Fe.

The log log paper used for plotting the back pressure curve shall be of at least three inch cycles.

NOMENCLATURE

Q = Actual rate of flow at end of flow period at W. H. working pressure (P_w). MCF/da. @ 15.025 psia and 60° F.

P_c = 72 hour wellhead shut-in casing (or tubing) pressure whichever is greater. psia

P_w = Static wellhead working pressure as determined at the end of flow period. (Casing if flowing thru tubing, tubing if flowing thru casing.) psia

P_t = Flowing wellhead pressure (tubing if flowing through tubing, casing if flowing through casing.) psia

P_f = Meter pressure, psia.

h_w = Differential meter pressure, inches water.

F_g = Gravity correction factor.

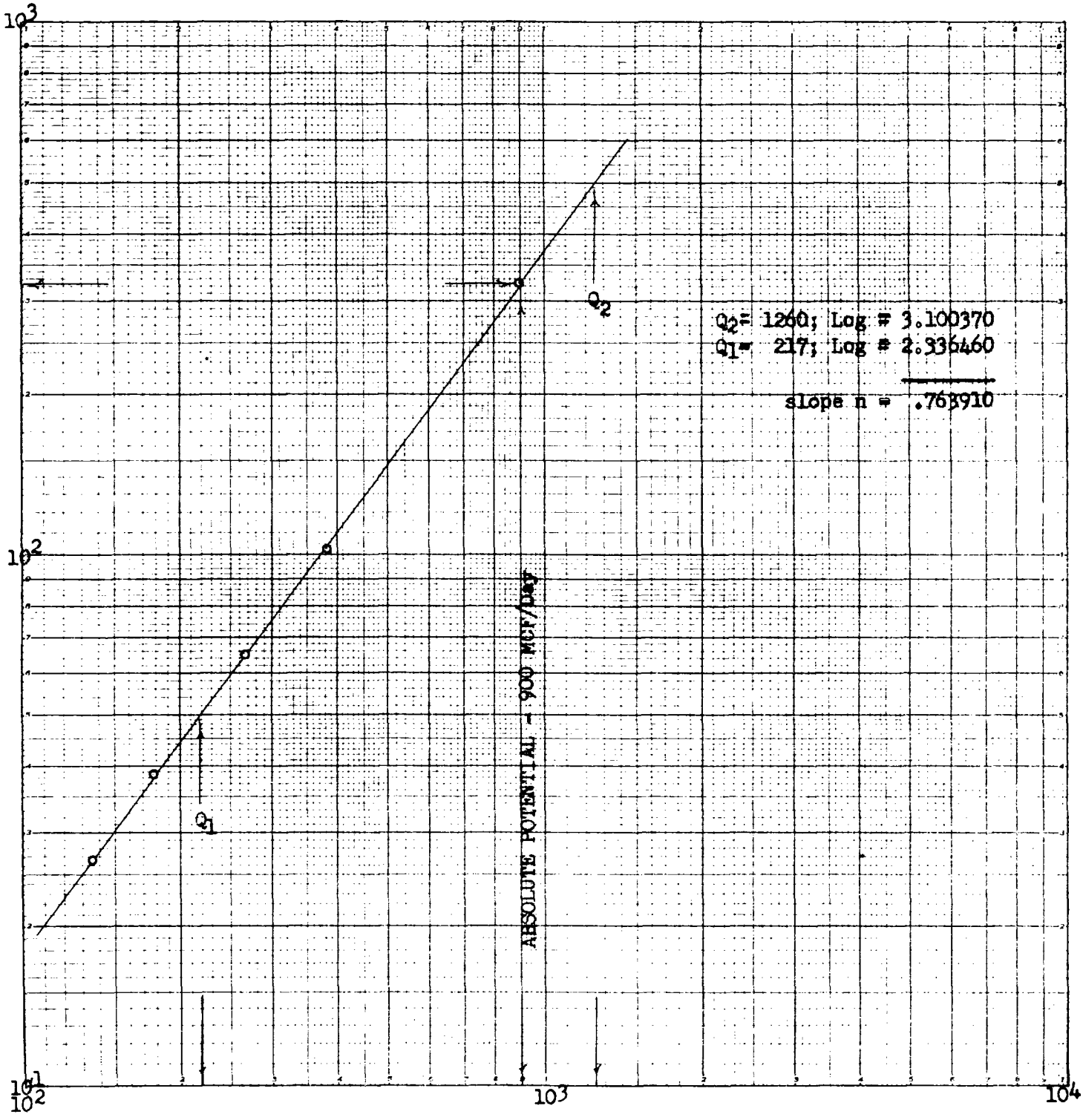
F_t = Flowing temperature correction factor.

F_{pv} = Supercompressability factor.

n = Slope of back pressure curve.

Note: If P_w cannot be taken because of manner of completion or condition of well, then P_w must be calculated by adding the pressure drop due to friction within the flow string to P_t.

COMPANY	Continental Oil Co.
WELL	SEMU-Eumont No.69
LOCATION	F Sec. 24-20S-37E
COUNTY	Lea
DATE	1-20-61



MCFD - 15.025 psia.

NEW MEXICO OIL CONSERVATION COMMISSION

Form C-122
Revised 12-1-55

MULTI-POINT BACK PRESSURE TEST FOR GAS WELLS

Pool Eumont Formation Queen County Lea

Initial ____ Annual ____ Special X Date of Test 1-20-61

Company Continental Oil Company Lease [illegible] Eumont Well No. 69

Unit F Sec. 24 Twp. 20S Rge. 37E Purchaser E.P.N.G.

Casing 5 1/2 Wt. 14.0 I.D. 5.012 Set at 3949 Perf. ____ To ____

Tubing 2 Wt. 4.7 I.D. 1.995 Set at 3615 Perf. ____ To ____

Gas Pay: From 3620 To 3747 L 3615 xG .674 -GL 2436 Bar.Press. 13.2

Producing Thru: Casing ____ Tubing X Type Well Single

Date of Completion: 6-11-59 Packer None Single-Bradenhead-G. G. or G.O. Dual Reservoir Temp. 90°

OBSERVED DATA

Tested Through ~~(Prover)~~ ~~(Choke)~~ (Meter) Type Taps Flange

No.	~~(Prover)~~ (Line) Size	~~(Choke)~~ (Orifice) Size	Flow Data Press. psig	Flow Data Diff. h_w	Flow Data Temp. °F.	Tubing Data Press. psig	Tubing Data Temp. °F.	Casing Data Press. psig	Casing Data Temp. °F.	Duration of Flow Hr.
SI						553		553		72
1.	4	.750	200	8.41	85	496		529		24
2.	4	.750	220	15.32	94	496		518		24
3.	4	.750	257	24.01	72	496		492		24
4.	4	.750	235	54.02	69	419		453		24
5.										

FLOW CALCULATIONS

No.	Coefficient (24-Hour)	$\sqrt{h_w p_f}$	Pressure psia	Flow Temp. Factor F_t	Gravity Factor F_g	Compress. Factor F_{pv}	Rate of Flow Q-MCFPD @ 15.025 psia
1.	3.495	42.94	213.2	.9768	.9435	1.029	136.5
2.	3.495	55.73	233.2	.9688	.9435	1.020	178.4
3.	3.495	80.54	270.2	.9587	.9435	1.026	260.7
4.	3.495	115.79	248.2	.9715	.9435	1.025	383.3
5.							

PRESSURE CALCULATIONS

Gas Liquid Hydrocarbon Ratio ~ cf/bbl. Specific Gravity Separator Gas ~

Gravity of Liquid Hydrocarbons ~ deg. Specific Gravity Flowing Fluid ~

P_c 9.936 $(1-e^{-s})$ 0.152 P_c 566.2 P_c^2 320.6

No.	P_w or P_t (psia)	P_t^2	F_cQ	$(F_cQ)^2$	$(F_cQ)^2$ $(1-e^{-s})$	P_w^2	$P_c^2-P_w^2$	Cal. P_w	$\frac{P_w}{P_c}$
1.	509.2					294.8	26.6		.90
2.	449.2					282.2	38.4		.79
3.	449.2		——MEASURED——			255.2	65.4		.79
4.	432.2					247.3	103.3		.76
5.									

Absolute Potential: 900 MCFPD; n .766

COMPANY Continental Oil Company

ADDRESS Box 427, Hobbs, New Mexico

AGENT and TITLE W. D. Howard, Test Engineer

WITNESSED W. D. Murray

COMPANY El Paso Natural Gas Company

REMARKS

cc: [illegible] (2) NMOCC Hobbs (1) File

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The log log paper used for plotting the back pressure curve shall be of at least three inch cycles.

NOMENCLATURE

Q = Actual rate of flow at end of flow period at W. H. working pressure (P_w). MCF/da. @ 15.025 psia and 60° F.

P_c = 72 hour wellhead shut-in casing (or tubing) pressure whichever is greater. psia

P_w = Static wellhead working pressure as determined at the end of flow period. (Casing if flowing thru tubing, tubing if flowing thru casing.) psia

P_t = Flowing wellhead pressure (tubing if flowing through tubing, casing if flowing through casing.) psia

P_f = Meter pressure, psia.

h_w = Differential meter pressure, inches water.

F_g = Gravity correction factor.

F_t = Flowing temperature correction factor.

F_{pv} = Supercompressability factor.

n = Slope of back pressure curve.

Note: If P_w cannot be taken because of manner of completion or condition of well, then P_w must be calculated by adding the pressure drop due to friction within the flow string to P_t.