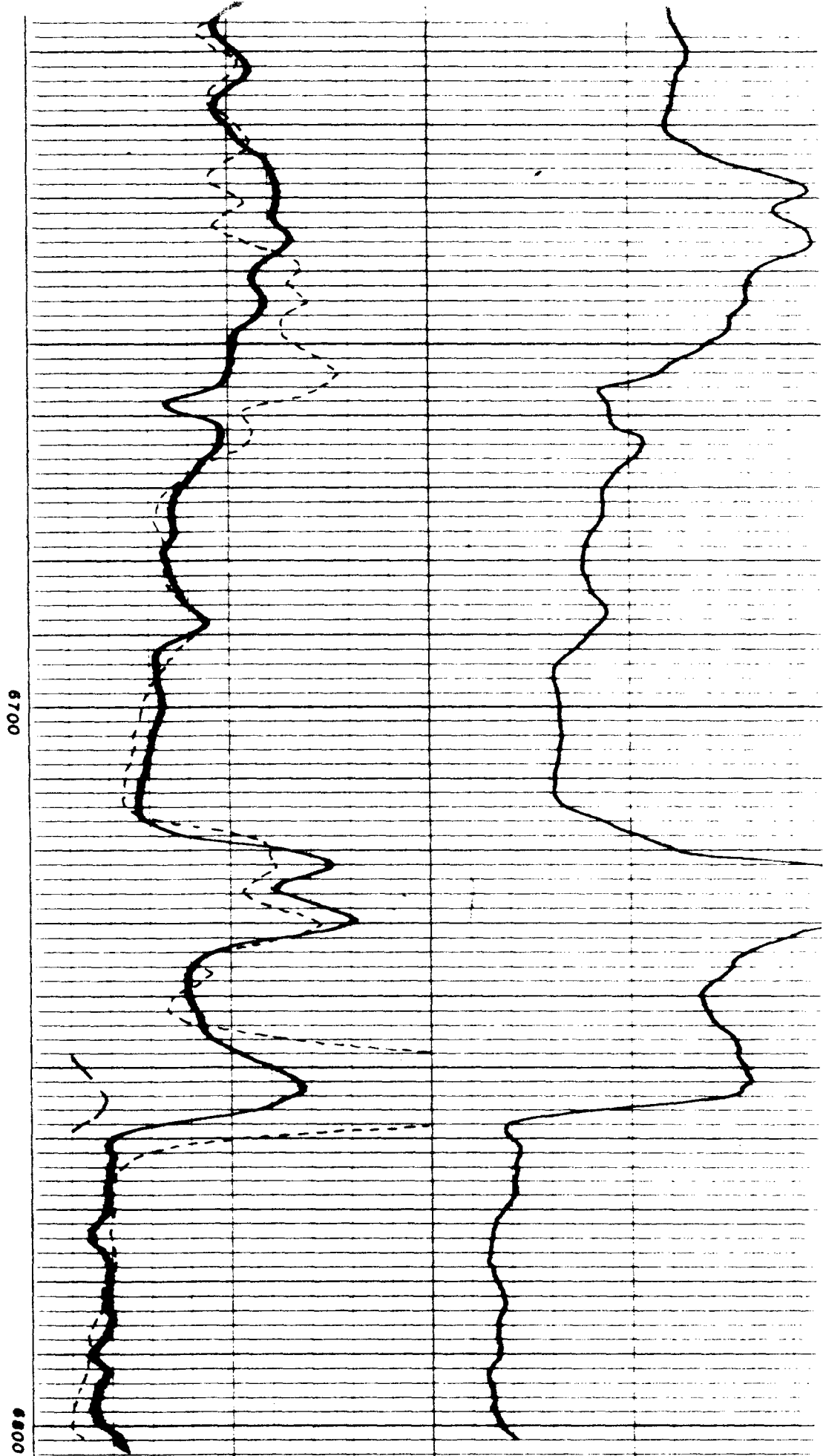
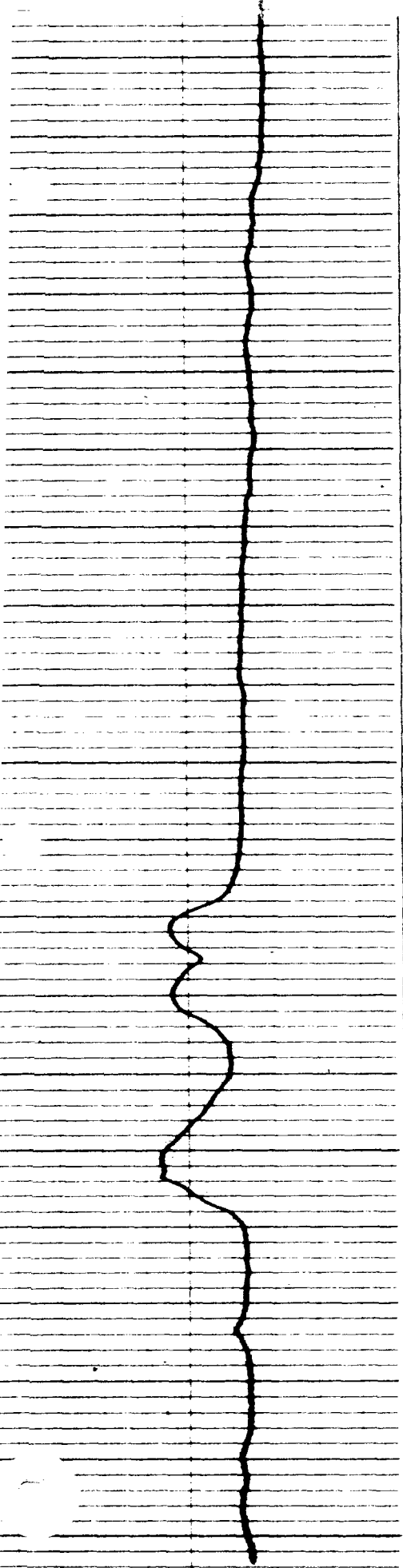


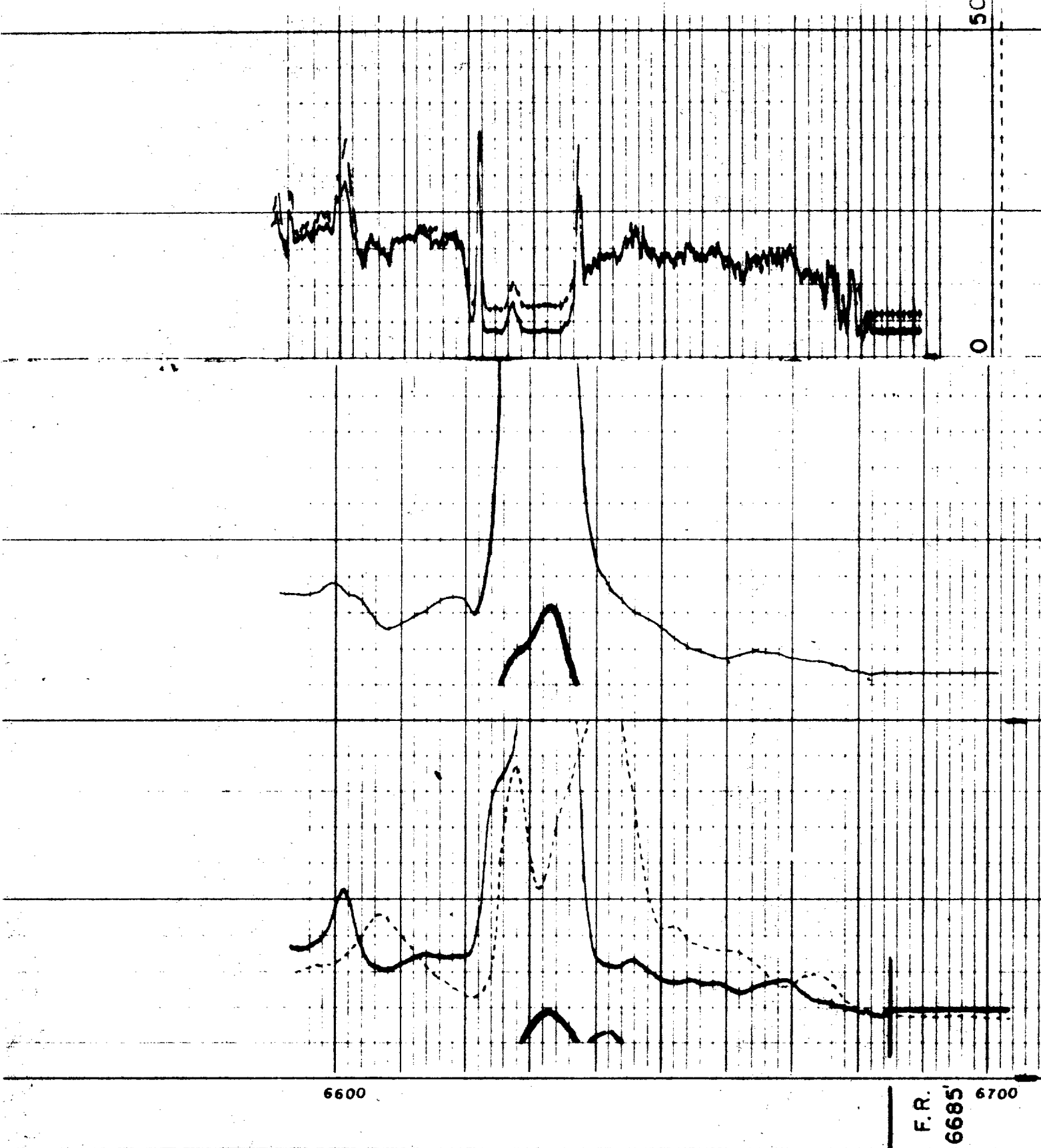
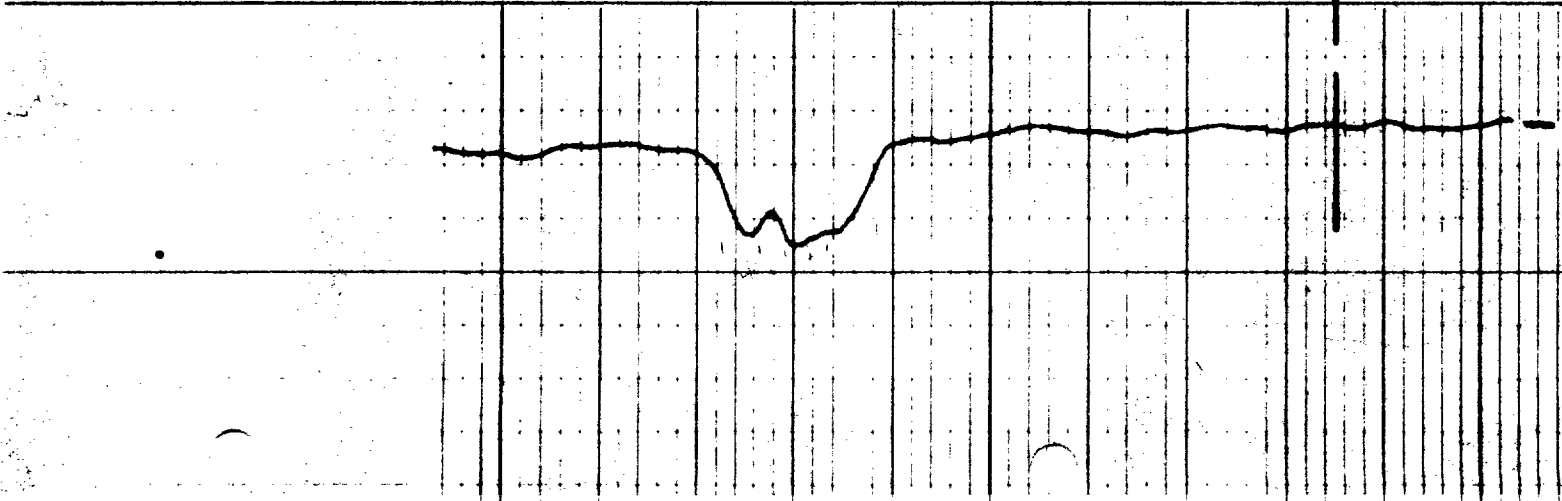
Lowry et al Operating Account

Schlumberger Electric Logs Surveys
and
Schlumberger Microlog Surveys
of
Tocito Sand

Pettigrew-Tocito Field
Rio Arriba County, N.M.



LOWRY ET AL
FEDERAL 1-134
LEV 6550 DF



6600

F.R.

6685

6700

U.S. W. DOSWELL
SCOTT - FEDERAL NO. 2 179
SEC 9 - 26N - 6W
RIO ARRIBA CO., N.M.

0099

6700

K 0.13 and
φ = 11.20/6

K 0.13 and
φ = 11.20/6

10
+ -

F.R.
6726

NORMAL

LONG NORMAL

MICROLOG

LATERAL

1000 C

10000

AM = 2"

ET AL

FEDERAL 4-13-132

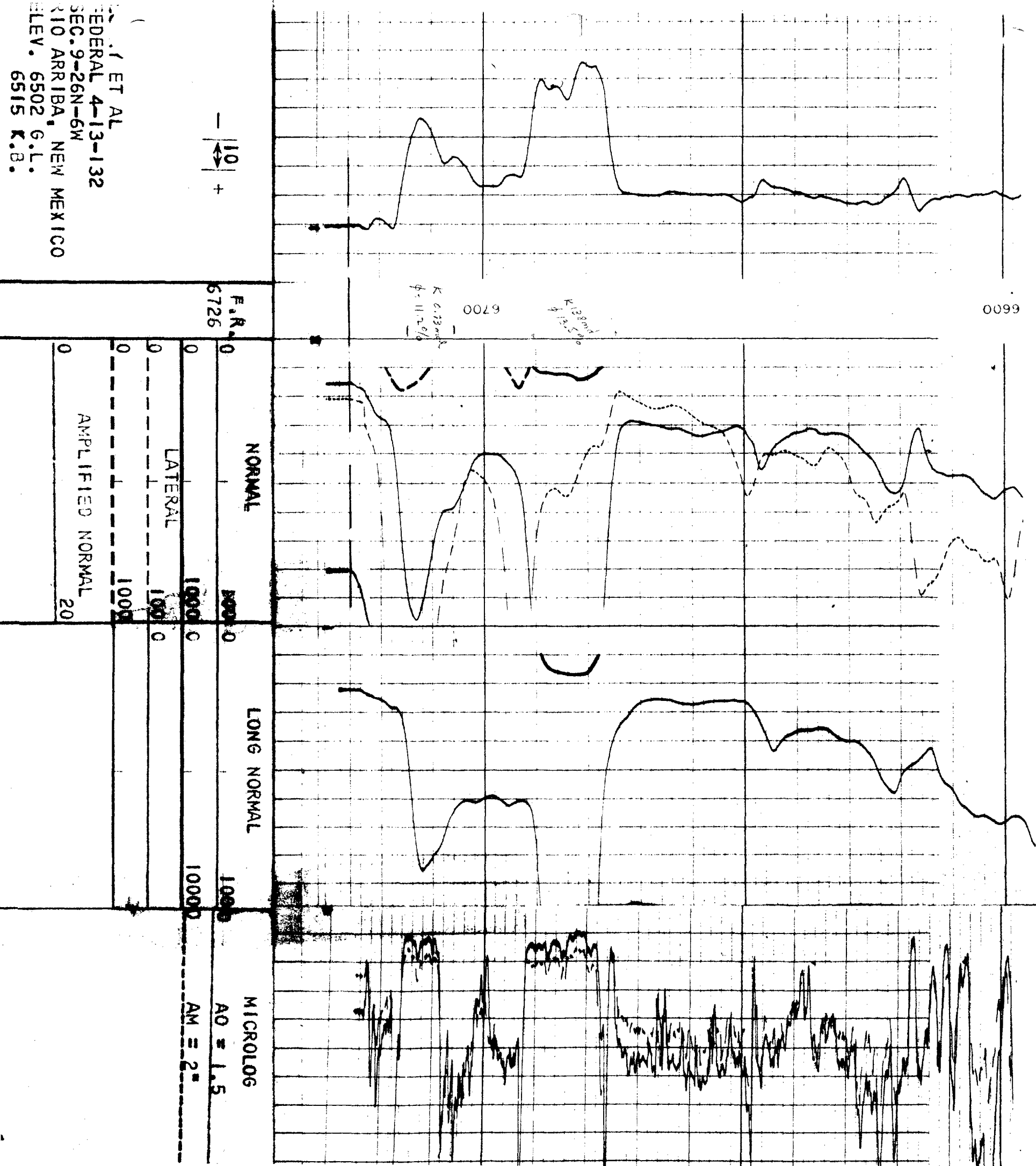
SEC. 9-26N-6W

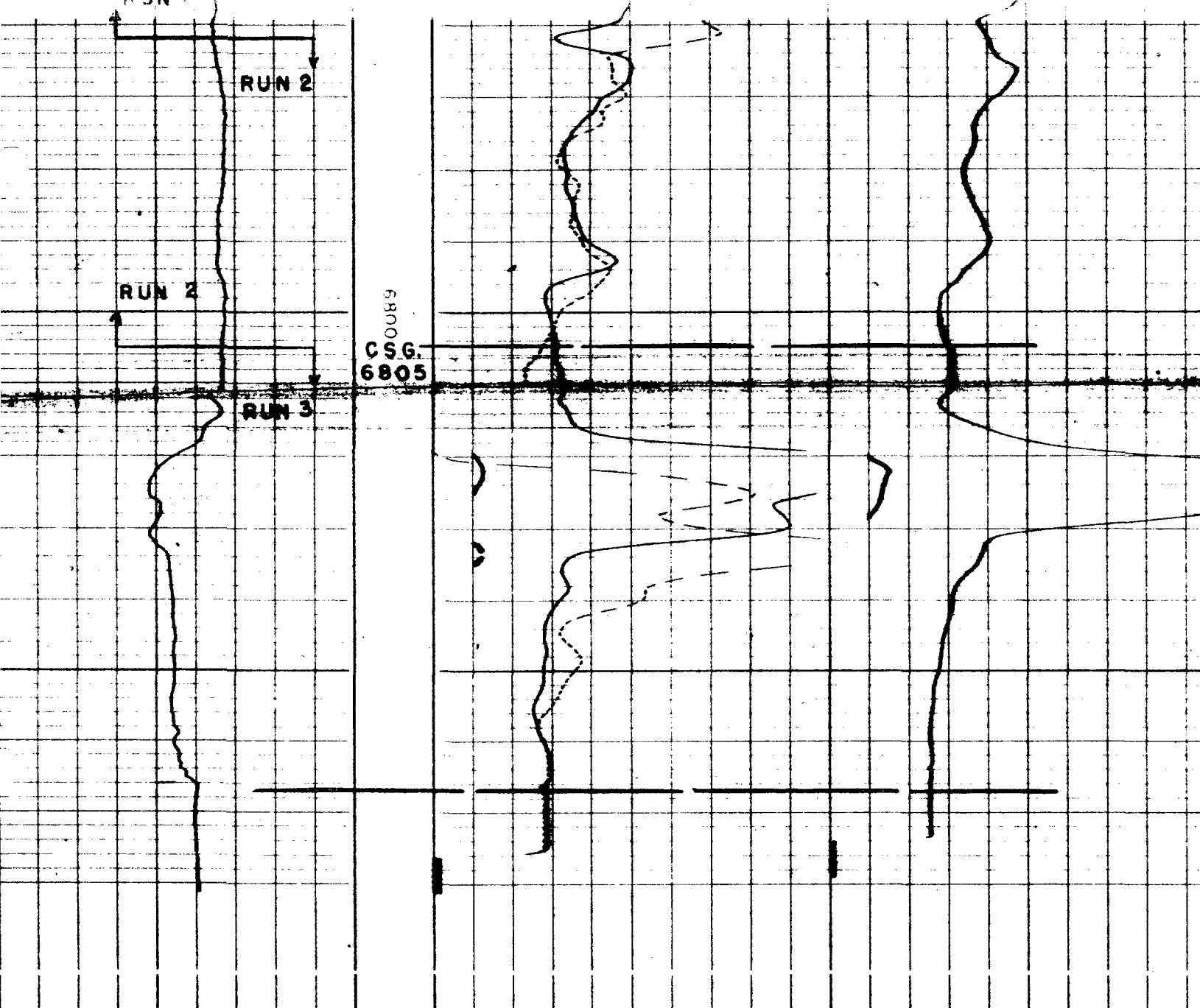
RIO ARRIBA, NEW MEXICO

ELEV. 6502 G.L.

6515 K.B.

AMPLIFIED NORMAL
20



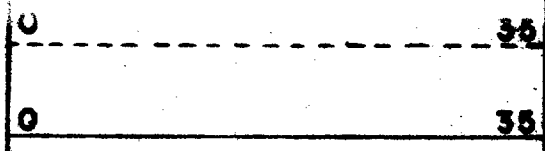


- 10 +

F.R.
6867

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0	LATERAL	100		
0		1000		
0	AMPLIFIED NORMAL	20		

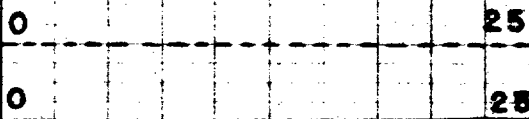
WRY ET AL
DERAL 19-34-157
C.10-26N-6W
O ARRIBA, NEW MEXICO



RUN 1

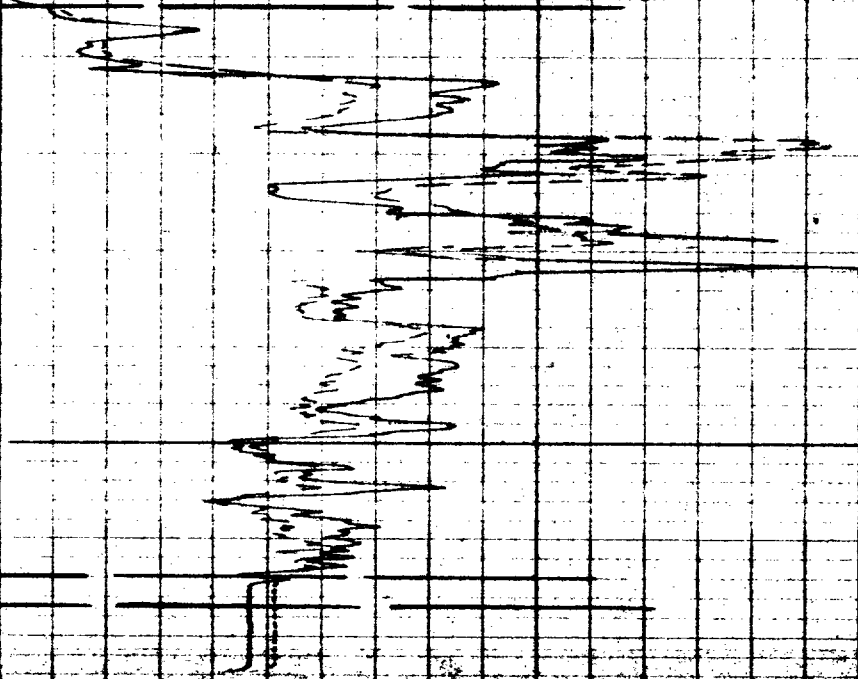


RUN 2



0089

CSG.
6805

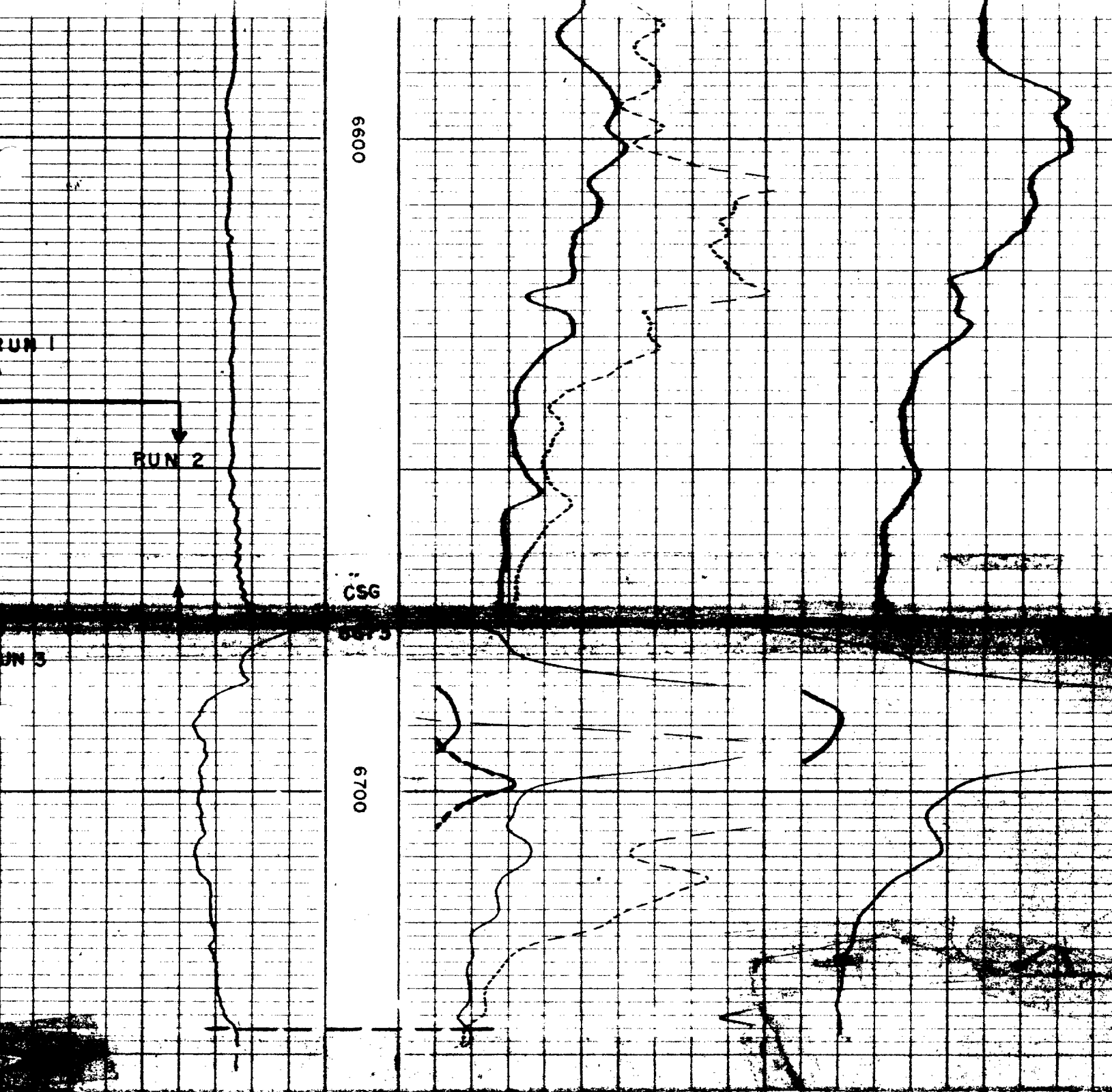


F.R.
6864

0 LATERAL 25

0 LONG NORMAL 25

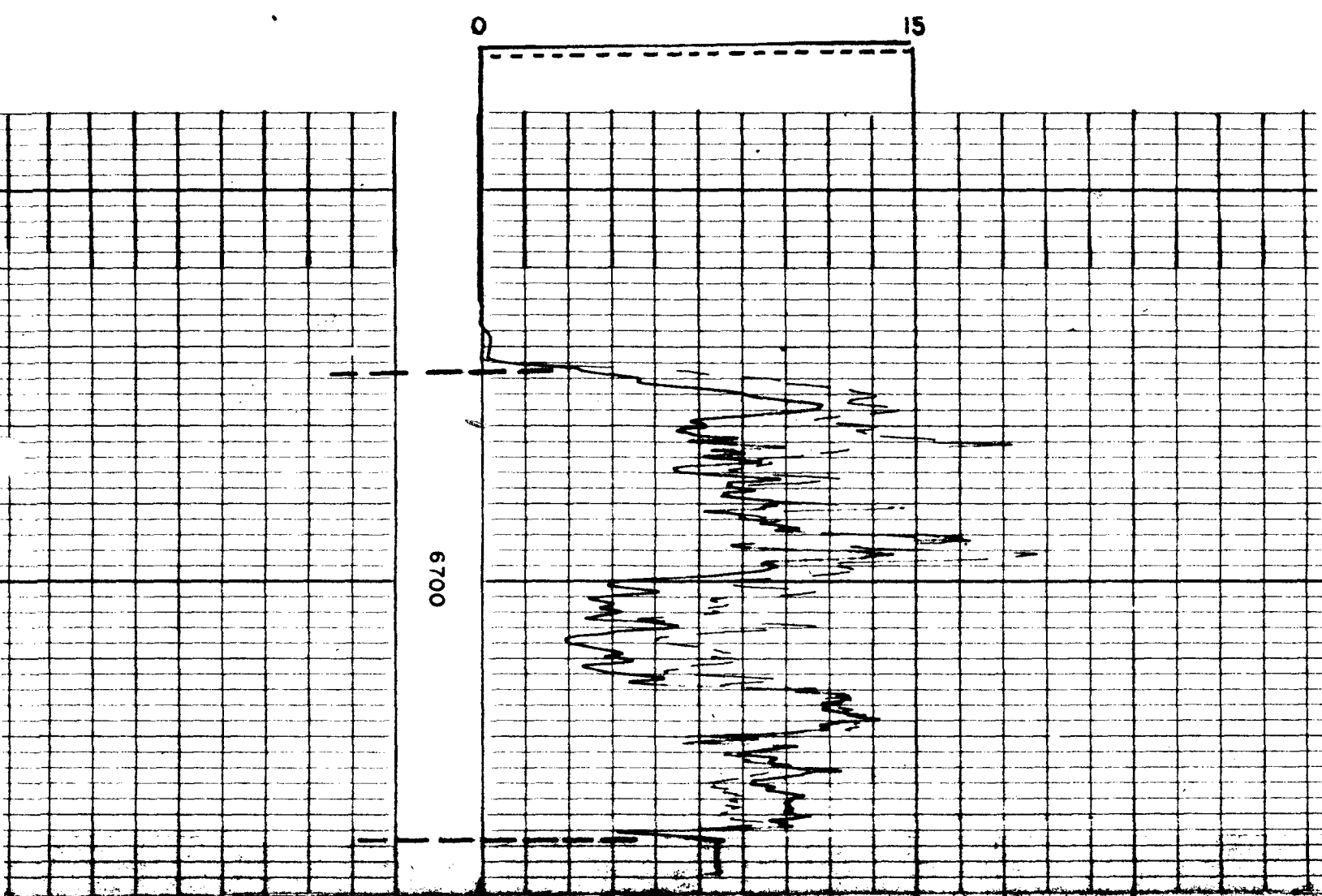
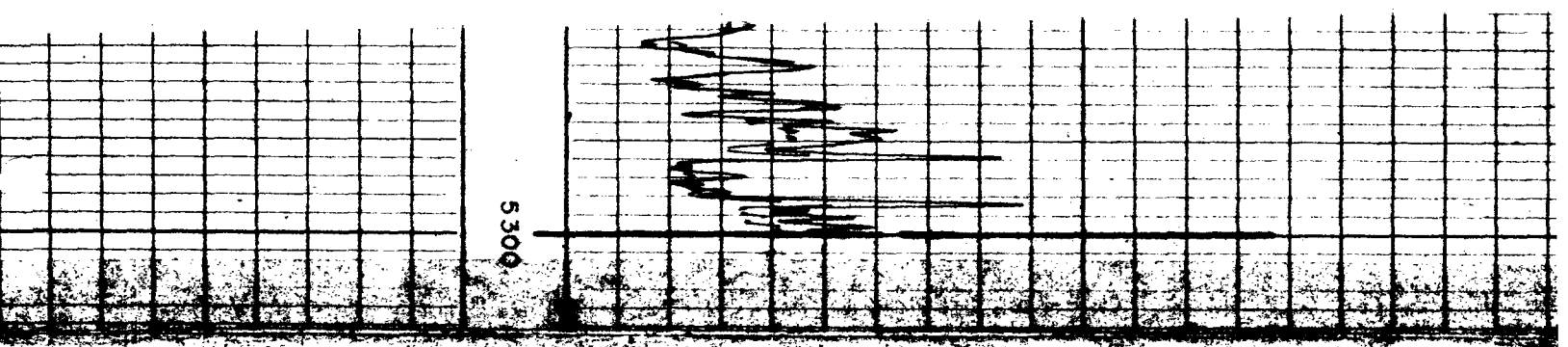
LOWRY ET AL
FEDERAL 19-34-157
SEC. 10-26N-6W
RIO ARriba COUNTY, NEW MEXICO
ELEV. 6628' 0"



F.R.
6736

0	NORMAL	100 0	LONG NORMAL	100
0		1000 0		1000
0	LATERAL	100		
0		1000		
0	AMPLIFIED NORMAL	20		

LOWRY ET AL
FEDERAL 7-35-109
SEC. 3-26N-6W
R10 ARRIBA, NEW MEXICO
1964



- | +

F.R.
6733

LATERAL

15

LONG NORMAL

15

WRY ET AL
FEDERAL 7-35-109
SEC. 3-26N-6W
RIO ARRIBA, NEW MEXICO
ELEV. 6484' G.L.

+

F.R.
6764

1000

LONG NORMAL

0000

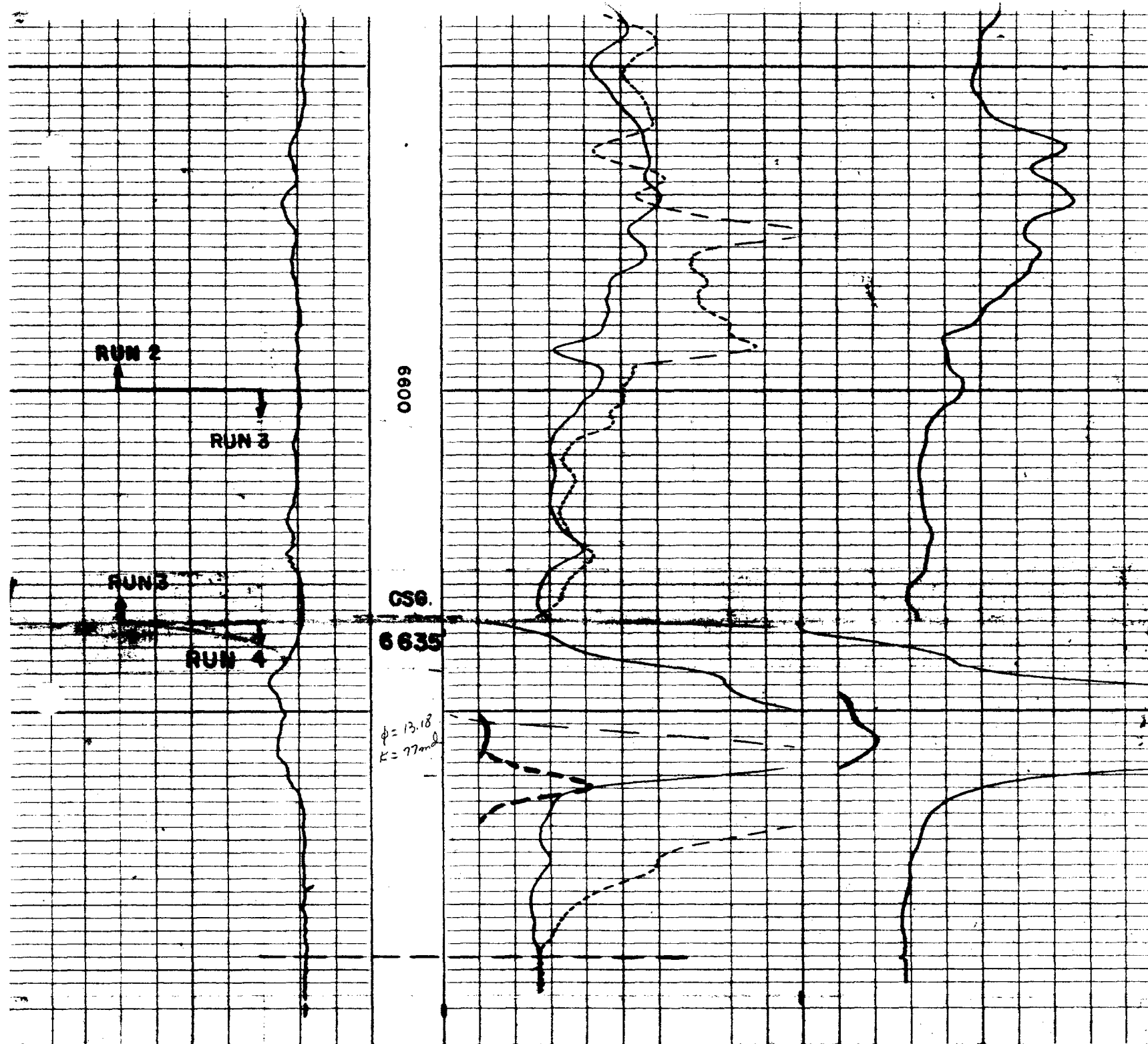
MICRO-DO
AO = 1.5"

LATERAL

100

AMPLIFIED NORMAL

$$AM = 2''$$
$$AO = 1.5''$$

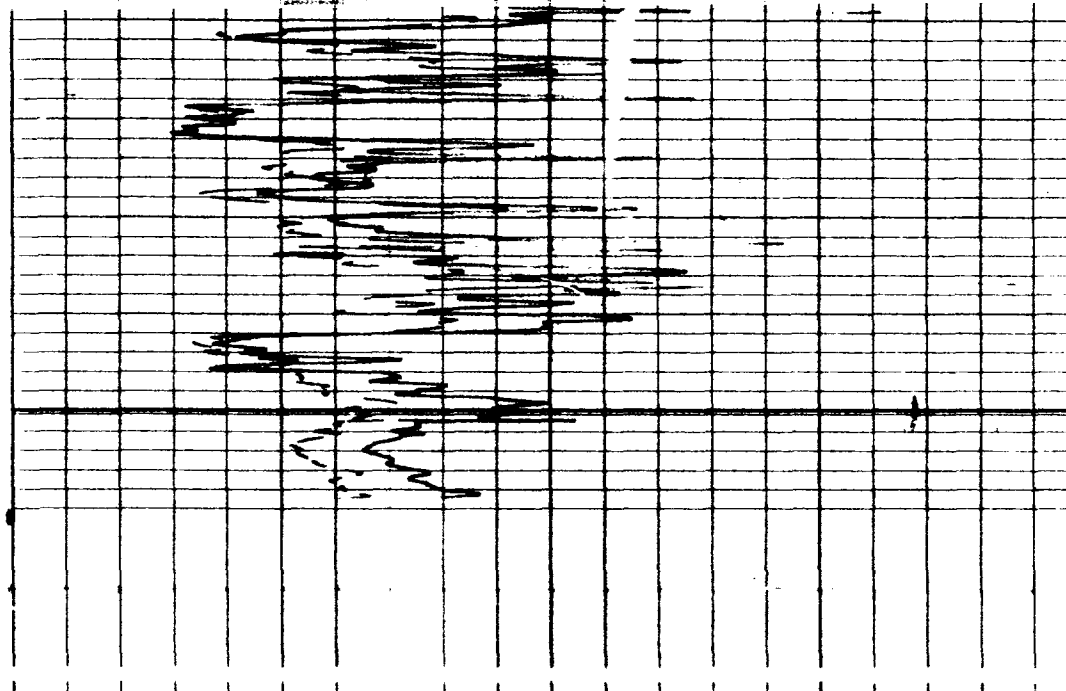
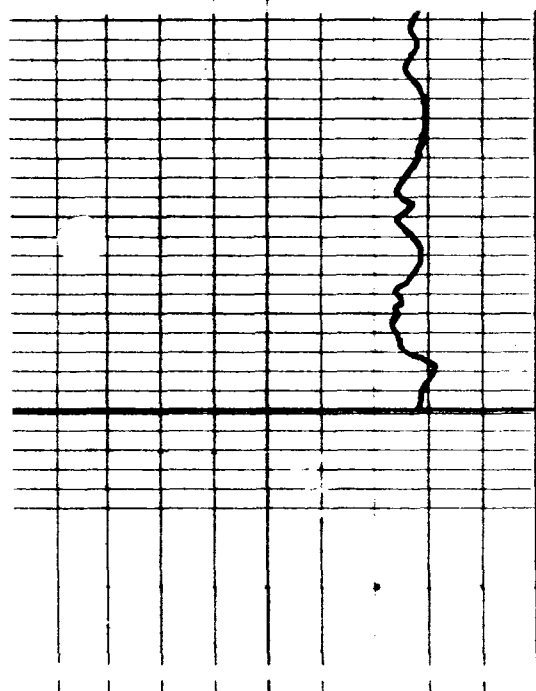


-10 +

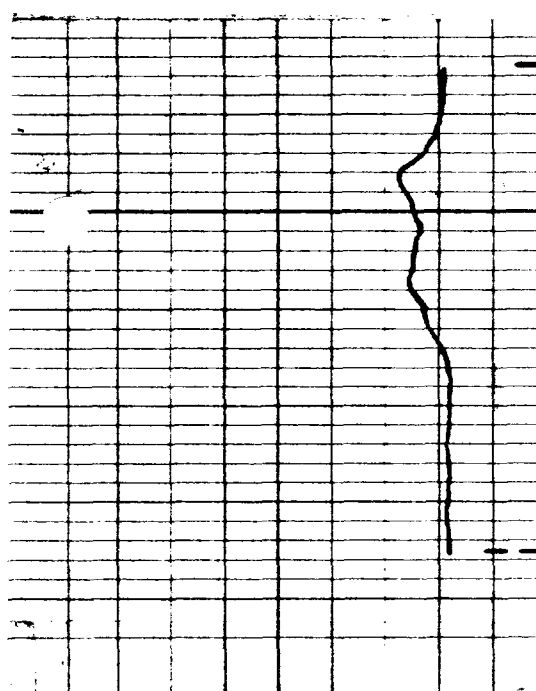
F.R.
6688

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0	LATERAL	100			
0		1000			
0	AMPLIFIED NORMAL	20			

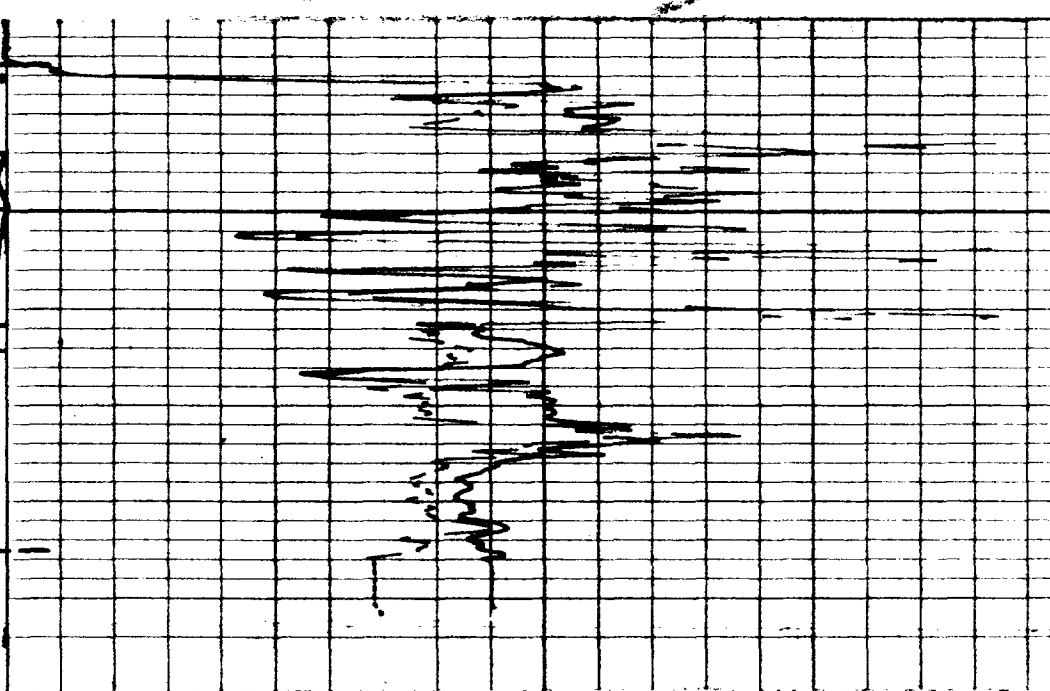
LOWRY ET AL
FEDERAL 22-45-207
SEC. 10-26N-6W
RIO ARRIBA, NEW MEXICO



RUN 2



CSG
6635



- 10 +

F.R.
6685

LATERAL
A0 = 1.5"

0

20

40

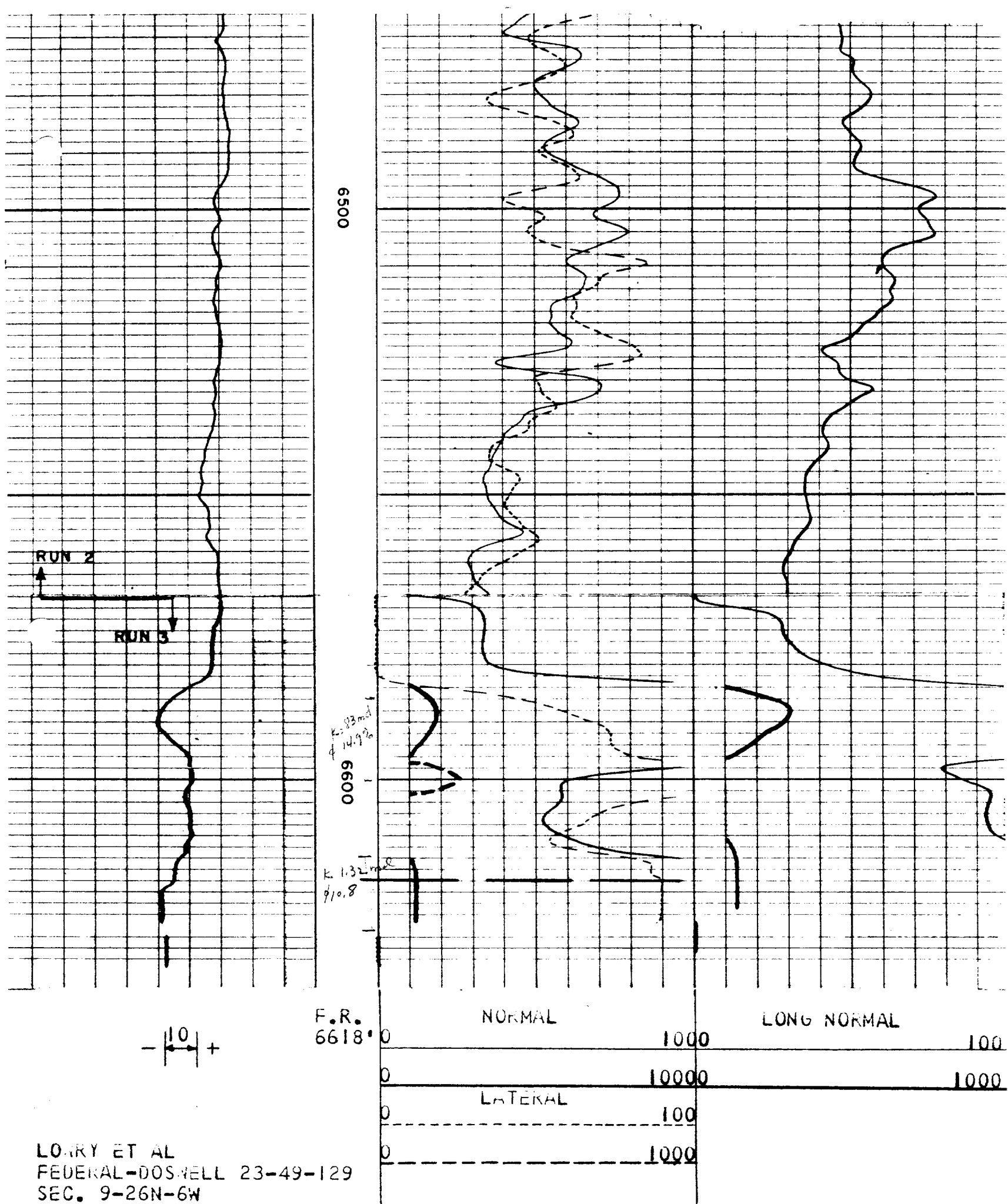
LONG NORMAL
AM = 2"

0

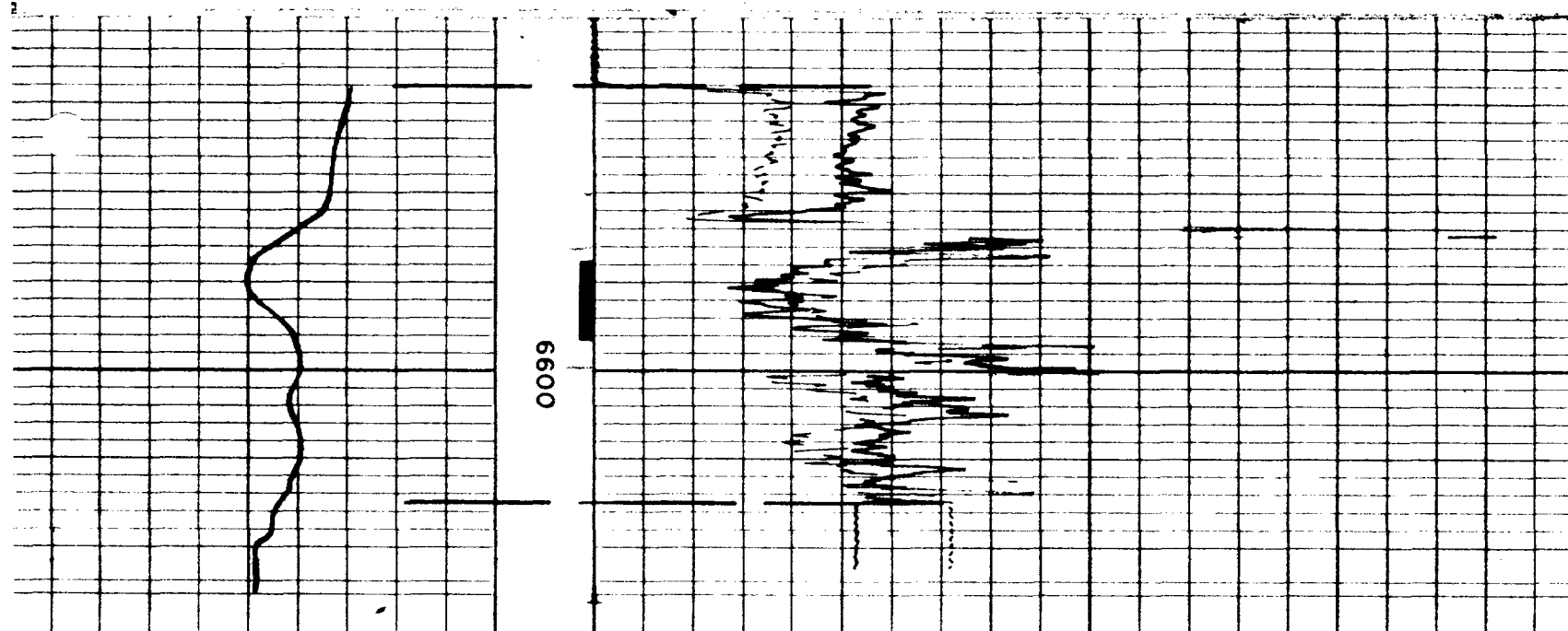
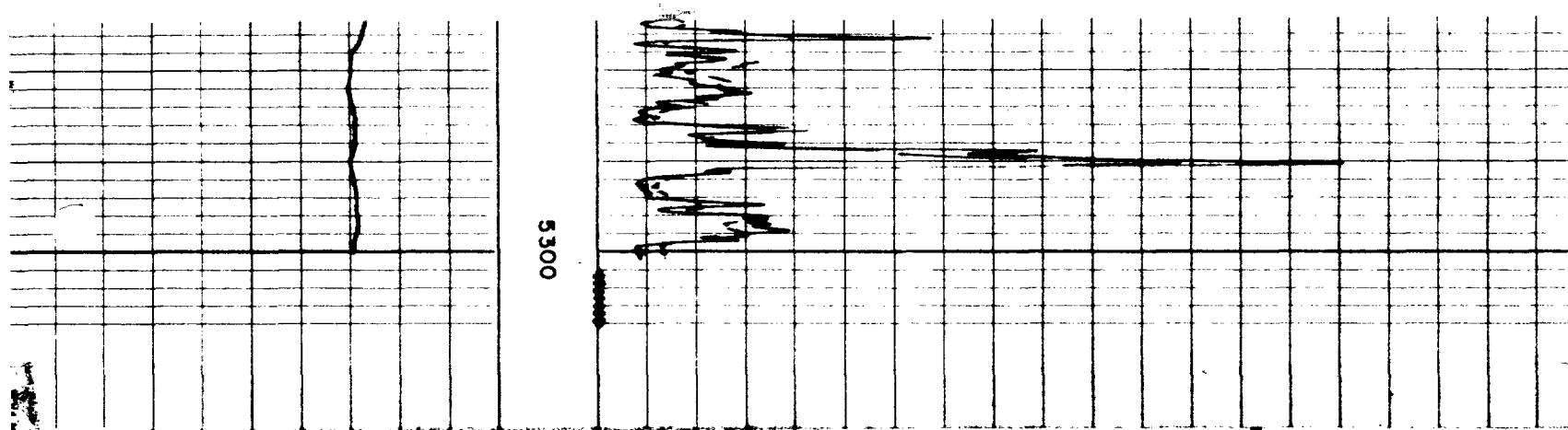
20

40

LOWRY ET AL
FEDERAL 22-45-207
SEC. 10-26N-6W
RIO ARRIBA, NEW MEXICO



LORRY ET AL
 FEDERAL-DOSWELL 23-49-129
 SEC. 9-26N-6W
 RIO ARRIBA, NEW MEXICO
 ELEV. 6413' G.L.

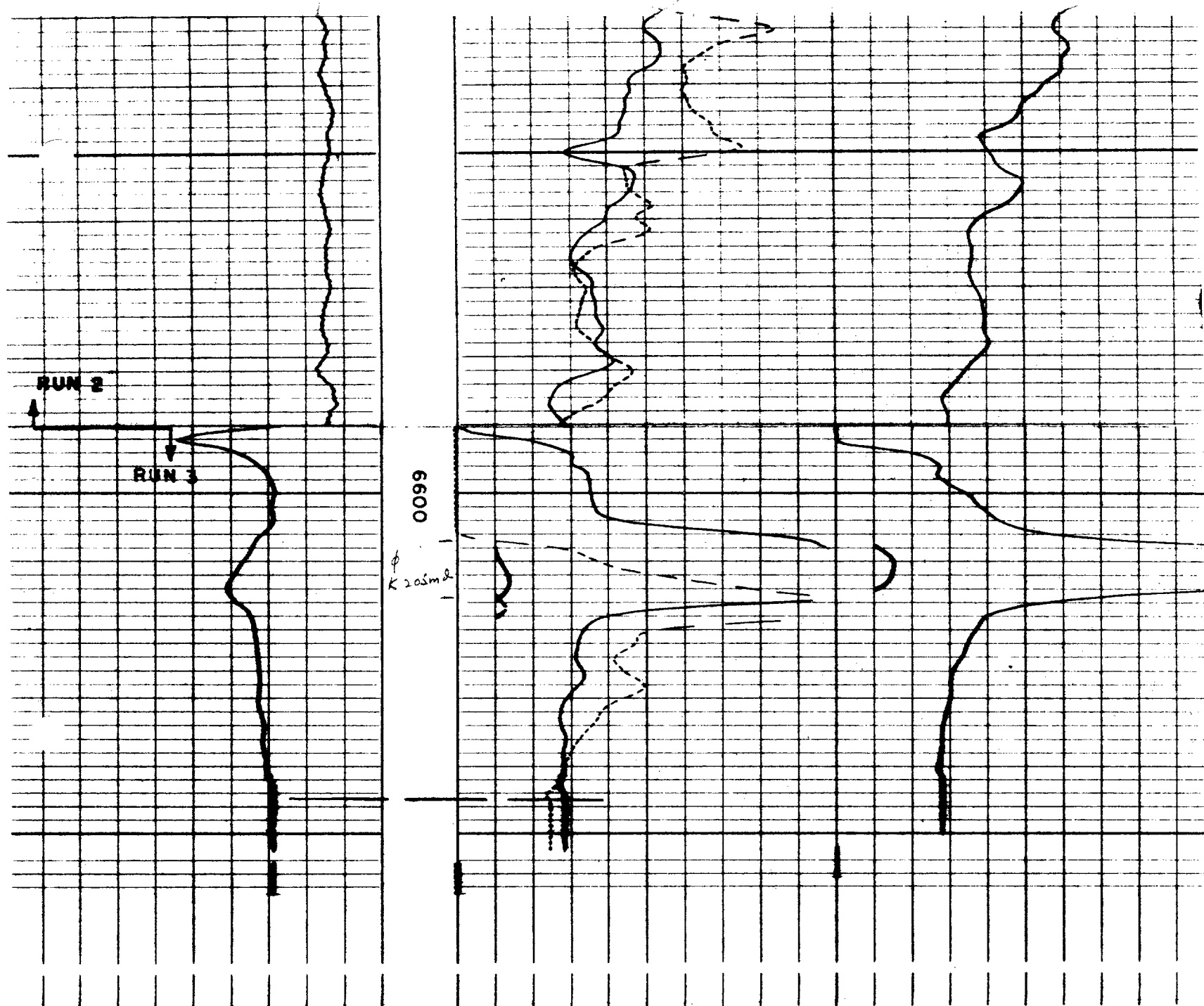


- 10 +

F.R.
6615'

LOWRY ET AL
FEDERAL-DOSWELL 23-49-129
S. 9-26N-6W
RIO ARRIBA, NEW MEXICO
ELEV. 6413' G.L.

LATERAL		
0	$AO = 1.5''$	100
LONG NORMAL		
0	$AM = 2''$	100

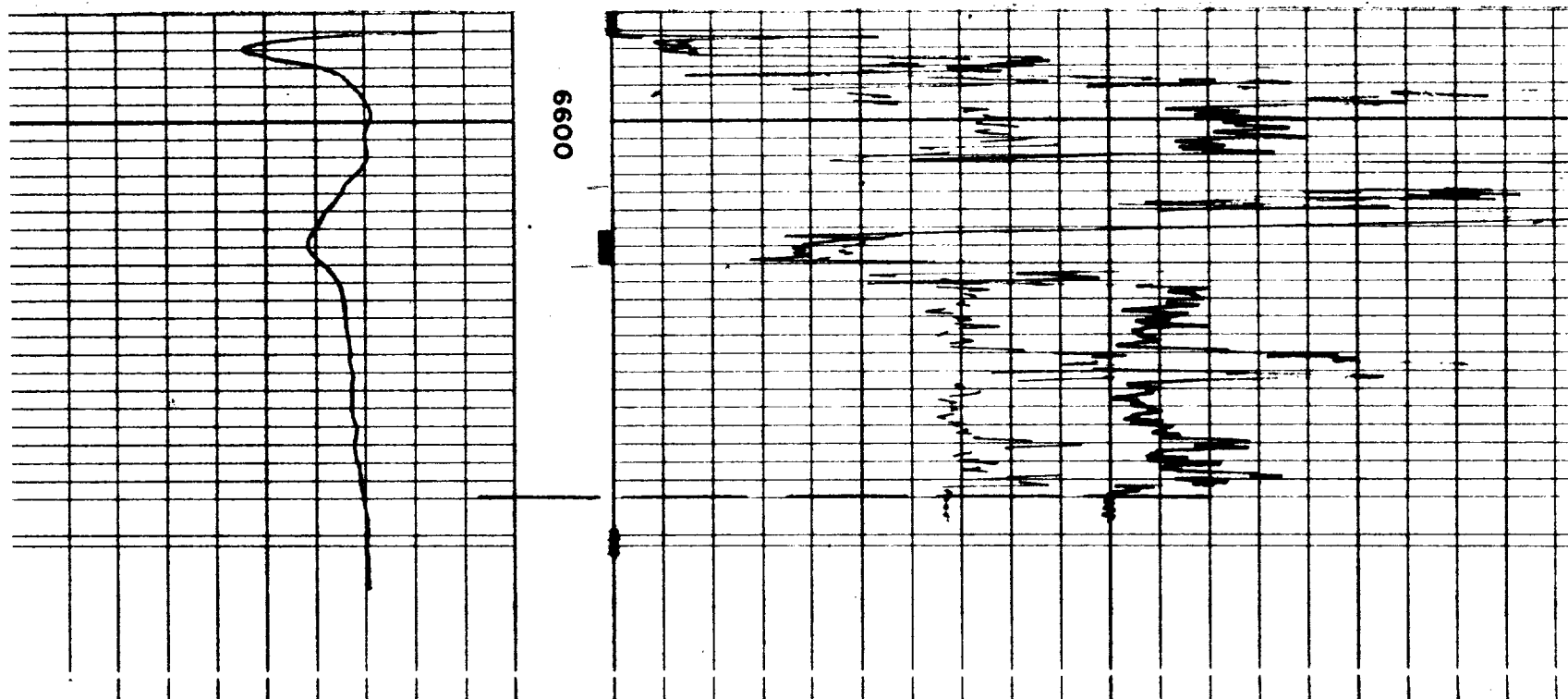


- 10 +

F.R.
6645

NORMAL		LONG NORMAL	
0	100	0	100
0	1000	0	1000
LATERAL			
0	100		
0	1000		

LOWRY ET AL
FEDERAL DOSWELL #24-50-177
SEC. 9-26N-6W
RIO ARRIBA, NEW MEXICO
ELEV. 6466' G.L.



- 10 +

F.R.
6645

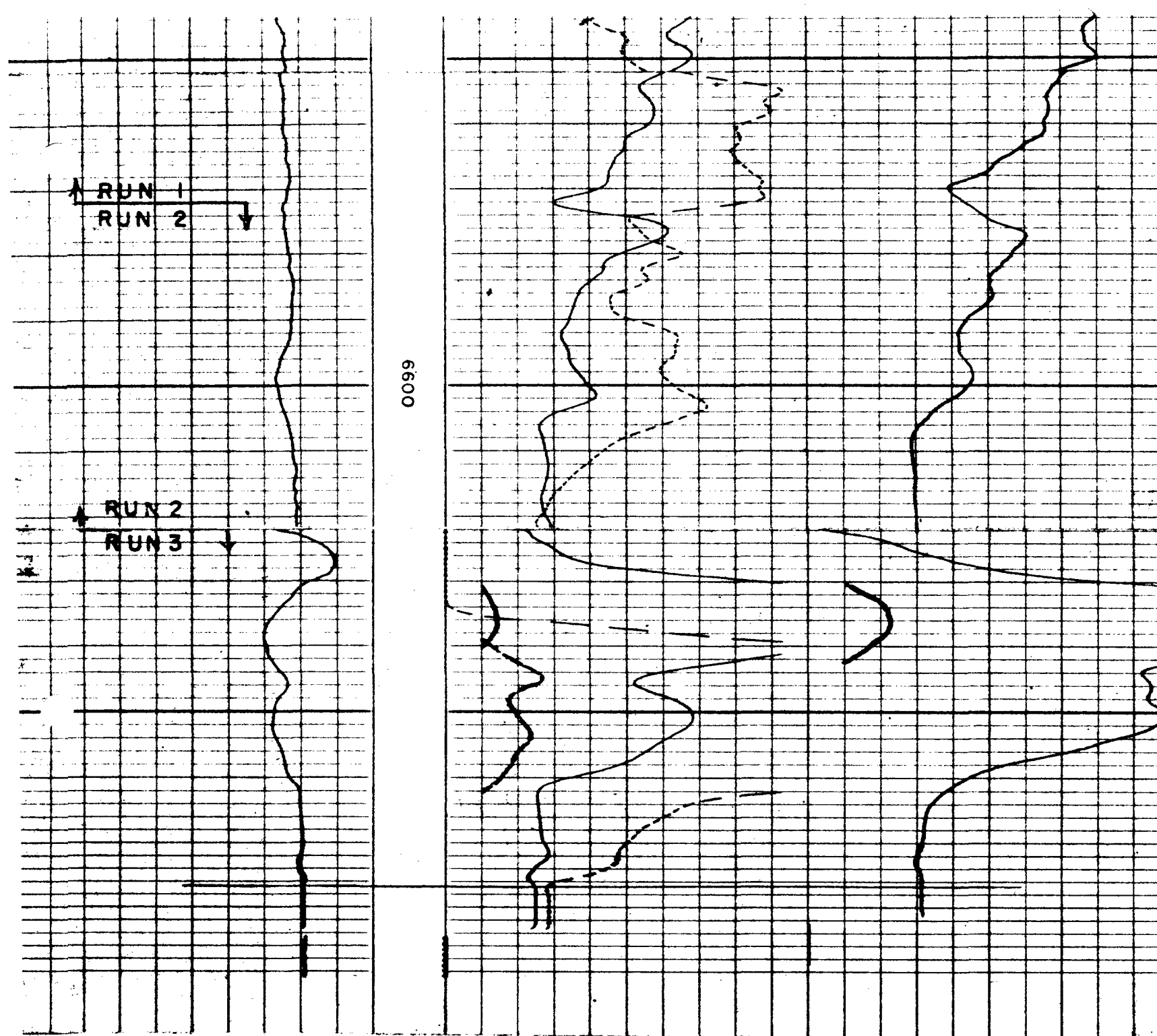
0 Micro Inverse 1"x1" 20

40

0 Micro Normal 2" 20

40

LOWRY ET AL
FEDERAL DOSWELL #24-50-177
SEC. 9-26N-6W
RIO ARRIBA, NEW MEXICO
ELEV. 6466' G.L.

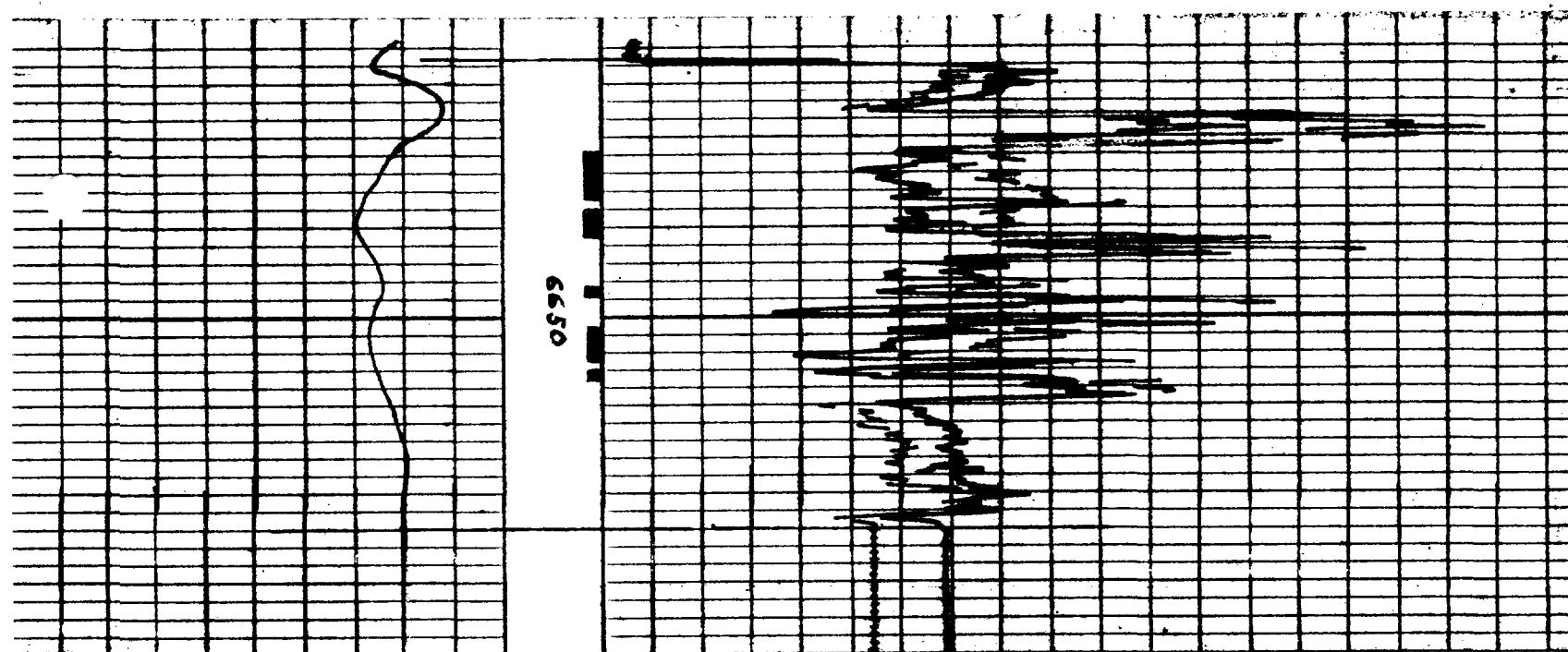
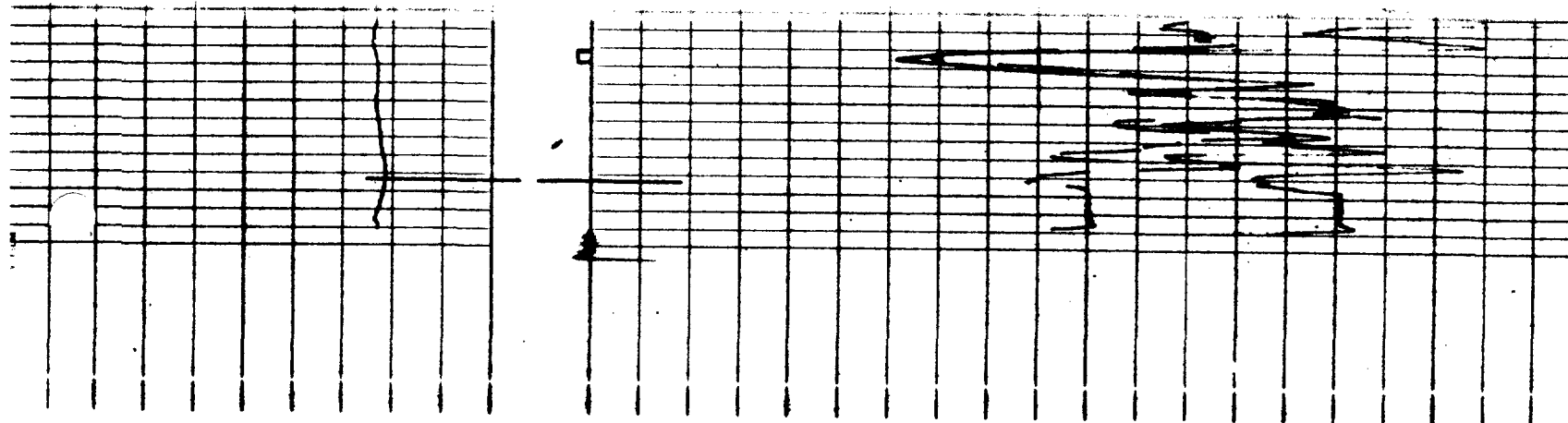


- 10 +

F.R.
6677

NORMAL		LONG NORMAL	
0	100	0	100
0	1000	0	1000
LATERAL			
0	100		
0	1000		

LOWRY ET AL
FEDERAL DOSWELL 25-51-127
SEC. 8-26N-6W
RIO ARRIBA, NEW MEXICO
ELEV. 6482' G.L.



- 10 +

F.R.
6674'

0 Micro Inverse 1"x1" 20

40

0 Micro Normal 2" 20

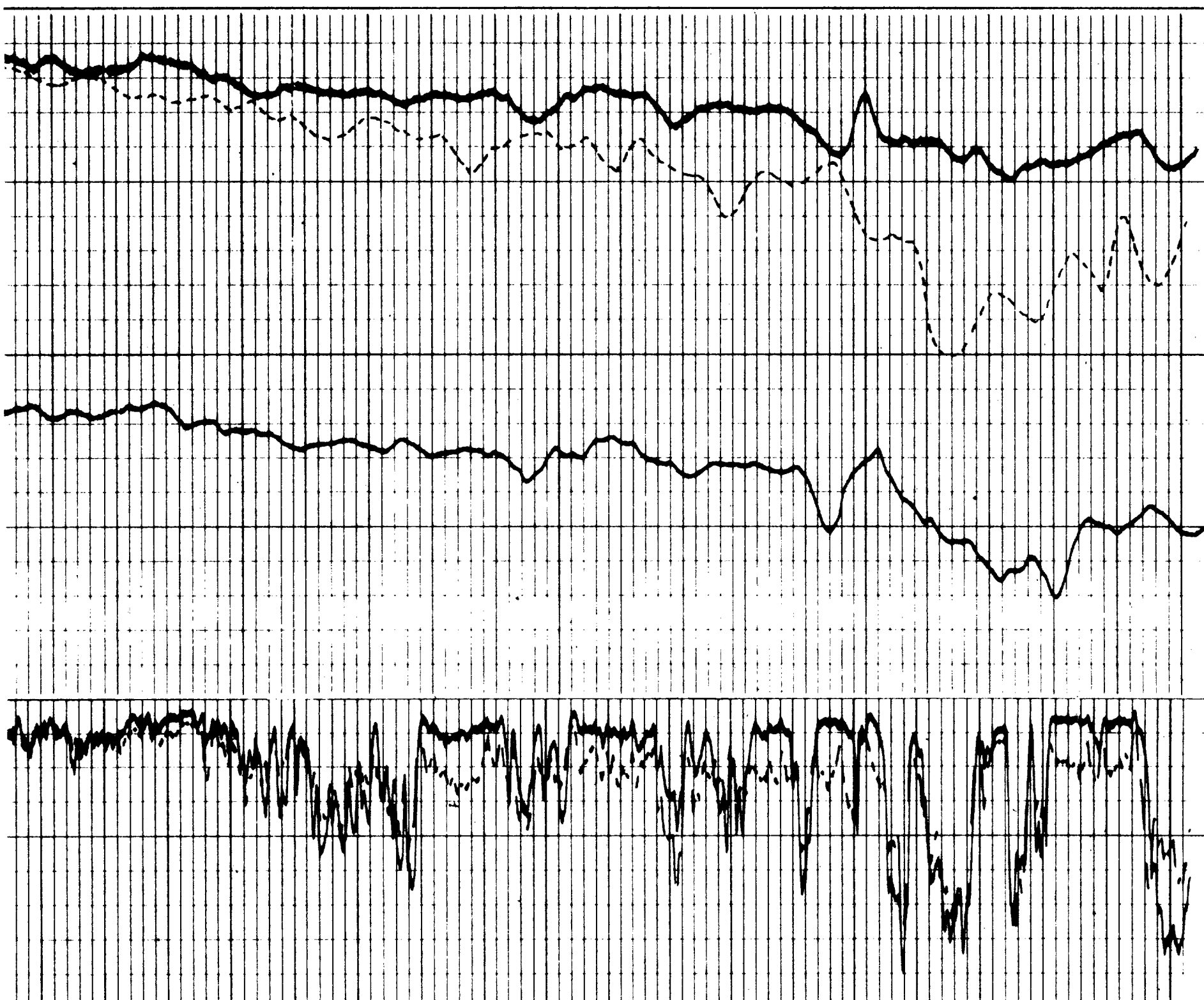
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LOWRY ET AL
FEDERAL DOWELL #25-51-127
SEC. 8-26N-6W
RIO ARRIBA, NEW MEXICO
ELEV 6482' G.L.

LOWRY ET AL
STATE 1-268

0099

0099



August 13, 1952

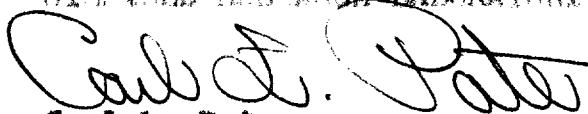
Lowry et al Operating Account
616 East Central Avenue
Albuquerque, New Mexico

Gentlemen:

Enclosed herewith is the report of the analysis of the 3 $\frac{1}{2}$ " Rotary core samples taken from the Federal Lease, Well No. 22-45-207, Rio Arriba County, New Mexico, and submitted to our laboratory on August 4, 1952.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Carl L. Pate

CLP:bl
9 c.c.

LOWRY et al OPERATING ACCOUNT

CORE ANALYSIS REPORT

FEDERAL LEASE

WELL NO. 22-45-207

RIO ARGIRA COUNTY, NEW MEXICO

OILFIELD RESEARCH LABORATORIES

CHANDLER, KANSAS

AUGUST 13, 1952

Oil Field Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Lovry et al Operating Account Lease Federal Well No. 22-45-
207

Location SW 1/4, 38 1/2

Section 10 Twp. 26N Rge. 6W County Rio Arriba State New Mexico

Name of Sand Tooito

Top of Core 6643.00

Bottom of Core 6662.00

Top of Sand 6643.95

Bottom of Sand 6662.00

Total Feet of Permeable Sand 9.10

Total Feet of Floodable Sand 11.55

Distribution of Permeable Sand:

Permeability Range Millidarcys	Feet	Cum. Ft.
<u>0 - 1</u>	<u>2.25</u>	<u>2.25</u>
<u>1 - 2</u>	<u>1.00</u>	<u>3.25</u>
<u>2 - 4</u>	<u>3.00</u>	<u>6.25</u>
<u>4 & above</u>	<u>2.85</u>	<u>9.10</u>

Average Permeability Millidarcys 68.27

Average Percent Porosity 11.02

Average Percent Oil Saturation 35.66

Average Percent Water Saturation 22.83

Average Oil Content, Bbls./A. Ft. 305.

Total Oil Content, Bbls./Acre 5,792.

Average Percent Oil Recovery by Laboratory Flooding Tests 8.61

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. 95.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre 1,103.

Total Calculated Oil Recovery, Bbls./Acre 2,200.

Packer Setting, Feet

Viscosity, Centipoises @

A. P. I. Gravity, degrees @ 60 °F

Elevation, Feet

An oil base mud was used as a circulating fluid in the coring of the sand in this well. This well was drilled in virgin territory.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
6643.00 - 6643.95	- Sandy limestone.
6643.95 - 6647.75	- Dark medium grained micaceous calcareous sandstone.
6647.75 - 6649.65	- Dark fine grained micaceous calcareous sandstone.
6649.65 - 6650.60	- Dark fine grained micaceous calcareous shaley sandstone.
6650.60 - 6653.45	- Dark coarse grained micaceous calcareous sandstone containing a vertical fracture.
6653.45 - 6655.35	- Hard calcareous shaley sandstone.
6655.35 - 6659.15	- Brown medium grained micaceous calcareous sandstone.
6659.15 - 6662.00	- Brown to dark medium grained micaceous calcareous sandstone.

Coring was started at a depth of 6643.00 feet in sandy limestone and completed at 6662.00 feet in medium grained micaceous calcareous sandstone. This core shows a total of 19.00 feet of formation containing oil. For the most part, the pay is made up of fine to medium grained micaceous calcareous sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into three sections. The weighted average permeability of the upper, middle and lower sections is 1.10, 214.74 and 1.92 millidarcys respectively; the overall average being 68.27 (See Table II). By observing the data given on the coregraph, it is noticeable that the cored section has a very irregular permeability profile and contains a very loose zone in the middle of the sand section.

The sand in this core shows a fair weighted average percent oil saturation, namely, 35.66. The weighted average percent oil saturation of the upper, middle and lower sections is 35.86, 37.40 and 34.90 respectively. The weighted average percent water saturation of the upper, middle and lower sections is 24.75, 19.30 and 22.29 respectively; the overall average being 22.83 (See Table IV). This gives an overall weighted average total fluid saturation of 58.49 percent. This low total fluid saturation shows that considerable fluid was lost during coring which was no doubt oil.

For the sake of future information, all of the saturation samples were analyzed for chloride content. The results of these tests are given in Tables VII and VIII. From the data given in these tables and on the coregraph, it is noticeable that the sand has a very irregular chloride content.

The weighted average oil content of the upper, middle and lower sections is 266, 511 and 271 barrels per acre foot respectively; the overall average being 305. The total oil content, as shown by this core, is 5,792 barrels per acre (See Table IV).

LABORATORY FLOODING TESTS

The sand in this core responded fairly well to laboratory flooding tests, as a total recovery of 1,103 barrels of oil per acre was obtained from 11.55 feet of sand. The weighted average percent oil saturation was reduced from 32.30 to 23.69, or represents an average recovery of 8.61 percent. The weighted average effective permeability of the samples is 4.65 millidarcys, while the average initial fluid production pressure is 31.3 pounds per square inch (See Table VI).

By observing the data given in Table V, you will note that of the 20 samples tested, 12 produced oil and water. This indicates that approximately 60 percent of the sand represented by these samples is floodable. The tests also show that the sand has a very wide variation in effective permeability and that the middle part of the cored section is very loose. A synthetic brine of approximately 25,000 parts per million, calculated as common salt or sodium chloride, was used to flood out the sand samples.

CONCLUSION

On the basis of the above data, it is evident that a total recovery of 2,200 barrels of oil per acre, 1800 barrels per acre by primary production and 400 barrels per acre by secondary recovery, can be obtained from the area represented by this core by efficient developing and operating practices. In calculating this recovery, an allowance was made for oil lost during coring.

The principle drawback of this core is the fact that it has a wide variation in permeability and a low percent porosity. The fact that the oil carries so much gas in solution is another factor that greatly reduces the volume of recoverable oil in place. Chances are, pressure maintenance, (the injection of the gas, produced along with the oil, back into the pay zone), will recover almost as much oil as would be expected by a combination of primary production and water-flooding. Furthermore, this method would be less expensive.

Oilfield Research Laboratories
RESULTS OF PERMEABILITY TESTS
TABLE I

Company Lowry et al Operating Acct. Lease Federal Well No. 22-45-
207

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	6643.15	Imp.	0.95	0.95	0.00
2	6644.00	Imp.	0.55	1.50	0.00
3	6645.00	0.99	1.00	2.50	0.99
4	6646.00	1.75	1.00	3.50	1.75
5	6647.00	0.66	1.25	4.75	0.82
6	6648.00	Imp.	0.75	5.50	0.00
7	6649.00	Imp.	1.15	6.65	0.00
8	6650.00	Imp.	0.95	7.60	0.00
9	6651.00	229.	0.90	8.50	206.00
10	6652.00	126.	1.00	9.50	126.00
11	6653.00	295.	0.95	10.45	280.00
12	6654.00	Imp.	1.05	11.50	0.00
13	6655.00	Imp.	0.85	12.35	0.00
14	6656.00	Imp.	1.15	13.50	0.00
15	6657.00	2.9	1.00	14.50	2.90
16	6658.00	Imp.	1.00	15.50	0.00
17	6659.00	3.4	0.65	16.15	2.21
18	6660.00	0.49	1.35	17.50	0.66
19	6661.00	Imp.	1.00	18.50	0.00
20	6661.85	Imp.	0.50	19.00	0.00

Oil Field Research Laboratories

SUMMARY OF PERMEABILITY TESTS

TABLE II

Company Lowry, et al Operating Acct. Lease Federal Well No. 22-45-
207

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity, Ft. x Md.
6643.00-6650.60	3.25	1.10	3.56
6650.60-6653.45	2.85	214.74	612.00
6653.45-6662.00	3.00	1.92	5.77
6643.00-6662.00	9.10	68.27	621.33

Oil Field Research Laboratories

RESULTS OF SATURATION TESTS

TABLE III

Company Lowry et al Operating Account Lease Federal Well No. 22-45-207

Sat. No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbls./A. Ft.	Feet of Core		Total Oil Content Bbls./Acre
			Oil	Water	Total		Ft.	Cum. Ft.	
1	6643.15	5.6	49.5	22.5	72.0	215	0.95	0.95	204
2	6644.00	8.9	34.4	19.4	53.8	238	0.55	1.50	131
3	6645.00	9.2	29.6	17.1	46.7	211	1.00	2.50	211
4	6646.00	9.3	41.8	28.6	70.4	308	1.00	3.50	388
5	6647.00	10.8	30.8	23.6	54.4	258	1.25	4.75	322
6	6648.00	12.4	47.8	21.3	69.1	461	0.75	5.50	306
7	6649.00	9.7	23.9	33.8	67.7	180	1.15	6.65	207
8	6650.00	8.1	35.2	27.4	62.6	221	0.95	7.60	210
9	6651.00	19.4	25.4	20.9	46.3	383	0.90	8.50	305
10	6652.00	12.9	39.4	17.4	56.8	394	1.00	9.50	394
11	6653.00	20.7	46.8	19.8	66.6	754	0.95	10.45	716
12	6654.00	6.8	51.2	23.2	74.4	271	1.05	11.50	285
13	6655.00	4.9	30.6	37.5	68.1	116	0.85	12.35	98
14	6656.00	13.9	35.0	23.7	58.7	378	1.15	13.50	435
15	6657.00	13.6	32.6	20.7	53.3	344	1.00	14.50	344
16	6658.00	9.8	33.9	22.3	56.2	258	1.00	15.50	258
17	6659.00	17.1	29.3	19.4	48.7	389	0.65	16.15	253
18	6660.00	11.6	31.7	16.9	48.6	286	1.35	17.50	386
19	6661.00	9.3	27.5	18.0	45.5	198	1.00	18.50	198
20	6661.85	3.5	45.0	21.4	66.4	122	0.50	19.00	61
Total						5,792			

Oil Field Research Laboratories

SUMMARY OF SATURATION TESTS

TABLE IV

Company	Lowry et al Operating Account	Lease	Federal	Well No.	22-45-207	
Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Oil Saturation	Average Percent Water Saturation	Average Oil Content Bbls./A. Ft.	Total Oil Content Bbls./Acre
6643.00 - 6650.60	7.60	9.32	35.86	24.75	266	2,019
6650.60 - 6653.45	2.85	17.58	37.40	19.30	511	1,455
6653.45 - 6662.00	8.55	10.35	34.90	22.29	271	2,318
6643.00 - 6662.00	19.00	11.02	35.66	22.83	305	5,792

Company LOWRY-45-207

Sample No.	Depth, Feet	Effective Porosity Percent	Original Water	Effective Permeability, Millidarcys **	Initial Fluid Production Pressure Lbs./Sq. In.
			Percent ^d		
1	6643.15	5.8	47.7	Imp.	50 ^f
2	6644.00	8.9	32.4	0.048	50
3	6645.00	9.6	28.4	0.039	50
4	6646.00	9.7	39.4	0.146	30
5	6647.00	10.7	28.7	Imp.	50 ^f
6	6648.00	12.3	46.4	Imp.	50 ^f
7	6649.00	9.3	26.4	Imp.	50 ^f
8	6650.00	8.4	35.2	Imp.	50 ^f
9	6651.00	19.1	26.8	24.50	5
10	6652.00	13.1	36.7	11.30	15
11	6653.00	20.7	44.4	17.90	5
12	6654.00	8.4	48.9	Imp.	50 ^f
13	6655.00	5.2	29.1	Imp.	50 ^f
14	6656.00	13.9	33.0	1.19	20
15	6657.00	13.5	34.0	0.202	50
16	6658.00	9.7	31.7	0.030	50
17	6659.00	17.4	27.2	1.75	20
18	6660.00	11.4	30.3	0.176	30
19	6661.00	9.0	26.0	0.202	50
20	6661.85	3.8	42.0	Imp.	50 ^f
Notes: cc - cubic centi * - Volume of w ** - Determined					

Oilfield Research Laboratories
SUMMARY OF LABORATORY FLOODING TESTS

TABLE VI

Company	Lourey et al Operating Account	Lease	Federal	Well No
	6643.95	6650.60	6655.35	22-45-207
Depth Interval, Feet	6646.50	6652.45	6661.50	6661.50
Feet of Core Analyzed	2.55	2.85	6.15	11.55
Average Percent Porosity	9.49	17.51	12.18	12.90
Average Percent Original Oil Saturation	33.57	36.13	30.02	32.30
Average Percent Oil Recovery	7.49	15.54	5.87	8.61
Average Percent Residual Oil Saturation	26.08	20.59	24.15	27.69
Average Percent Residual Water Saturation	53.74	65.05	50.83	54.76
Average Percent Total Residual Fluid Saturation	79.22	85.64	74.98	78.45
Average Original Oil Content, Bbls./A. Ft.	248.	494.	291.	330.
Average Oil Recovery, Bbls./A. Ft.	56.	212.	58.	95.
Average Residual Oil Content, Bbls./A. Ft.	192.	282.	233.	235.
Total Original Oil Content, Bbls./Acre	631.	1,408.	1,787.	3,826.
Total Oil Recovery, Bbls./Acre	142.	605.	356.	1,103.
Total Residual Oil Content, Bbls./Acre	489.	803.	1,431.	2,723.
Average Effective Permeability, Millidarcys	0.083.	17.68	0.517	4.65
Average Initial Fluid Production Pressure, p.s.i.	43.3	8.3	36.7	31.3

NOTE: Only those samples which recovered oil were used in calculating the above averages.

Oilfield Research Laboratories
RESULTS OF WATER DIFFERENTIATION TESTS
TABLE VII

Company Lowry et al Operating Acct. Lease Federal Well No. 22-45-
207

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation		
			Connate	Drilling & Foreign	Total
1	6643.15	44,000			
2	6644.00	12,800			
3	6645.00	31,000			
4	6646.00	19,700			
5	6647.00	13,500			
6	6648.00	48,500			
7	6649.00	36,800			
8	6650.00	27,800			
9	6651.00	37,500			
10	6652.00	36,800			
11	6653.00	7,430			
12	6654.00	22,900			
13	6655.00	50,100			
14	6656.00	29,600			
15	6657.00	22,300			
16	6658.00	35,900			
17	6659.00	7,000			
18	6660.00	42,000			
19	6661.00	47,000			
20	6661.85	71,500			
Note: ppm - parts per million.					

Oil Field Research Laboratories

SUMMARY OF WATER DIFFERENTIATION TESTS

TABLE VIII

Company Lowry et al Operating Acct. Lease Federal Well No. 22-45-
207

Depth Interval, Feet	Chloride Content of Brine in Sand, ppm	Average Percent Connate Water	Average Percent Drilling & Foreign Water
6643.00-6650.60	29,147		
6650.60-6653.45	27,231		
6653.45-6662.00	35,423		
6643.00-6662.00	31,684		

Note: ppm - parts per million.