

OILFIELD RESEARCH LABORATORIES

536 NORTH HIGHLAND - CHANUTE, KANSAS 66720 - PHONE (316) 431-2650

September 24, 1981

Hur-Chee Oil Company
c/o James Cheever
R R # 1
Severy, Kansas 67137

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary cores taken from the Bowman Lease, Well No. 20, located in Chautauqua County, Kansas and submitted to our laboratory on September 10, 1981.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/kas

5 c to Severy, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Hur-Chee Oil Company Lease Bowman Well No. 20
 Location 1140' NSL & 490' WEL E $\frac{1}{2}$ SW $\frac{1}{4}$
 Section 26 Twp. 34S Rge. 11E County Chautauqua State Kansas

Elevation, Feet - - - - -

	Redd	Peru
Name of Sand - - - - -		
Top of Core - - - - -	1046.0	1262.0
Bottom of Core - - - - -	1076.0	1275.0
Top of Sand - - - - -	1046.0	1262.0
Bottom of Sand - - - - -	1076.0	1275.0
Total Feet of Permeable Sand - - - - -	17.1	11.0
Total Feet of Floodable Sand - - - - -	0.	0.

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

REDD SAND

0 - 5	9.2	9.2
5 - 10	3.3	12.5
10 & Above	4.6	17.1

PERU SAND

0 - 1	9.0	9.0
1 - 10	2.0	11.0

Average Permeability Millidarcys - - - - -	7.7	0.95
Average Percent Porosity - - - - -	15.6	14.9
Average Percent Oil Saturation - - - - -	13.1	22.5
Average Percent Water Saturation - - - - -	66.4	64.6
Average Oil Content, Bbls./A. Ft. - - - - -	168.	265.
Total Oil Content, Bbls./Acre - - - - -	3,948.	3,448.
Average Percent Oil Recovery by Laboratory Flooding Tests - - - - -	0.	0.
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - -	0.	0.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - -	0.	0.
Total Calculated Oil Recovery, Bbls./Acre - - - - -	0.	0.

Oilfield Research Laboratories

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GENERAL INFORMATION & SUMMARY

Company Hur-Chee Oil Co. Lease Bowman Well No 20
 Location 1140' NSL & 490' WEL E $\frac{1}{2}$ SW $\frac{1}{2}$
 Section 26 Twp 34S Rge 11E County Chautauqua State Kansas

Elevation, Feet - - - - -

Name of Sand - - - - -	WISER
Top of Core - - - - -	1333.0
Bottom of Core - - - - -	1356.0
Top of Sand - - - - -	1333.0
Bottom of Sand - - - - -	1356.0
Total Feet of Permeable Sand - - - - -	18.2
Total Feet of Floodable Sand - - - - -	5.2

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

	<u>WISER SAND</u>	
14 - 30	4.9	5.9
40 - 60	5.6	11.5
60 - 100	4.8	16.3
100 & Above	1.9	18.2

Average Permeability Millidarcys - - - - -	49.1
Average Percent Porosity - - - - -	16.7
Average Percent Oil Saturation - - - - -	24.9
Average Percent Water Saturation - - - - -	58.1
Average Oil Content, Bbls./A. Ft. - - - - -	336.
Total Oil Content, Bbls./Acre - - - - -	7,230.
Average Percent Oil Recovery by Laboratory Flooding Tests - - - - -	3.9
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - -	55.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - -	285.
Total Calculated Oil Recovery, Bbls./Acre - - - - -	See "Calculated Recovery"

Section

The core was sampled and the samples sealed in plastic bags by a representative of the client.

In as much as only the Wiser sand responded to flooding susceptibility tests, a calculated recovery is given for the Wiser sand only.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
	<u>REDD SAND</u>
1046.0 - 1051.2	Grayish light brown shaly sandstone.
1051.2 - 1055.2	Gray shale.
1055.2 - 1058.3	Grayish light brown shaly sandstone.
1058.3 - 1058.7	Light brown sandstone.
1058.7 - 1067.0	Grayish light brown shaly sandstone.
1067.0 - 1071.2	Light brown sandstone.
1071.2 - 1073.7	Gray shale.
1073.7 - 1076.0	Grayish light brown shaly sandstone.

PERU SAND

1262.0 - 1275.0	Grayish light brown shaly sandstone.
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WISER SAND

1333.0 - 1338.3	Grayish light brown shaly sandstone.
1338.3 - 1346.2	Light brown sandstone.
1346.2 - 1346.9	Brown sandstone with micaceous partings.
1346.9 - 1350.6	Brown sandstone.
1350.6 - 1351.4	Gray shaly sandstone.
1351.4 - 1352.0	Brown sandstone.

- 1352.0 - 1353.7 Grayish light brown sandstone with fine shale part-
ings.
- 1353.7 - 1354.4 Brown sandstone.
- 1354.4 - 1356.0 Grayish light brown sandstone with fine shale part-
ings.

LABORATORY FLOODING TESTS

WISER SAND

The Wiser sand in this core responded to laboratory flooding tests, as a total recovery of 285 barrels of oil per acre was obtained from 5.2 feet of sand. The weighted average percent oil saturation was reduced from 39.3 to 35.4, or represents an average recovery of 3.9 percent. The weighted average effective permeability of the samples is 6.25 millidarcys, while the average initial fluid production pressure is 15.8 pounds per square inch (See Table V).

CALCULATED RECOVERY

WISER SAND

It would appear from a study of the core data, that efficient primary and waterflood operations in the vicinity of this well should recover approximately 820 barrels of oil per acre. This is an average recovery of 158 barrels per acre foot from 5.2 feet of floodable sand analyzed in this core.

These recovery values were calculated using the following data and assumptions:

Original formation volume factor, estimated	1.08
Reservoir water saturation, percent, estimated	35.0
Average porosity, percent	18.3
Oil saturation after flooding, percent	35.4
Performance factor, percent, estimated	45.0
Net floodable sand, feet	5.2

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hur-Chee Oil Company Lease Bowman Well No. 20

Sample No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbls. / A Ft.	Perm., Mill.	Feet of Sand		Total Oil Content	Perm. Capacity Ft. X md.
			Oil	Water	Total			Ft.	Cum. Ft.		
						<u>REDD SAND</u>					
1	1046.6	16.7	13	69	82	168	7.8	1.0	1.0	168	7.80
2	1047.7	15.7	17	66	83	207	2.2	1.0	2.0	207	2.20
3	1048.4	15.6	16	66	82	194	1.8	1.0	3.0	194	1.80
4	1049.6	16.7	4	92	96	52	0.33	1.0	4.0	52	0.33
5	1050.5	17.0	17	78	95	224	1.0	1.2	5.2	269	1.20
6	1055.5	13.7	7	89	96	74	Imp.	1.0	6.2	74	0.00
7	1056.7	13.5	9	69	78	94	Imp.	1.1	7.3	103	0.00
8	1057.4	15.3	6	70	76	71	3.1	1.0	8.3	71	3.10
9	1058.5	13.4	5	91	96	52	14.	0.4	8.7	21	5.60
10	1059.5	13.0	10	85	95	101	Imp.	1.0	9.7	101	0.00
11	1060.6	13.1	7	78	85	71	1.5	1.0	10.7	71	1.50
12	1061.5	10.7	3	88	91	25	Imp.	1.0	11.7	25	0.00
13	1062.6	15.6	13	80	93	157	1.4	1.0	12.7	157	1.40
14	1063.6	18.4	6	82	88	86	1.8	1.0	13.7	86	1.80
15	1064.5	17.4	12	70	82	162	5.2	1.0	14.7	162	5.20
16	1065.5	15.7	15	52	67	183	4.5	1.0	15.7	183	4.50
17	1066.6	17.6	13	55	68	178	8.3	1.3	17.0	231	10.79
18	1067.6	17.4	21	58	79	283	21.	1.0	18.0	283	21.00
19	1068.5	19.1	38	33	71	563	30.	1.0	19.0	563	30.00
20	1069.5	19.7	22	57	79	336	11.	1.0	20.0	336	11.00
21	1070.5	20.3	22	44	66	347	19.	1.2	21.2	416	22.80
22	1074.5	9.3	4	90	94	29	Imp.	1.3	22.5	38	0.00
23	1075.6	13.6	13	83	96	137	Imp.	1.0	23.5	137	0.00
						<u>PERU SAND</u>					
24	1262.5	15.9	10	86	96	123	0.32	1.0	1.0	123	0.32

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

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Company Hur-Chee Oil Co.

Lease Bowman

Well No. 20

Sample No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbls. / A Ft.	Perm., Mill.	Feet of Sand		Total Oil Content	Perm. Capacity Ft. X md.
			Oil	Water	Total			Ft.	Cum. Ft.		
25	1263.5	16.7	52	42	94	674	Imp.	1.0	2.0	674	0.00
26	1264.5	16.0	25	62	87	310	0.33	1.0	3.0	310	0.33
27	1265.6	14.7	32	59	91	365	6.1	1.0	4.0	365	6.10
28	1266.5	17.2	39	46	85	520	0.49	1.0	5.0	520	0.49
29	1267.5	16.1	8	72	80	100	0.47	1.0	6.0	100	0.47
30	1268.5	17.9	14	66	80	194	1.1	1.0	7.0	194	1.10
31	1269.5	10.4	23	73	96	186	Imp.	1.0	8.0	186	0.00
32	1270.5	14.5	22	72	94	247	0.20	1.0	9.0	247	0.20
33	1271.5	14.1	42	46	88	459	0.24	1.0	10.0	459	0.24
34	1272.5	11.1	9	60	69	78	0.31	1.0	11.0	78	0.31
35	1273.5	15.1	10	80	90	117	0.29	1.0	12.0	117	0.29
36	1274.4	13.8	7	76	85	75	0.63	1.0	13.0	75	0.63
<u>WISER SAND</u>											
37	1333.4	16.0	2	86	88	25	0.27	1.0	1.0	25	0.27
38	1334.5	14.3	6	90	96	67	Imp.	1.0	2.0	67	0.00
39	1335.5	13.9	5	87	92	54	Imp.	1.0	3.0	54	0.00
40	1336.5	13.8	9	88	97	96	5.7	1.0	4.0	96	5.70
41	1337.5	10.9	3	92	95	25	Imp.	1.3	5.3	33	0.00
42	1338.6	20.3	20	55	75	315	121.	1.0	6.3	315	121.00
43	1339.5	19.5	29	43	72	439	68.	1.0	7.3	439	68.00
44	1340.6	18.0	33	44	77	461	97.	1.0	8.3	461	97.00
45	1341.5	18.4	30	36	66	428	54.	1.0	9.3	428	54.00
46	1342.5	17.0	28	56	84	369	52.	1.0	10.3	369	52.00
47	1343.5	15.3	33	48	81	392	22.	1.0	11.3	392	22.00
48	1344.5	16.0	35	50	85	434	26.	1.0	12.3	434	26.00

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

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Company	Hur-Chee Oil Company	Lease	Bowman	Well No.	20
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Sample No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbls. / A Ft.	Perm., Mill.	Feet of Sand		Total Oil Content	Perm. Capacity Ft. X md.
			Oil	Water	Total			Ft.	Cum. Ft.		
49	1345.7	15.3	49	38	87	582	14.	0.9	13.2	524	12.60
50	1346.5	17.9	11	61	72	153	44.	0.7	13.9	107	30.80
51	1347.5	18.6	27	45	72	390	84.	1.0	14.9	390	84.00
52	1348.6	17.7	44	39	83	604	40.	1.0	15.9	604	40.00
53	1349.6	18.9	26	52	78	381	63.	0.8	16.7	305	50.40
54	1350.5	19.6	25	47	72	380	102.	0.9	17.6	342	91.80
55	1351.6	17.7	38	36	74	522	42.	0.6	18.2	313	25.20
56	1352.5	14.0	37	57	94	402	23.	1.0	19.2	402	23.00
57	1353.5	20.4	46	42	88	728	53.	0.7	19.9	510	37.10
58	1354.5	18.6	37	41	78	534	54.	0.6	20.5	320	32.40
59	1355.5	17.6	22	69	91	300	20.	1.0	21.5	300	20.00

SUMMARY OF PERMEABILITY & SATURATION TESTS

20

Company	Hur-Chee Oil Company	Lease	Bowman	Well No.	20
	Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.	
			<u>REDD SAND</u>		
	1046.0 - 1076.0	17.1	7.7	132.02	
			<u>PERU SAND</u>		
	1262.0 - 1275.0	11.0	0.95	10.48	
			<u>WISER SAND</u>		
	1333.0 - 1338.3	2.0	3.0	5.97	
	1338.3 - 1356.0	16.2	54.8	887.30	
	1333.0 - 1356.0	18.2	49.1	893.27	
	Depth Interval, Feet	Feet of Core Analyzed	Average Percent Oil Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbls./Acre
			<u>REDD SAND</u>		
	1046.0 - 1076.0	23.5	13.1	168	3,948
			<u>PERU SAND</u>		
	1262.0 - 1275.0	13.0	22.5	265	3,448
			<u>WISER SAND</u>		
	1333.0 - 1338.3	5.3	4.9	52	275
	1338.3 - 1356.0	16.2	31.5	429	6,955
	1333.0 - 1356.0	21.5	24.9	336	7,230

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Hur-Chee Oil Co. Lease Bowman Well No. 20

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation		Volume of Water Recovered cc*	Effective Permeability Millidarcys**	Initial Fluid Production Pressure Lbs./Sq./In.
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	% Oil	% Water			
						REDD SAND					
1	1046.6	16.8	13	169	0	0	13	70	8	0.15	50
2	1047.7	15.7	17	207	0	0	17	67	9	0.37	50
3	1048.4	15.5	16	192	0	0	16	68	0	Imp.	-
4	1049.6	16.7	4	52	0	0	4	93	0	Imp.	-
5	1050.5	17.5	16	217	0	0	16	79	10	0.37	50
6	1055.5	14.2	6	66	0	0	6	90	0	Imp.	-
7	1056.7	14.0	8	87	0	0	8	72	0	Imp.	-
8	1057.4	15.4	6	72	0	0	6	76	41	0.90	25
9	1058.5	13.4	5	52	0	0	5	92	0	Imp.	-
10	1059.5	12.5	11	107	0	0	11	84	0	Imp.	-
11	1060.6	13.0	7	71	0	0	7	79	0	Imp.	-
12	1061.5	10.7	3	25	0	0	3	89	0	Imp.	-
13	1062.6	15.7	13	158	0	0	13	80	11	0.30	45
14	1063.6	18.4	6	86	0	0	6	84	8	0.30	50
15	1064.5	17.9	11	153	0	0	11	74	0	Imp.	-
16	1065.5	15.7	15	183	0	0	15	55	8	0.30	50
17	1066.6	17.1	14	186	0	0	14	64	26	0.37	35
18	1067.6	17.8	20	276	0	0	20	60	18	0.30	45
19	1068.5	19.6	37	563	0	0	37	39	21	0.19	35
20	1069.5	19.8	22	338	0	0	22	60	34	0.45	35
21	1070.5	20.1	22	343	0	0	22	50	16	0.22	45
22	1074.5	8.9	5	35	0	0	5	90	0	Imp.	-
23	1075.6	13.5	13	136	0	0	13	84	0	Imp.	-
						PERU SAND					
24	1262.5	15.8	10	123	0	0	10	87	0	Imp.	-

Notes: cc—cubic centimeter.

*—Volume of water recovered at the time of maximum oil recovery.

**—Determined by passing water through sample which still contains residual oil.

Oilfield Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company			Hur-Chee Oil Co.			Lease			Rowman			Well No.			20		
Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation		Volume of Water Recovered cc*	Effective Permeability Millidarcys**	Initial Fluid Production Pressure Lbs./Sq./In.						
			%	Bbbls./A. Ft.	%	Bbbls./A. Ft.	% Oil	% Water				Bbbls./A. Ft.					
25	1263.5	17.0	51	673	0	0	51	44	0	Imp.	-						
26	1264.5	15.6	26	315	0	0	26	62	0	Imp.	-						
27	1265.6	14.4	33	369	0	0	33	60	0	Imp.	-						
28	1266.5	17.7	38	522	0	0	38	47	0	Imp.	-						
29	1267.5	16.1	8	100	0	0	8	73	0	Imp.	-						
30	1268.5	17.8	14	193	0	0	14	68	0	Imp.	-						
31	1269.5	10.9	22	186	0	0	22	74	0	Imp.	-						
32	1270.5	14.2	23	253	0	0	23	73	0	Imp.	-						
33	1271.5	14.4	41	458	0	0	41	47	0	Imp.	-						
34	1272.5	11.0	9	77	0	0	9	63	0	Imp.	-						
35	1273.5	15.2	10	118	0	0	10	82	0	Imp.	-						
36	1274.4	13.7	7	74	0	0	7	78	0	Imp.	-						
WISER SAND																	
37	1333.4	16.1	2	25	0	0	2	86	0	Imp.	-						
38	1334.5	14.2	6	66	0	0	6	90	0	Imp.	-						
39	1335.5	14.0	5	54	0	0	5	88	0	Imp.	-						
40	1336.5	13.3	10	103	0	0	10	87	0	Imp.	-						
41	1337.5	10.9	3	25	0	0	3	92	0	Imp.	-						
42	1338.6	20.1	20	312	0	0	20	57	34	0.60	35						
43	1339.5	19.6	29	441	2	30	27	56	252	4.95	20						
44	1340.6	18.2	33	466	2	28	31	55	310	9.30	20						
45	1341.5	18.5	30	431	0	0	30	54	322	8.70	10						
46	1342.5	17.4	27	364	0	0	27	68	324	5.85	10						
47	1343.5	15.8	32	392	0	0	32	50	0	Imp.	-						
48	1344.5	16.1	35	437	0	0	35	52	264	5.40	20						

Company Hur-Chee Oil Co.

Lease Rowman

Well No.

20

Notes: cc—cubic centimeter.

*—Volume of water recovered at the time of maximum oil recovery.

**—Determined by passing water through sample which still contains residual oil.

RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

-3-

Well No. 20

Lease Bowman

Company Hur-Chee Oil Co.

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation		Volume of Water Recovered cc*	Effective Permeability Millidarcys**	Initial Fluid Production Pressure Lbs./Sq./In.
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	% Oil	% Water			
49	1345.7	15.4	49	585	5	60	44	46	58	0.75	10
50	1346.5	17.9	11	153	0	0	11	75	28	0.45	25
51	1347.5	18.7	27	392	0	0	27	56	196	17.69	10
52	1348.6	17.8	44	608	5	69	39	57	236	9.93	15
53	1349.6	19.0	26	383	0	0	26	57	70	1.05	25
54	1350.5	19.8	25	384	0	0	25	59	374	13.16	15
55	1351.6	18.2	37	522	0	0	37	42	146	2.85	20
56	1352.5	14.3	36	399	0	0	36	60	192	3.30	25
57	1353.5	20.5	46	732	7	111	39	52	322	8.66	10
58	1354.5	18.7	37	537	3	44	34	54	148	2.70	20
59	1355.5	17.5	22	299	0	0	22	71	458	5.10	10

Notes: cc—cubic centimeter.

*—Volume of water recovered at the time of maximum oil recovery.

**—Determined by passing water through sample which still contains residual oil.

Oilfield Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company Hur-Chee Oil Co.

Lease Bowman

Well No. 20

WISER SAND

1338.3 - 1356.0

Depth Interval, Feet

Feet of Core Analyzed

5.2

Average Percent Porosity

18.3

Average Percent Original Oil Saturation

39.3

Average Percent Oil Recovery

3.9

Average Percent Residual Oil Saturation

35.4

Average Percent Residual Water Saturation

53.5

Average Percent Total Residual Fluid Saturation

88.9

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

553.

Average Oil Recovery, Bbls./A. Ft.

55.

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

498.

Total Original Oil Content, Bbls./Acre

2,877.

Total Oil Recovery, Bbls./Acre

285.

Total Residual Oil Content, Bbls./Acre

2,592.

Average Effective Permeability, Millidarcys

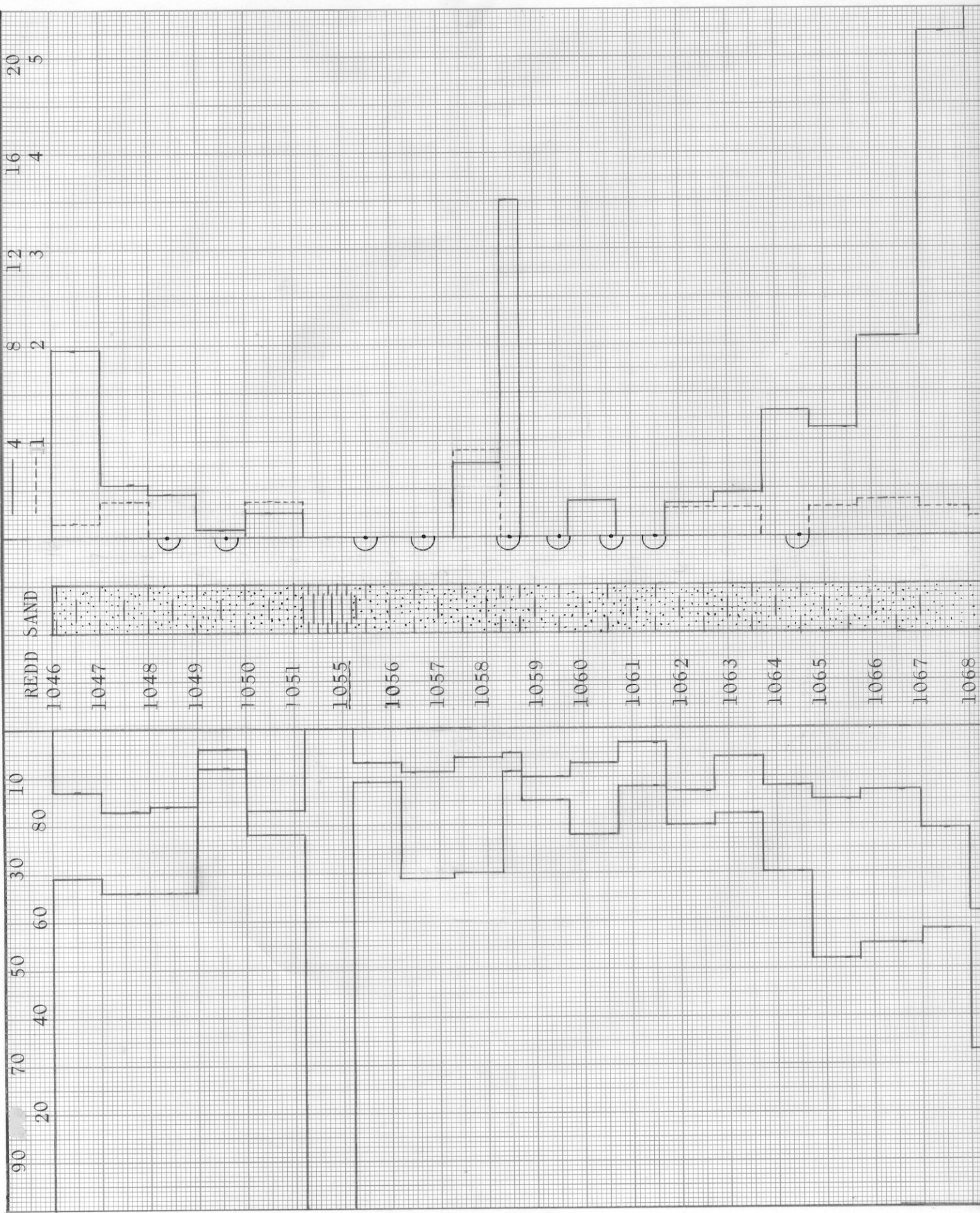
6.25

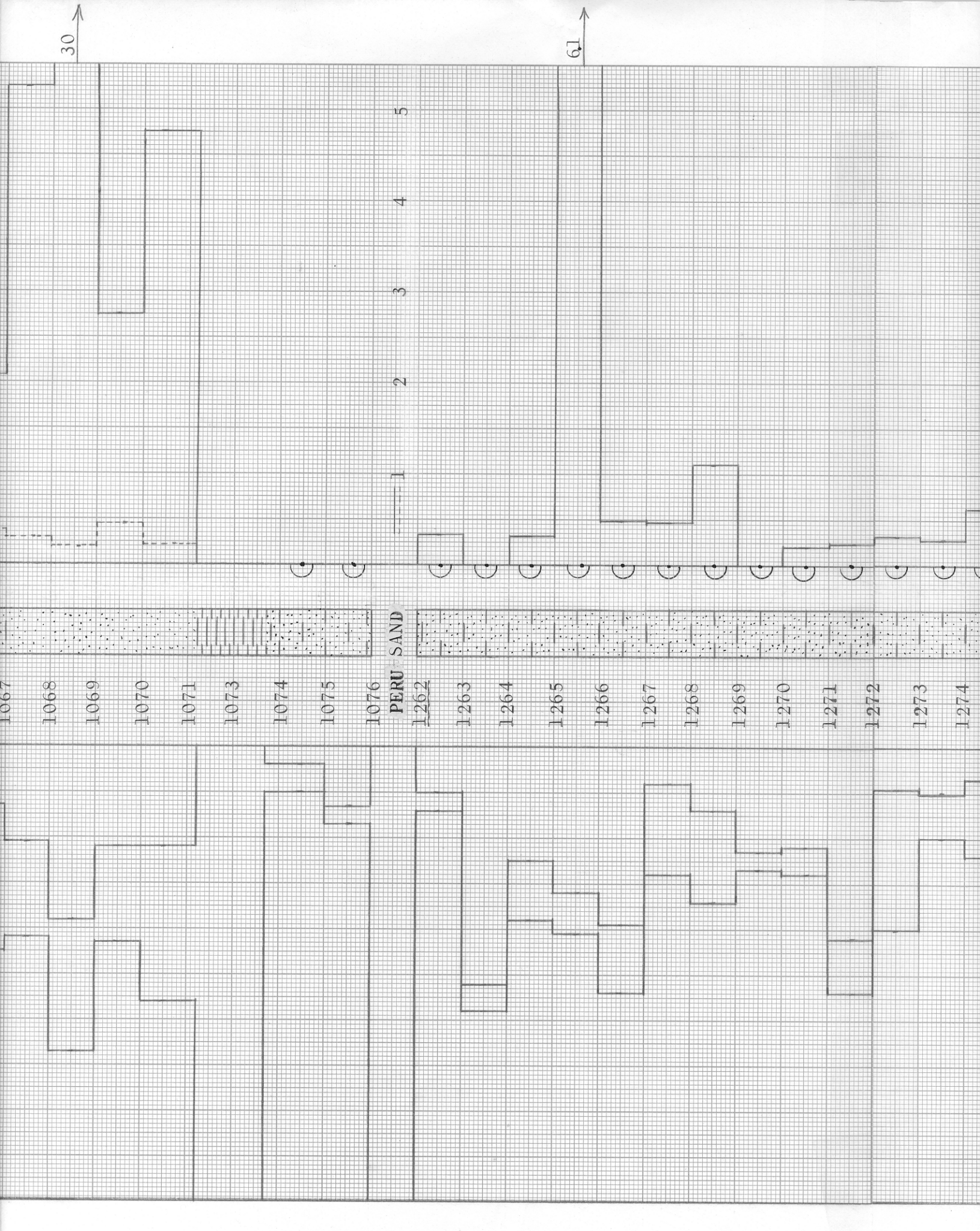
Average Initial Fluid Production Pressure, p.s.i.

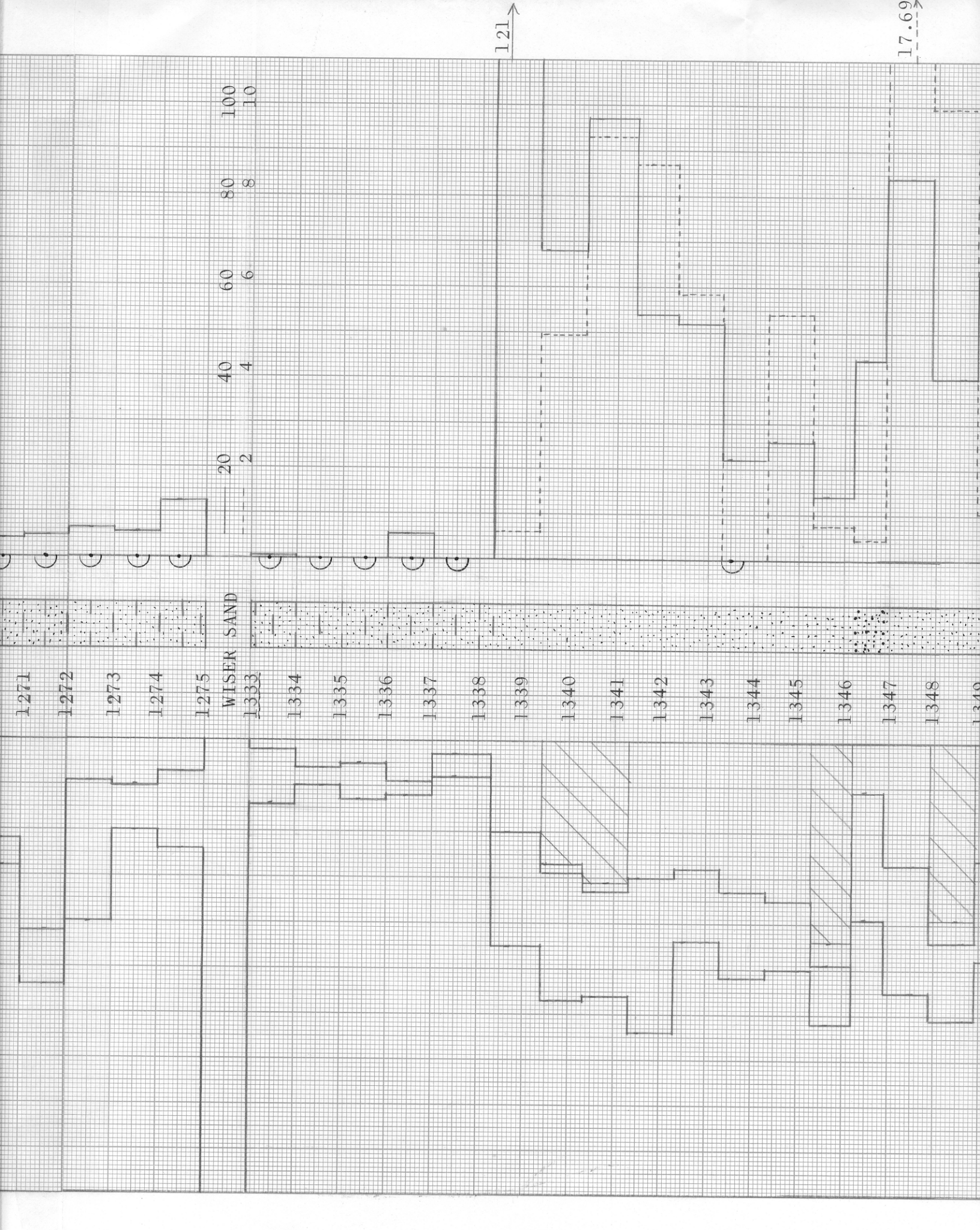
15.8

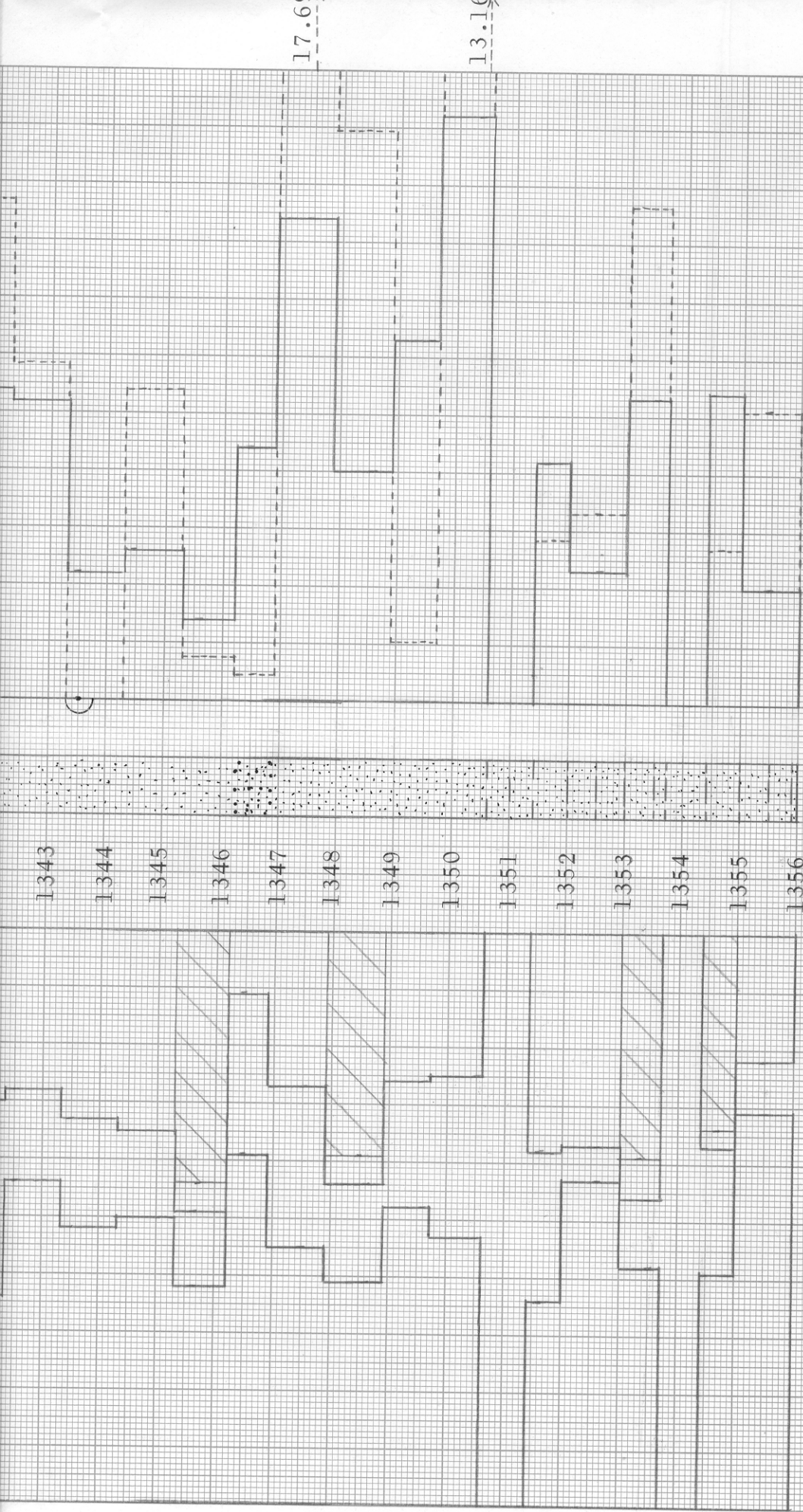
NOTE: Only those samples which recovered oil were used in calculating the above averages.

WATER SAT., PERCENT —————> OIL SAT., PERCENT
PERMEABILITY, IN MILLIDARCS ————> EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCS









HUR - CHEE OIL COMPANY

BOWMAN LEASE

CHAUTAUQUA COUNTY, KANSAS

WELL NO. 20

IMPERMEABLE TO WATER

HUR - CHEE OIL COMPANY

BOWMAN LEASE

WELL NO. 20

CHAUTAUQUA COUNTY, KANSAS

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY MILLIDARCYS	CALCULATED OIL RECOVERY BBLs / ACRE
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REDD SAND

1046.0 - 1076.0	23.5	15.6	13.1	66.4	7.7	
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PERU SAND

1262.0 - 1275.0	13.0	14.9	22.5	64.6	0.95	
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WISER SAND

1333.0 - 1338.3	5.3	13.6	4.9	88.8	3.0	
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1338.3 - 1356.0	16.2	17.8	31.5	48.1	54.8	
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1333.0 - 1356.0	21.5	16.7	24.9	58.1	49.1	
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820
(PRIMARY AND
WATERFLOODING)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
SEPTEMBER, 1981

PDC