

# OILFIELD RESEARCH LABORATORIES

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

December 17, 1982

Peterland Oil Company  
4018 Main Street  
Kansas City, Missouri 64111

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Harney Lease, Well No. 16, located in Montgomery County, Kansas and submitted to our laboratory on December 13, 1982.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/rmc

4 c to Kansas City, Missouri  
1 c to K C Energy, Buffalo, Kansas

- REGISTERED ENGINEERS -

CORE ANALYSIS - WATER ANALYSIS - REPRESSURING ENGINEERING - SURVEYING & MAPPING - PROPERTY EVALUATION & OPERATION

**Oilfield Research Laboratories**  
**GENERAL INFORMATION & SUMMARY**

Company Peterland Oil Company Lease Harney Well No. 16  
 Location \_\_\_\_\_  
 Section 9 Twp. 32S Rge. 17E County Montgomery State Kansas

Elevation, Feet .....  
 Name of Sand.....  
 Top of Core .....  
 Bottom of Core .....  
 Top of Sand .....  
 Bottom of Sand .....  
 Total Feet of Permeable Sand .....  
 Total Feet of Floodable Sand.....

Bartlesville  
 692.0  
 725.6  
 692.0  
 724.9  
 9.7  
 6.5

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 2	3.2	3.2
8 - 19	5.0	8.2
25 - 27	1.5	9.7

Average Permeability Millidarcys .....  
 Average Percent Porosity .....  
 Average Percent Oil Saturation .....  
 Average Percent Water Saturation.....  
 Average Oil Content, Bbls./ A. Ft. ....  
 Total Oil Content, Bbls./ Acre.....  
 Average Percent Oil Recovery by Laboratory Flooding Tests.....  
 Average Oil Recovery by Laboratory Flooding Tests, Bbls./ A. Ft. ....  
 Total Oil Recovery by Laboratory Flooding Tests, Bbls./ Acre .....  
 Total Calculated Oil Recovery, Bbls./ Acre.....

10.7  
 14.4  
 28.0  
 57.7  
 328.  
 4,133.  
 3.8  
 49.  
 318.

See "Calculated Recovery"  
 Section

-2-

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

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
692.0 - 692.6	Light grayish brown slightly calcareous very shaly sandstone with scattered shale partings.
692.6 - 694.5	Gray shale with fine light gray sandstone partings.
694.5 - 695.9	Light gray and gray laminated sandstone and shale.
695.9 - 696.3	Gray slightly sandy shale.
696.3 - 696.6	Gray and light gray laminated shale and sandstone.
696.6 - 697.4	Gray slightly sandy shale.
697.4 - 697.7	Gray and light gray laminated shale and sandstone.
697.7 - 698.3	Gray shale with fine light gray sandstone partings.
698.3 - 699.3	Light grayish brown slightly shaly sandstone with scattered shale partings.
699.3 - 701.3	Brown sandstone.
701.3 - 702.3	Grayish brown slightly shaly sandstone.
702.3 - 703.3	Brown sandstone with widely scattered fine shale partings.
703.3 - 704.8	Brown sandstone.
704.8 - 706.6	Gray shale.
706.6 - 720.0	No core.
720.0 - 722.0	Light grayish brown very shaly sandstone with shale partings.
722.0 - 722.6	Light brown very shaly sandstone.
722.6 - 724.9	Gray and light gray laminated shale and sandstone.
724.9 - 725.6	Gray shale.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 318 barrels of oil per acre was obtained from 6.5 feet of sand. The weighted average percent oil saturation was reduced from 35.4 to 31.6, or represents an average recovery of 3.8 percent. The weighted average effective permeability of the samples is 0.59 millidarcys, while the average initial fluid production pressure is 28.6 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 16 samples tested, 7 produced water and oil, and 1 sample water only. This indicates that approximately 44 percent of the sand represented by these samples is floodable pay sand.

CALCULATED RECOVERY

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 950 barrels of oil per acre. This is an average recovery of 146 barrels per acre foot from 6.5 feet of floodable sand analyzed in this core.

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

Original formation volume factor, estimated	1.05
Reservoir water saturation, percent, estimated	45.0
Average porosity, percent	16.5
Oil saturation after flooding, percent	31.6
Performance factor, percent, estimated	55.0
Net floodable sand, feet	6.5

**Oilfield Research Laboratories**

**RESULTS OF SATURATION & PERMEABILITY TESTS**

**TABLE 1-B**

Company Peterland Oil Company Lease Harney Well No. 16

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.		
1	692.3	12.5	23	60	83	223	0.59	0.6	0.6	134	0.35
2	694.7	14.2	2	87	89	22	Imp.	0.7	1.3	15	0.00
3	695.4	9.4	5	91	96	36	Imp.	0.7	2.0	25	0.00
4	696.4	9.3	15	81	96	108	Imp.	0.3	2.3	32	0.00
5	697.6	11.8	19	75	94	174	Imp.	0.3	2.6	52	0.00
6	698.5	17.5	29	53	82	394	8.9	1.0	3.6	394	8.90
7	699.5	16.1	37	46	83	462	10.	1.0	4.6	462	10.00
8	700.5	15.6	32	50	82	387	15.	1.0	5.6	387	15.00
9	701.5	16.9	38	45	83	498	8.9	1.0	6.6	498	8.90
10	702.5	17.2	41	46	87	547	18.	1.0	7.6	547	18.00
11	703.5	15.8	29	52	81	356	26.	0.7	8.3	249	18.20
12	704.4	15.8	41	52	93	503	25.	0.8	9.1	402	20.00
13	720.6	14.0	38	42	80	413	1.8	1.0	10.1	413	1.80
14	721.6	13.7	24	57	81	255	1.6	1.0	11.1	255	1.60
15	722.4	12.4	25	52	77	241	1.5	0.6	11.7	145	0.90
16	724.3	9.8	18	79	97	137	Imp.	0.9	12.6	123	0.00

# Oilfield Research Laboratories

## SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Peterland Oil Company	Lease	Harney	Well No.	16			
Depth Interval, Feet	Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity, Ft. x Md.	Average Percent Oil Saturation	Average Percent Water Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbls./Acre
692.0 - 697.7	692.0 - 697.7	0.6	0.59	0.35	11.1	79.8	99	258
698.3 - 704.8	698.3 - 704.8	6.5	15.2	99.00	35.4	48.9	452	2,939
720.0 - 724.9	720.0 - 724.9	2.6	1.7	4.30	26.6	57.5	267	936
692.0 - 724.9	692.0 - 724.9	9.7	10.7	103.65	28.0	57.7	328	4,133
Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Oil Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbls./Acre			
692.0 - 697.7	2.6	11.7	11.1	99	258			
698.3 - 704.8	6.5	16.5	35.4	452	2,939			
720.0 - 724.9	3.5	12.5	26.6	267	936			
692.0 - 724.9	12.6	14.4	28.0	328	4,133			

# Oilfield Research Laboratories

## RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

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	Bbls./A. Ft.			
1	692.3	12.4	23	221	0	0	23	63	221	14	0.15	10
2	694.7	14.2	2	22	0	0	2	87	22	0	Imp.	-
3	695.4	9.9	4	31	0	0	4	93	31	0	Imp.	-
4	696.4	8.9	16	110	0	0	16	81	110	0	Imp.	-
5	697.6	11.6	20	180	0	0	20	75	180	0	Imp.	-
6	698.5	17.4	29	391	2	27	27	58	364	22	0.37	35
7	699.5	16.1	37	462	3	37	34	64	425	20	0.30	35
8	700.5	15.7	32	390	2	24	30	68	366	106	1.35	15
9	701.5	16.8	38	495	5	65	33	59	430	28	0.37	30
10	702.5	17.2	41	547	6	80	35	55	467	18	0.22	35
11	703.5	15.9	29	358	3	37	26	72	321	48	0.67	25
12	704.4	15.9	41	506	6	74	35	62	432	74	0.97	25
13	720.6	14.3	37	410	0	0	37	46	410	0	Imp.	-
14	721.6	13.2	25	256	0	0	25	58	256	0	Imp.	-
15	722.4	12.9	24	240	0	0	24	55	240	0	Imp.	-
16	724.3	9.3	19	137	0	0	19	79	137	0	Imp.	-

Well No. 16

Lease Harney

Peterland Oil Company

**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

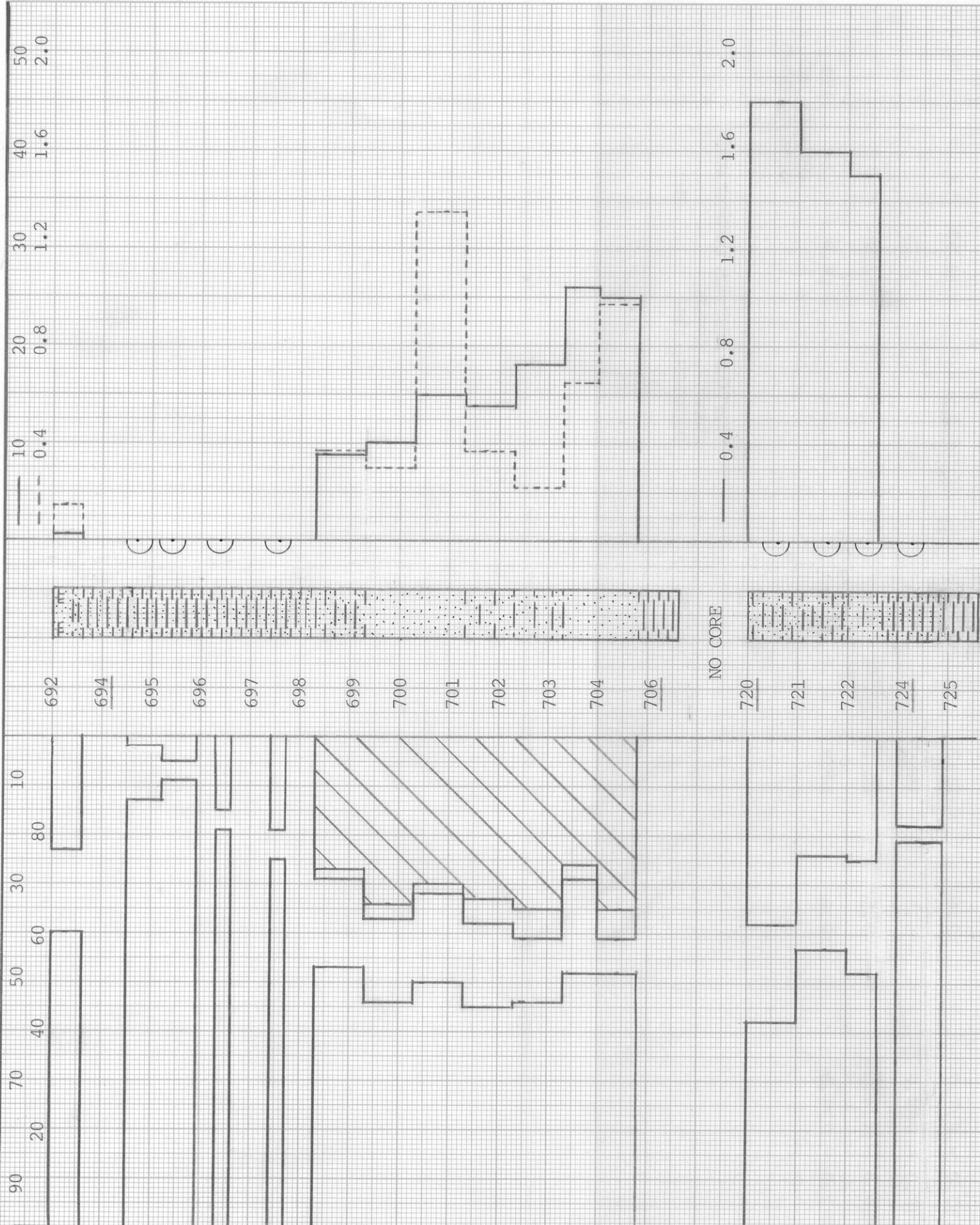
## SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Peterland Oil Company	Lease	Harney	Well No.	16
Depth Interval, Feet	698.3 - 704.8				
Feet of Core Analyzed	6.5				
Average Percent Porosity	16.5				
Average Percent Original Oil Saturation	35.4				
Average Percent Oil Recovery	3.8				
Average Percent Residual Oil Saturation	31.6				
Average Percent Residual Water Saturation	62.2				
Average Percent Total Residual Fluid Saturation	93.8				
Average Original Oil Content, Bbls./A. Ft.	453.				
Average Oil Recovery, Bbls./A. Ft.	49.				
Average Residual Oil Content, Bbls./A. Ft.	404.				
Total Original Oil Content, Bbls./Acre	2,941.				
Total Oil Recovery, Bbls./Acre	318.				
Total Residual Oil Content, Bbls./Acre	2,623.				
Average Effective Permeability, Millidarcys	0.59				
Average Initial Fluid Production Pressure, p.s.i.	28.6				

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

WATER SAT., PERCENT → ← OIL SAT., PERCENT



10 20 30 40 50

0.4 0.8 1.2 1.6 2.0

10 20 30 40 50

0.4 0.8 1.2 1.6 2.0

10 20 30 40 50

0.4 0.8 1.2 1.6 2.0

10 20 30 40 50

0.4 0.8 1.2 1.6 2.0

10 20 30 40 50

0.4 0.8 1.2 1.6 2.0

10 20 30 40 50

0.4 0.8 1.2 1.6 2.0

10 20 30 40 50

0.4 0.8 1.2 1.6 2.0

10 20 30 40 50

0.4 0.8 1.2 1.6 2.0

10 20 30 40 50






0.4 0.8 1.2 1.6 2.0







10 20 30 40 50

0.4 0.8 1.2 1.6 2.0

722  
724  
725

KEY:

-  SANDSTONE
-  SHALE
-  SANDY SHALE
-  SHALY SANDSTONE
-  IMPERMEABLE TO WATER

-  SHALE WITH SANDSTONE PARTINGS
-  SANDSTONE WITH SHALE PARTINGS
-  SHALY SANDSTONE WITH SHALE PARTINGS
-  SHALY CALCAREOUS SANDSTONE WITH SHALE PARTINGS
-  LAMINATED SANDSTONE AND SHALE
-  FLOODPOT RESIDUAL OIL SATURATION

# PETERLAND OIL COMPANY

HARNEY LEASE

MONTCOMERY COUNTY, KANSAS

WELL NO. 16

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
692.0 - 697.7	2.6	11.7	11.1	79.8	0.59	
698.3 - 704.8	6.5	16.5	35.4	48.9	15.2	
720.0 - 724.9	3.5	12.5	26.6	57.5	1.7	
692.0 - 724.9	12.6	14.4	28.0	57.7	10.7	950 (PRIMARY AND WATERFLOODING)

OILFIELD RESEARCH LABORATORIES  
CHANUTE, KANSAS  
DECEMBER, 1982 PDC