

OILFIELD RESEARCH LABORATORIES

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April 23, 1982

CFS Energy, Inc.
2525 Murworth, Suite 10K
Box 20327
Houston, Texas 77054

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Harold Morrell Lease, Well No. Core 11, located in Bourbon County, Kansas and submitted to our laboratory on April 16, 1982.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/kas

5 c to Houston, Texas

- REGISTERED ENGINEERS -

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

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GENERAL INFORMATION & SUMMARY

Company CFS Energy, Inc. Lease Harold Morrell Well No. Core 11
 Location _____
 Section 28 Twp. 23S Rge. 25E County Bourbon State Kansas

Elevation, Feet

Name of Sand.....	Peru
Top of Core	48.8
Bottom of Core	60.2
Top of Sand	49.6
Bottom of Sand (Tested)	59.5
Total Feet of Permeable Sand	9.7
Total Feet of Floodable Sand	2.9

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 5	3.7	3.7
5 - 10	3.0	6.7
10 - 43	3.0	9.7

Average Permeability Millidarcys	10.6
Average Percent Porosity	19.1
Average Percent Oil Saturation	24.9
Average Percent Water Saturation	57.5
Average Oil Content, Bbls./A. Ft.	370.
Total Oil Content, Bbls./Acre	3,587.
Average Percent Oil Recovery by Laboratory Flooding Tests	2.9
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	41.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	119.
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. Fresh water mud was used as a drilling fluid. The core was reported to be from a non-virgin area.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
48.8 - 49.6	Gray shale.
49.6 - 51.2	Light brown shaly sandstone.
51.2 - 51.6	Grayish brown very shaly sandstone.
51.6 - 52.8	Light brown slightly shaly sandstone.
52.8 - 54.5	Light brown shaly sandstone.
54.5 - 54.7	Gray sandy shale.
54.7 - 55.6	Light brown shaly sandstone.
55.6 - 56.8	Light brown sandstone.
56.8 - 57.7	Light brown slightly shaly sandstone.
57.7 - 59.5	Light brown sandstone.
59.5 - 60.2	Dark grayish brown sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 119 barrels of oil per acre was obtained from 2.9 feet of sand. The weighted average percent oil saturation was reduced from 30.6 to 27.7, or represents an average recovery of 2.9 percent. The weighted average effective permeability of the samples is 0.34 millidarcys, while the average initial fluid production pressure is 38.3 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 11 samples tested, 3 produced water and oil, and 5 produced water only. This indicates that approximately 27 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 730 barrels of oil per acre. This is an average recovery of 252 barrels per acre foot from 2.9 feet of floodable sand analyzed in this core.

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

Original formation volume factor, estimated	1.01
Reservoir water saturation, percent, estimated	40.0
Average porosity, percent	18.6
Oil saturation after flooding, percent	27.7
Performance factor, percent, estimated	55.0
Net floodable sand, feet	2.9

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company CFS Energy, Inc. Lease Harold Morrell Well No. Core 11

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			Ft.	Cum. Ft.		
1	49.7	19.6	28	57	85	2.6	0.6	0.6	256	1.56
2	50.5	19.7	31	59	90	1.6	1.0	1.6	474	1.60
3	51.4	17.0	30	61	91	0.41	0.4	2.0	158	0.16
4	52.4	17.8	30	43	73	8.3	1.2	3.2	497	9.96
5	53.3	18.4	31	52	83	2.3	0.7	3.9	310	1.61
6	54.4	17.8	17	62	79	1.6	1.0	4.9	235	1.60
7	55.4	18.4	22	59	81	5.8	0.9	5.8	283	5.22
8	56.6	17.3	22	51	73	13.	1.2	7.0	354	15.60
9	57.5	20.1	13	68	81	9.4	0.9	7.9	183	8.46
10	58.4	20.5	26	67	93	19.	0.8	8.7	331	15.20
11	59.4	23.3	28	61	89	42.	1.0	9.7	506	42.00

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SUMMARY OF PERMEABILITY & SATURATION TESTS
TABLE III

Company	CFS Energy, Inc.	Lease	Harold Morrell	Well No.	Core 11
	Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.	
	49.6 - 53.5	3.9	3.8	14.89	
	53.5 - 59.5	5.8	15.2	88.08	
	49.6 - 59.5	9.7	10.6	102.97	

	Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Oil Saturation	Average Percent Water Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbls./Acre
	49.6 - 53.5	3.9	18.6	30.1	52.7	435	1,695
	53.5 - 59.5	5.8	19.5	21.3	60.7	326	1,892
	49.6 - 59.5	9.7	19.1	24.9	57.5	370	3,587

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

CFS Energy, Inc.			Lease		Harold Morrell		Well No.		Core 11			
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.	
			%	Bbbs./A. Ft.	%	Bbbs./A. Ft.	% Oil	% Water				
1	49.7	19.5	28	424	0	0	28	58	424	0	Imp.	-
2	50.5	19.6	31	471	2	30	29	62	441	8	0.30	45
3	51.4	16.8	30	391	0	0	30	62	391	0	Imp.	-
4	52.4	17.8	30	414	3	41	27	66	373	32	0.45	25
5	53.3	18.3	31	440	4	57	27	69	383	6	0.22	45
6	54.4	17.9	17	236	0	0	17	63	236	0	Imp.	-
7	55.4	18.5	22	316	0	0	22	71	316	44	0.82	40
8	56.6	17.4	22	297	0	0	22	73	297	170	2.40	20
9	57.5	20.0	13	202	0	0	13	79	202	158	1.65	15
10	58.4	20.4	26	411	0	0	26	71	411	240	3.00	10
11	59.4	23.2	28	504	0	0	28	69	504	328	5.34	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.

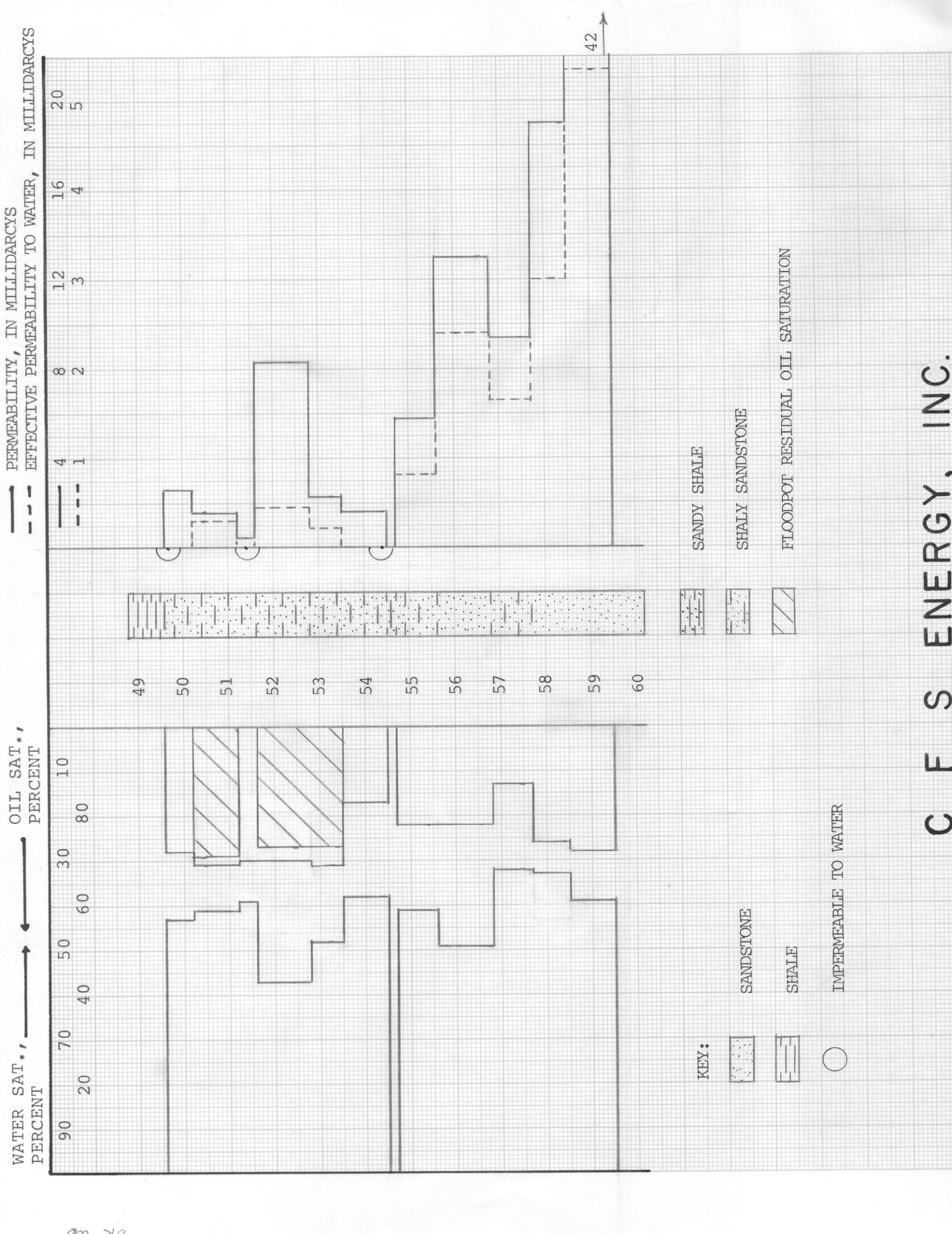
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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	CFS Energy, Inc.	Lease	Harold Morrell	Well No.	Core 11
Depth Interval, Feet	48.8 - 53.5				
Feet of Core Analyzed	2.9				
Average Percent Porosity	18.6				
Average Percent Original Oil Saturation	30.6				
Average Percent Oil Recovery	2.9				
Average Percent Residual Oil Saturation	27.7				
Average Percent Residual Water Saturation	65.3				
Average Percent Total Residual Fluid Saturation	93.0				
Average Original Oil Content, Bbls./A. Ft.	440.				
Average Oil Recovery, Bbls./A. Ft.	41.				
Average Residual Oil Content, Bbls./A. Ft.	399.				
Total Original Oil Content, Bbls./Acre	1,276.				
Total Oil Recovery, Bbls./Acre	119.				
Total Residual Oil Content, Bbls./Acre	1,157.				
Average Effective Permeability, Millidarcys	0.34				
Average Initial Fluid Production Pressure, p.s.i.	38.3				

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





SHALE



FLOODPOT RESIDUAL OIL SATURATION



IMPERMEABLE TO WATER

C F S ENERGY, INC.

HAROLD MORRELL LEASE

WELL NO. CORE 11

BOURBON COUNTY, KANSAS

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE POROSITY PERCENT	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY MILLIDARCYS	CALCULATED OIL RECOVERY BBLs. / ACRE
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49.6 - 53.5	3.9	18.6	30.1	52.7	3.8	
53.5 - 59.5	5.8	19.5	21.3	60.7	15.2	
49.6 - 59.5	9.7	19.1	24.9	57.5	10.6	730

(PRIMARY AND
WATERFLOODING)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
APRIL, 1982

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