

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

CORE ANALYSIS REPORT

FOR

PENNZOIL COMPANY

DAVIDSON NO. 8 WELL
BOGGS FIELD
ROANE COUNTY, WEST VIRGINIA

687-3368

These analyses, opinions or interpretations are based on observations and materials supplied by the client to whom, and for whose exclusive and confidential use, this report is made. The interpretations or opinions expressed represent the best judgment of Core Laboratories, Inc. (all errors and omissions excepted); but Core Laboratories, Inc. and its officers and employees, assume no responsibility and make no warranty or representations, as to the productivity, proper operations, or profitableness of any oil, gas or other mineral well or sand in connection with which such report is used or relied upon.

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CORE LABORATORIES, INC.



P. O. Box 131
Mt. Pleasant, MI 48858

Pennzoil Company
P. O. Drawer 1588
Parkersburg, W. Va. 26101

File No: 3602-656
January 7, 1981

Att: Mr. Stephen Holsclaw

Re: Core Analysis Report
Berea Sandstone Formation
Davidson No. 8 Well
Boggs Field
Roane Co., West Va.

Gentlemen:

A diamond core from this well between the depths of 2484' and 2499' has been received in our laboratory. Upon receipt, the core was oriented, surface-gamma logged and a full diameter sample obtained from each foot of its sandstone interval. The samples' inplace fluids were extracted by vacuum retorting and vertical air permeabilities measured. Subsequent to these analyses the core was reoriented and 1" O.D. cylindrical plugs were obtained from each full diameter sample along a common plane, horizontal to bedding, using water as a coolant. The plugs were cleaned by refluxing toluene through them and dried in a vacuum oven at 140° C. Air permeabilities, Boyle's Law porosities and grain densities were measured on the clean and dried samples. Results of these analyses are herein submitted in tabular and graphical form with a graph of the Surface-Gamma log.

Histogram presentations of permeability/porosity data with their respective tabular data are included. These presentations are primarily designed to aid in selecting "net pay cutoff" values of permeability and/or porosity for the reservoir.

This core is temporarily stored in our laboratory and will be returned to your warehouse via motor freight.

Please note that we have measured porosity on the horizontal plug samples instead of the full diameter samples as we have customarily done for you. The 'cork-screw' shape of the core presents problems in an accurate measurement of full diameter porosity, hence the porosity measurement on plug-type samples.

Pennzoil Company

January 7, 1981

The opportunity to be of service on this well is appreciated and please call if you have any questions.

Very truly yours,

CORE LABORATORIES, INC.



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CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

PENNZOIL COMPANY
DAVIDSON NO. 8 WELL
BOGGS FIELD
ROANE COUNTY, W. V.

DATE: 12-23-80
FORMATION: BEREA SANDSTONE
DRLG. FLUID:
LOCATION:

FILE NO: 3602-656
ENGINEER: MCCLURE
ELEVATION:

* INDICATES PLUG PERM

S INDICATES PRESERVED SAMPLE

SMP. NO.	DEPTH	PERM. TO AIR MD. MAXIMUM 90 DEG VERT.	POROSITY GEX. FLD.	FLUID SATS. OIL WTR.	GR. DEN.	DESCRIPTION
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FULL DIAMETER & CONVENTIONAL ANALYSIS

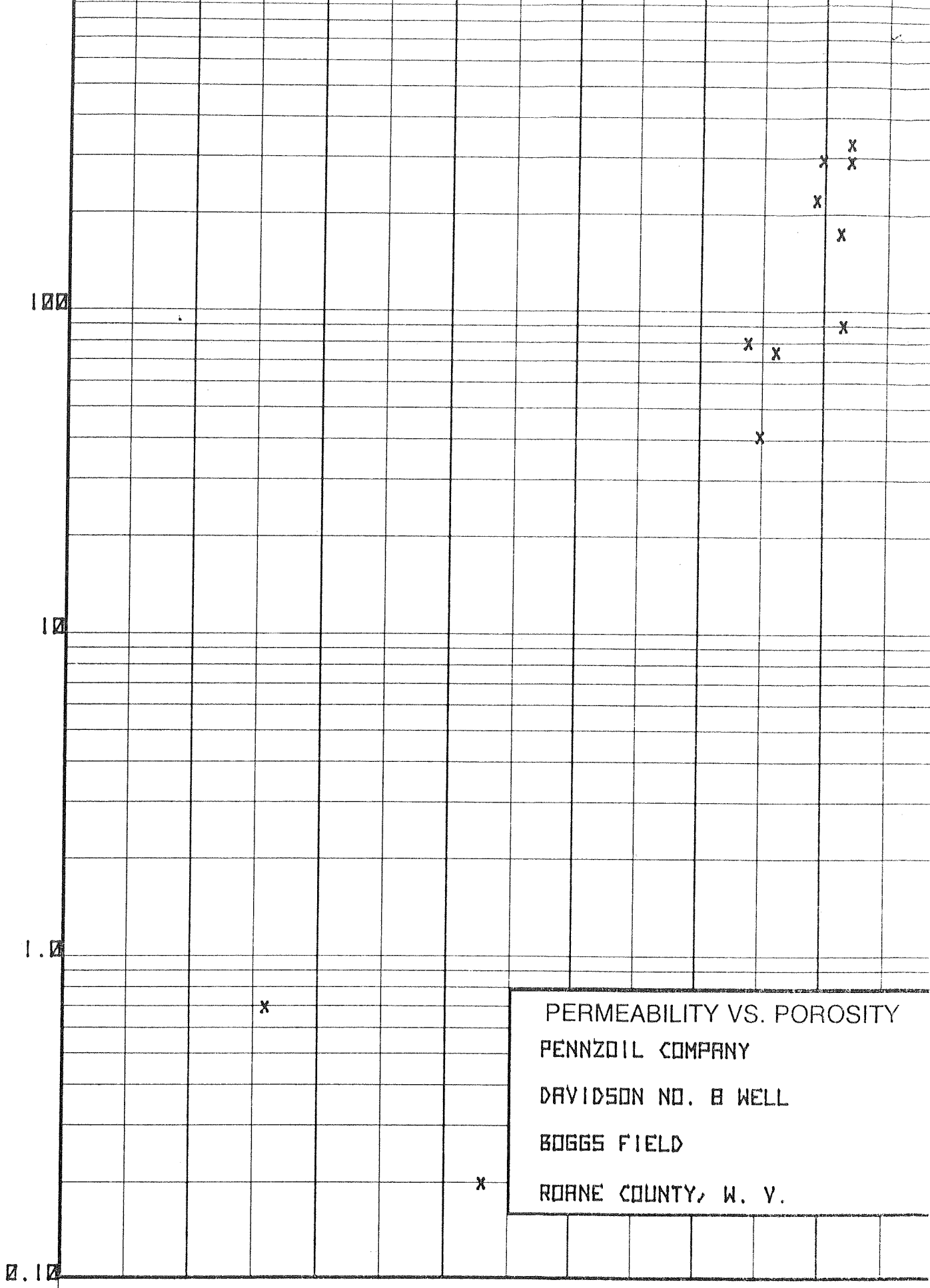
2484.0-2485.5

SHALE-CORE NOT SUBMITTED FOR ANALYSIS

1	2485.5-86.0	*	<0.1	<0.1	9.9	2.73	SS, PYR
2	2486.0-87.0	*	0.2	0.2	13.2	2.65	SS
3	2487.0-88.0	*	<0.1	<0.1	12.7	2.64	SS
4	2488.0-89.0	*	75.0	32.0	22.5	2.66	SS
5	2489.0-90.0	*	330.0	150.0	24.9	2.66	SS
6	2490.0-91.0	*	174.0	109.0	24.6	2.66	SS
7	2491.0-92.0	*	290.0	127.0	24.9	2.66	SS
8	2492.0-93.0	*	221.0	105.0	23.8	2.66	SS
9	2493.0-94.0	*	294.0	322.0	24.0	2.67	SS
10	2494.0-95.0	*	370.0	32.0	23.8	2.66	SS
11	2495.0-96.0	*	41.0	21.0	22.0	2.68	SS
12	2496.0-97.0	*	90.0	31.0	24.7	2.66	SS
13	2497.0-98.0	*	80.0	298.0	21.6	2.66	SS
14	2498.0-99.0	*	0.7	0.4	6.4	2.67	SS

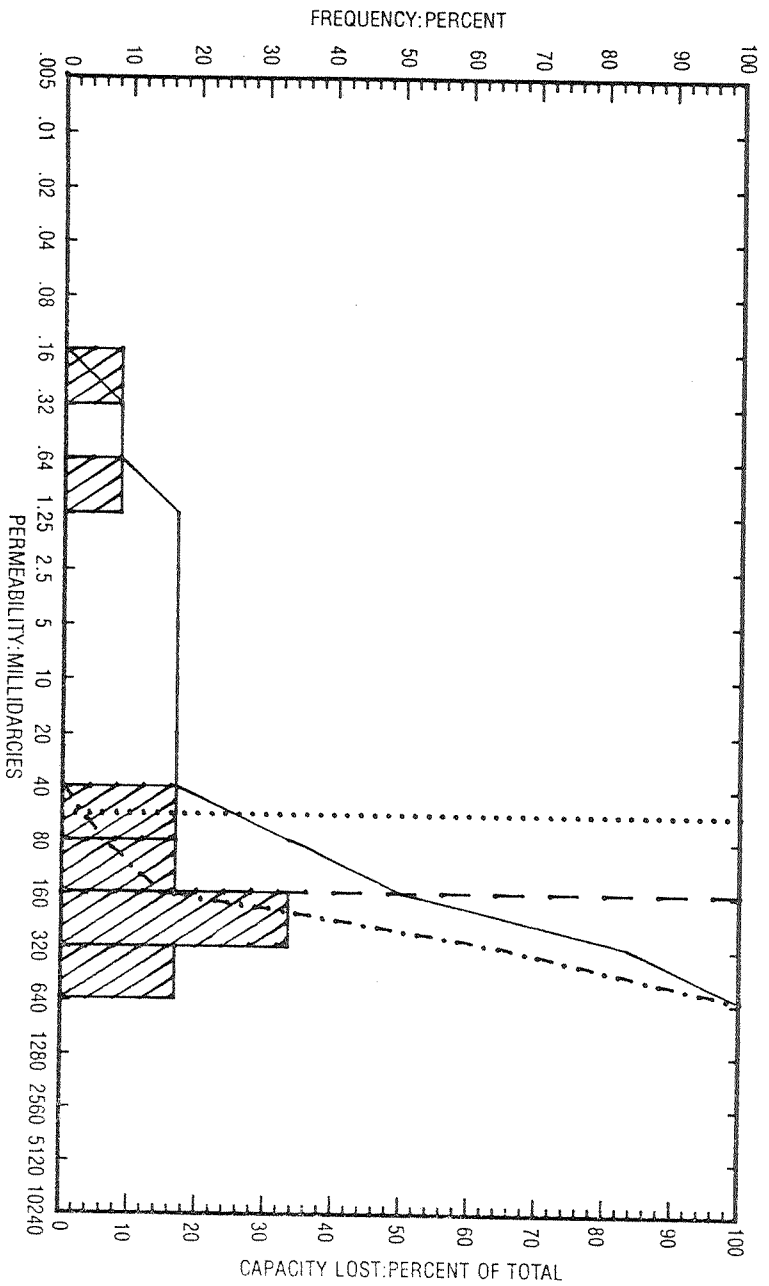
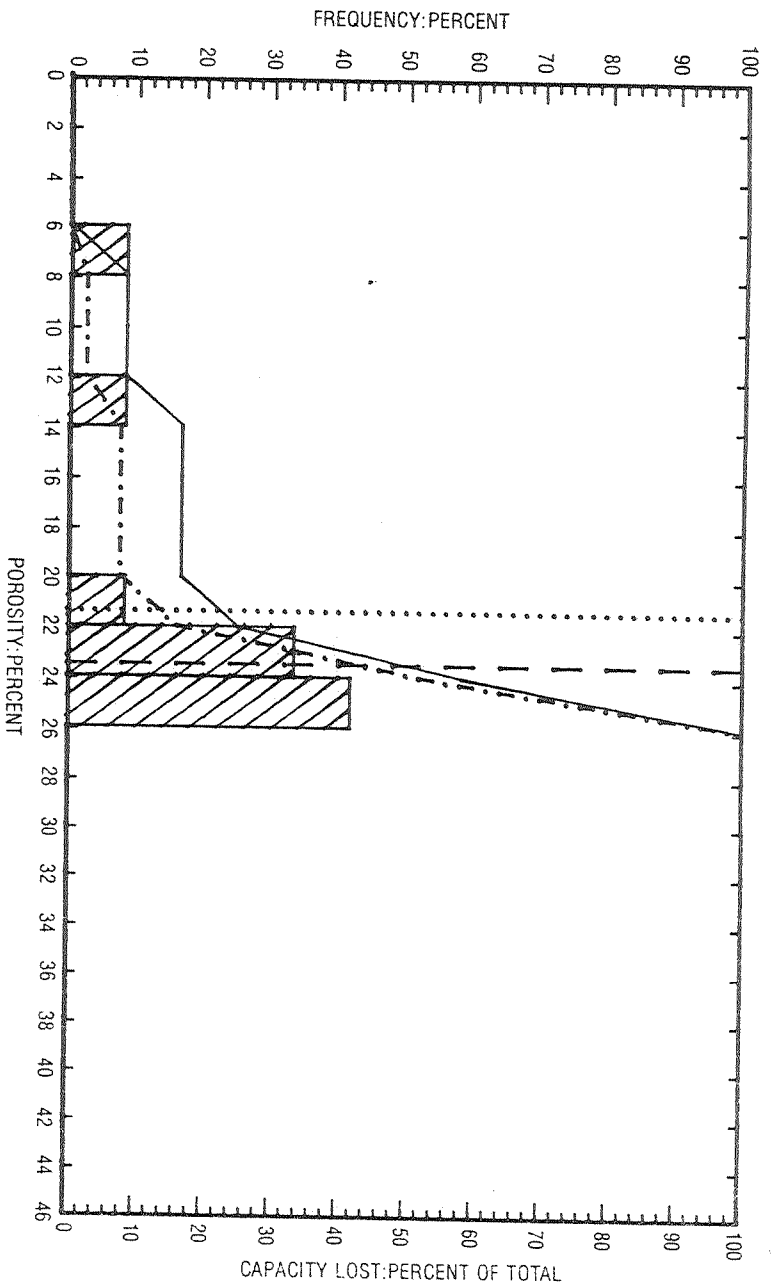
$h = 10'$ $\bar{K} = 197 \text{ md}$ $\bar{\alpha} = 23.7\%$

PERMEABILITY: MILLIDARCIES



PERMEABILITY VS. POROSITY
PENNZOIL COMPANY
DAVIDSON NO. 8 WELL
BOGGS FIELD
ROANE COUNTY, W. V.

4.0 8.0 12.0 16.0 20.0 24.0
POROSITY: PERCENT



PERMEABILITY AND POROSITY HISTOGRAMS

PENNZOIL COMPANY
DRYIDSON NO. 8 WELL
BOGGS FIELD
ROANE COUNTY, W. V.

- LEGEND**
- ARITHMETIC MEAN POROSITY
 - GEOMETRIC MEAN PERMEABILITY
 - MEDIAN VALUE
 - CUMULATIVE FREQUENCY
 - CUMULATIVE CAPACITY LOST

STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PENNZOIL COMPANY
FIELD : BOGGS FIELD

WELL : DAVIDSON NO. 8 WELL
COUNTY, STATE: ROANE COUNTY, W. V.

AIR PERMEABILITY : MD. (HORIZONTAL) RANGE USED 0.100 TO 1000
POROSITY : PERCENT (GAS EXPANSION) RANGE USED 0.0 TO 46.0

(PERMEABILITY UNCORRECTED FOR SLIPPAGE)

DEPTH LIMITS : 2484.0 - 2499.0 INTERVAL LENGTH : 15.0
FEET ANALYZED IN ZONE : 13.5 LITHOLOGY EXCLUDED : NONE

DATA SUMMARY

POROSITY AVERAGE	PERMEABILITY AVERAGES		
	ARITHMETIC	HARMONIC	GEOMETRIC
21.4	164	1.8	57

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STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PENNZOIL COMPANY
 FIELD : BOGGS FIELD

WELL : DAVIDSON NO. 8 WELL
 COUNTY, STATE: ROANE COUNTY, W. V.

GROUPING BY POROSITY RANGES

POROSITY RANGE	FEET IN RANGE	AVERAGE POROSITY	AVERAGE PERM. (GEOM.)	AVERAGE PERM. (ARITH)	FREQUENCY (PERCENT)	CUMULATIVE FREQUENCY (%)
6.0 - 8.0	1.0	6.4	0.700	0.700	8.3	8.3
12.0 - 14.0	1.0	13.2	0.200	0.200	8.3	16.7
20.0 - 22.0	1.0	21.6	80	80	8.3	25.0
22.0 - 24.0	4.0	23.0	126	177	33.3	58.3
24.0 - 26.0	5.0	24.6	213	236	41.7	100.0

TOTAL NUMBER OF FEET = 12.0

STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PENNZOIL COMPANY
 FIELD : BOGGS FIELD

WELL : DAVIDSON NO. 8 WELL
 COUNTY, STATE: ROANE COUNTY, W. V.

GROUPING BY PERMEABILITY RANGES

PERMEABILITY RANGE	FEET IN RANGE	AVERAGE PERM. (GEOM.)	AVERAGE PERM. (ARITH)	AVERAGE POROSITY	FREQUENCY (PERCENT)	CUMULATIVE FREQUENCY (%)
0.156 - 0.313	1.0	0.200	0.200	13.2	8.3	8.3
0.625 - 1.250	1.0	0.700	0.700	6.4	8.3	16.7
40 - 80	2.0	55	58	22.3	16.7	33.3
80 - 160	2.0	85	85	23.2	16.7	50.0
160 - 320	4.0	239	245	24.3	33.3	83.3
320 - 640	2.0	349	350	24.4	16.7	100.0

TOTAL NUMBER OF FEET = 12.0



CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

COMPANY PENNZOIL COMPANY FILE NO. 3602-656
 WELL DAVIDSON NO. 8 DATE 12-23-80
 FIELD BOGGS FORMATION BEREA Ss. ELEV. _____
 COUNTY ROANE STATE W. V. DRLG. FLD. _____ CORES _____
 LOCATION _____

CORRELATION COREGRAPH

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VERTICAL SCALE: 5" = 100'

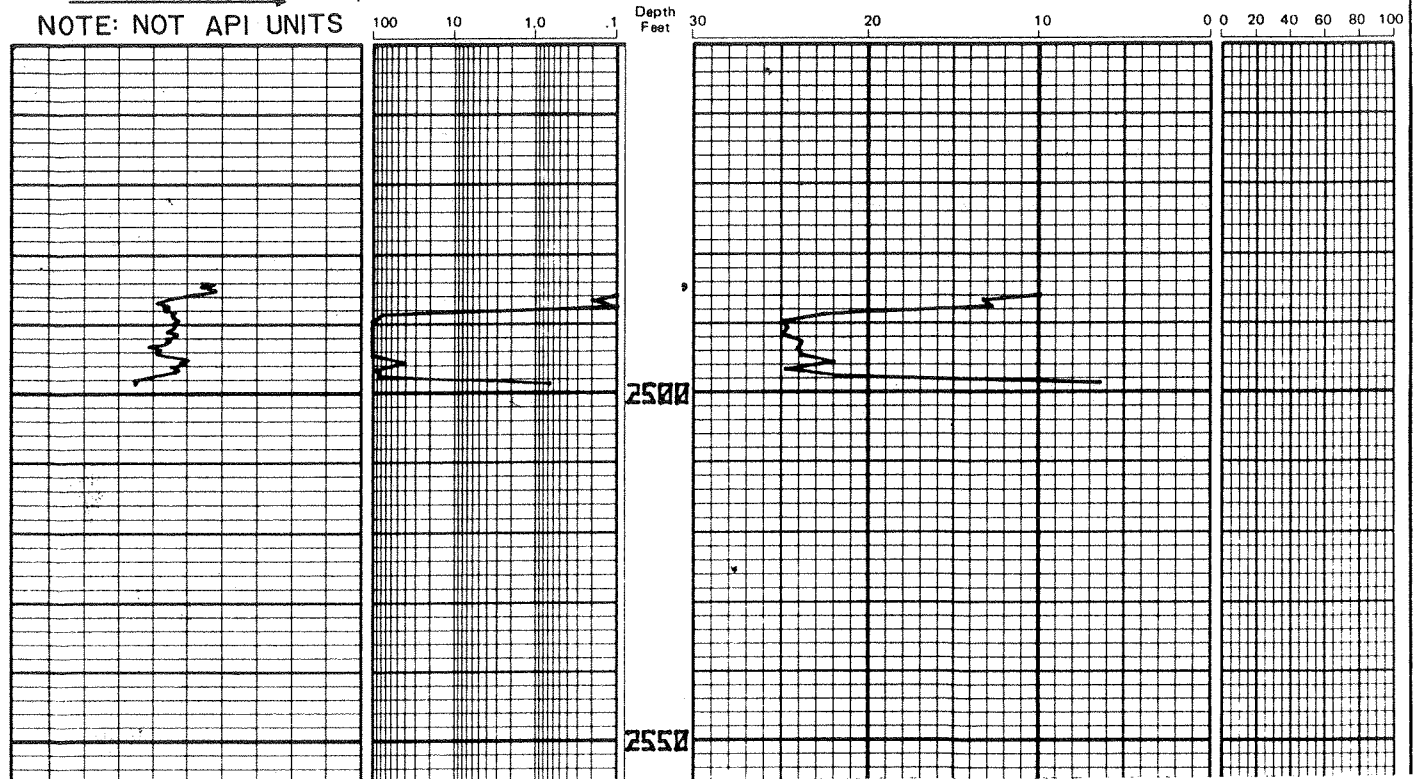
Total Water _____
 PERCENT PORE SPACE
 100 80 60 40 20 0

Gamma Ray
 RADIATION INCREASE →
 NOTE: NOT API UNITS

Permeability K_a - HORIZONTAL
 MILLIDARCIES

Porosity GEX
 PERCENT

Oil Saturation
 PERCENT PORE SPACE



STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PENNZOIL COMPANY
 FIELD : BOGGS FIELD

WELL : DAVIDSON NO. 8 WELL
 COUNTY, STATE: ROANE COUNTY, W. V.

POROSITY-FEET OF STORAGE CAPACITY LOST FOR SELECTED POROSITY CUT OFF

POROSITY CUT OFF	FEET LOST	CAPACITY LOST (%)	FEET REMAINING	CAPACITY REMAINING (%)	ARITH MEAN	MEDIAN
0.0	0.0	0.0	12.0	100.0	21.4	23.5
2.0	0.0	0.0	12.0	100.0	21.4	23.5
4.0	0.0	0.0	12.0	100.0	21.4	23.5
6.0	0.0	0.0	12.0	100.0	21.4	23.5
8.0	1.0	2.5	11.0	97.5	22.7	23.8
10.0	1.0	2.5	11.0	97.5	22.7	23.8
12.0	1.0	2.5	11.0	97.5	22.7	23.8
14.0	2.0	7.6	10.0	92.4	23.7	24.0
16.0	2.0	7.6	10.0	92.4	23.7	24.0
18.0	2.0	7.6	10.0	92.4	23.7	24.0
20.0	2.0	7.6	10.0	92.4	23.7	24.0
22.0	3.0	16.1	9.0	83.9	23.9	24.2
24.0	7.0	52.0	5.0	48.0	24.6	
26.0	12.0	100.0	0.0	0.0		

TOTAL STORAGE CAPACITY IN POROSITY-FEET = 256.4

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STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PENNZOIL COMPANY
 FIELD : BOGGS FIELD

WELL : DAVIDSON NO. 8 WELL
 COUNTY, STATE: ROANE COUNTY, W. V.

MILLIDARCY-FEET OF FLOW CAPACITY LOST FOR SELECTED PERMEABILITY CUT OFF

PERMEABILITY CUT OFF	FEET LOST	CAPACITY LOST (%)	FEET REMAINING	CAPACITY REMAINING (%)	GEOM MEAN	MEDIAN
0.005	0.0	0.0	12.0	100.0	57.25	160.00
0.010	0.0	0.0	12.0	100.0	57.25	160.00
0.020	0.0	0.0	12.0	100.0	57.25	160.00
0.039	0.0	0.0	12.0	100.0	57.25	160.00
0.078	0.0	0.0	12.0	100.0	57.25	160.00
0.156	0.0	0.0	12.0	100.0	57.25	160.00
0.313	1.0	0.0	11.0	100.0	95.75	174.48
0.625	1.0	0.0	11.0	100.0	95.75	174.48
1.250	2.0	0.0	10.0	100.0	156.59	190.27
2.500	2.0	0.0	10.0	100.0	156.59	190.27
5	2.0	0.0	10.0	100.0	156.59	190.27
10	2.0	0.0	10.0	100.0	156.59	190.27
20	2.0	0.0	10.0	100.0	156.59	190.27
40	2.0	0.0	10.0	100.0	156.59	190.27
80	4.0	5.9	8.0	94.1	202.98	226.27
160	6.0	14.6	6.0	85.4	271.47	
320	10.0	64.4	2.0	35.6	349.43	
640	12.0	100.0	0.0	0.0		

TOTAL FLOW CAPACITY IN MILLIDARCY-FEET (ARITHMETIC) = 1965.90

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