

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

CORE ANALYSIS REPORT

FOR

PENNZOIL

SILAS ASH NO. 17 WELL
CENTERPOINT-FLINT RUN FIELD
DODDRIDGE COUNTY, WEST VIRGINIA

017 2512

CORE LABORATORIES, INC.



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

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

File 3602-533
December 12, 1979

Att: Mr. Steven S. Holsclaw

Re: Core Analysis Report
Silas Ash Well No. 17
Pocono Big Injun Sand Formation
Centerpoint-Flint Run Field
Doddridge County, West Virginia

Gentlemen:

A diamond core from this well between the depths of 1939 feet and 1961 feet (excluding the 1953'-1955' interval) has been received in our Michigan laboratory. The following analyses have been performed in accordance with your letter of instructions:

1. Full diameter analysis of porosity and vertical permeability every foot.
2. Full diameter analysis of horizontal permeability every foot (maximum and 90° to maximum).
3. Conventional plug type analysis of horizontal permeability every foot corresponding with the "maximum" full diameter orientation.
4. Grain density every foot.
5. Gamma-Correlation log over entire core interval.

Results of these analyses are herein submitted in tabular and graphical form with a graph of the Surface-Gamma log and porosity-permeability histogram presentations.

This core is being returned to your office via motor freight.

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.

A handwritten signature in cursive script, appearing to read "Mabre Maness".

Mabre Maness
District Manager

er
encl.

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
 DALLAS, TEXAS

PENNZOIL
 SILAS ASH NO. 17 WELL
 CENTERPOINT-FLINT RUN FIELD
 DODDRIDGE COUNTY, WEST VIRGINIA

DATE: 12-3-79
 FORMATION: POCONO BIG INJUN SS
 DELG. FLUID:
 LOCATION:

FILE NO: 3602-533
 ENGINEER: MCCLURE
 ELEVATION:

* INDICATES PLUG PERM

S INDICATES PRESERVED SAMPLE

SMP. NO.	DEPTH	PERM. TO AIR MD. MAXIMUM	90 DEG VERT.	PCRODITY GEX. FLD.	FLUID SATS. OIL WTR.	GR. DEN.	DESCRIPTION
FULL DIAMETER ANALYSIS							
1	1939.0-40.0	0.2	0.2	0.2	6.7	2.73	SS
2	1940.0-41.0	0.4	0.2	<0.1	5.9	2.65	SS
3	1941.0-42.0	0.2	0.2	<0.1	5.4	2.69	SS
4	1942.0-43.0	0.9	0.6	0.2	8.2	2.65	SS
5	1943.0-44.0	6.2	5.7	1.5	12.2	2.68	SS
6	1944.0-45.0	126.0	66.0	44.0	19.4	2.67	SS, FRAC
7	1945.0-46.0	6.5	6.1	0.3	14.7	2.66	SS
8	1946.0-47.0	25.0	24.0	1.3	18.5	2.65	SS
9	1947.0-48.0	*	156.0		26.0	2.65	SS
10	1948.0-49.0	130.0	112.0	19.0	22.1	2.67	SS
11	1949.0-50.0	37.0	36.0	1.7	19.5	2.65	SS
12	1950.0-51.0	31.0	27.0	0.2	17.6	2.65	SS
13	1951.0-52.0	21.0	14.0	2.3	16.2	2.66	SS
14	1952.0-53.0	17.0	16.0	7.8	16.1	2.68	SS
1953.0-1955.0		CORE LOST IN SHIPMENT					
15	1955.0-56.0	0.5	0.4	<0.1	9.9	2.68	SS
16	1956.0-57.0	0.4	0.3	0.2	8.7	2.67	SS
17	1957.0-58.0	0.2	0.2	<0.1	9.7	2.69	SS
18	1958.0-59.0	0.4	0.3	0.4	11.9	2.69	SS
19	1959.0-60.0	0.5	0.5	0.6	11.3	2.69	SS
20	1960.0-61.0	0.2	0.2	<0.1	9.8	2.69	SS

φ = 18.33%

*perhaps in shale
 & wasn't sent? JPB
 12-24*

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
 DALLAS, TEXAS

PENNZOIL
 SILAS ASH NO. 17 WELL
 CENTERPOINT-FLINT RUN FIELD
 DODDRIDGE COUNTY, WEST VIRGINIA

DATE: 12-3-79
 FORMATION: POCONO BIG INJUN SS
 DRLG. FLUID:
 LOCATION:

FILE NO: 3602-533
 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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HORIZONTAL PLUG PERMEABILITIES

1	1939.0-40.0	0.4	6.7
2	1940.0-41.0	0.2	5.9
3	1941.0-42.0	0.3	5.4
4	1942.0-43.0	0.4	8.2
5	1943.0-44.0	8.3	12.2
6	1944.0-45.0	127.0	19.4
7	1945.0-46.0	12.0	14.7
8	1946.0-47.0	41.0	18.5
9	1947.0-48.0	*	26.0
10	1948.0-49.0	112.0	22.1
11	1949.0-50.0	29.0	19.5
12	1950.0-51.0	103.0	17.6
13	1951.0-52.0	13.0	16.2
14	1952.0-53.0	31.0	16.1

1953.0-1955.0 CORE LOST IN SHIPMENT

15	1955.0-56.0	0.9	9.9
16	1956.0-57.0	0.7	8.7
17	1957.0-58.0	0.4	9.7
18	1958.0-59.0	0.9	11.9
19	1959.0-60.0	1.1	11.3
20	1960.0-61.0	0.7	9.8

PERMEABILITY: MILLIDARCIES

FULL DIAMETER DATA

100

10

1.0

0.1

4.0

8.0

12.0

16.0

20.0

24.0

POROSITY: PERCENT

PERMEABILITY VS. POROSITY
PENNZOIL

SILAS ASH NO. 17 WELL

CENTERPOINT-FLINT RUN FIELD

DODDRIDGE COUNTY, WEST VIRG

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 Petroleum Reservoir Engineering
 DALLAS, TEXAS

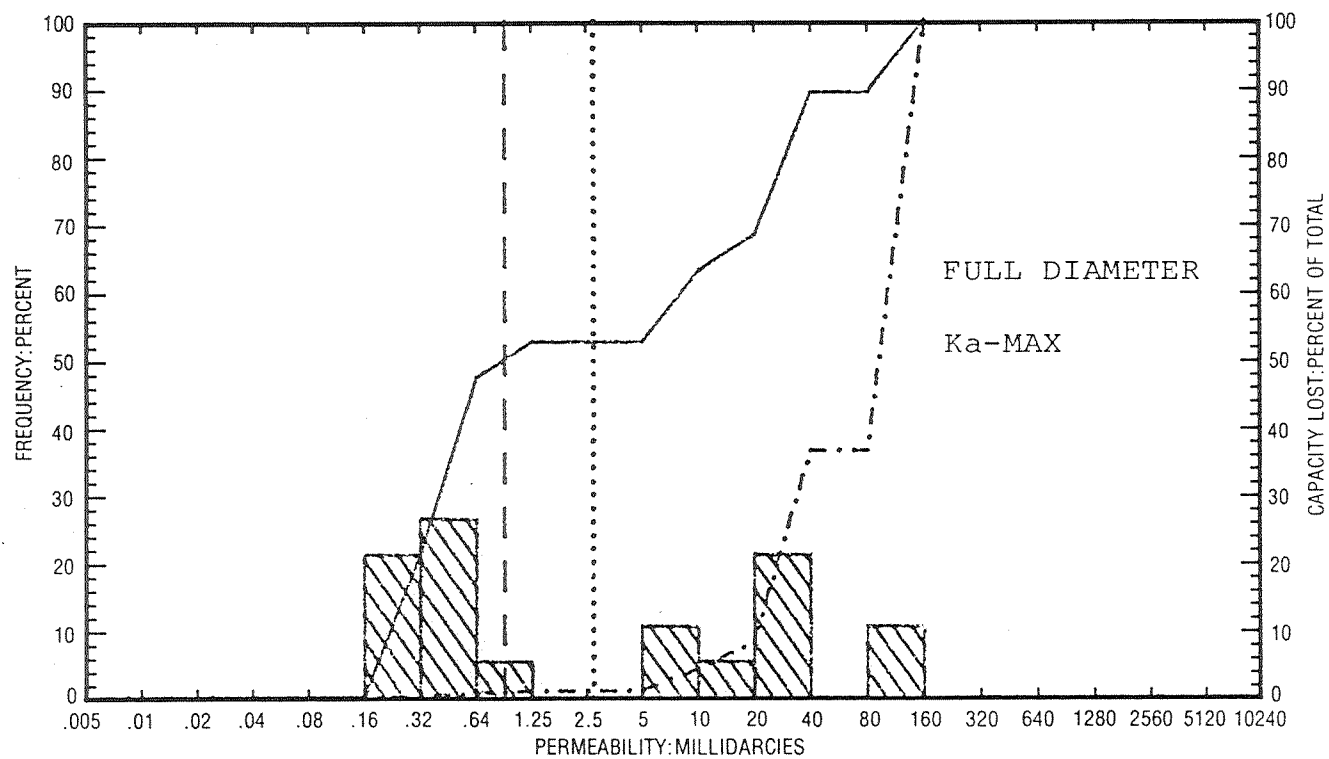
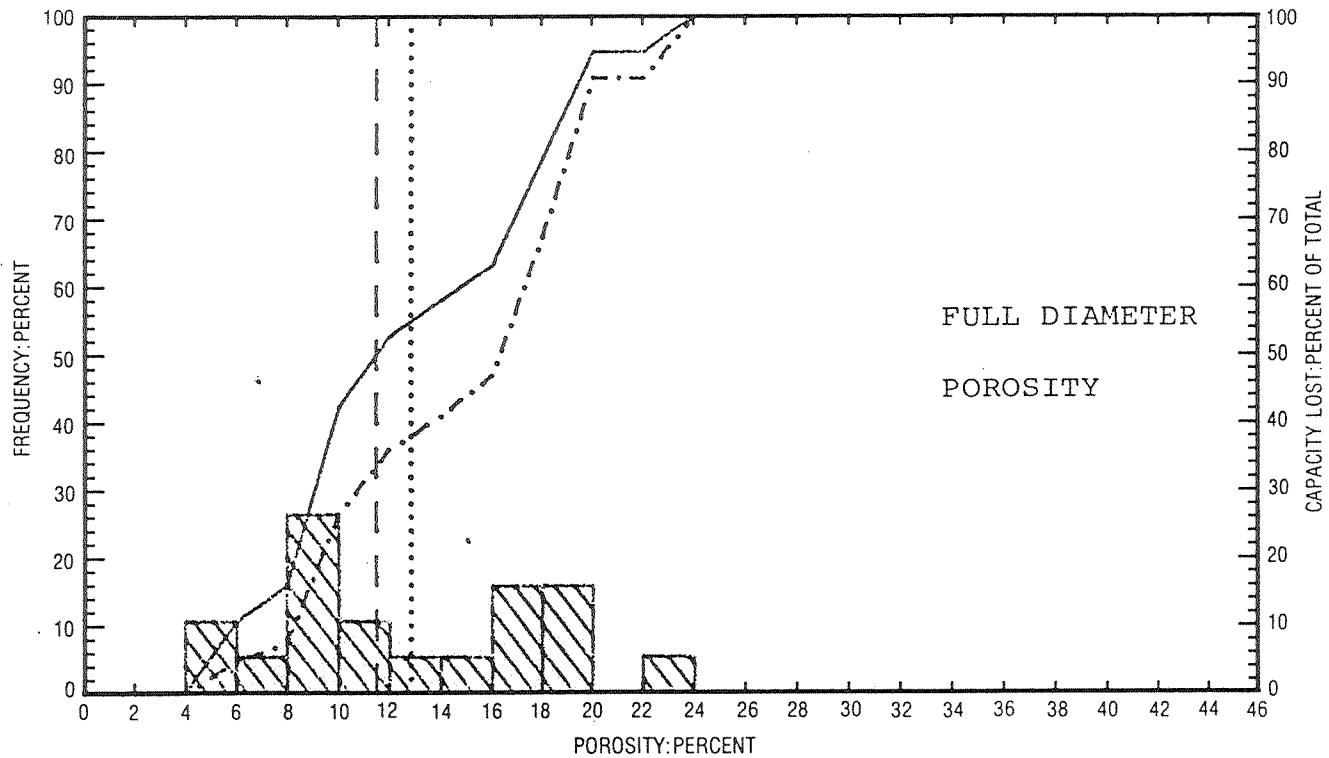
PERMEABILITY VS POROSITY

COMPANY: PENNZOIL
 FIELD : CENTERPOINT-FLINT RUN FIELD

WELL : SILAS ASH NO. 17 WELL
 COUNTY, STATE: DODDRIDGE COUNTY, WEST VIRGINIA

AIR PERMEABILITY : MD - MAX (UNCORRECTED FOR SLIPPAGE)
 POROSITY : PERCENT (GAS EXPANSION)

DEPTH INTERVAL	RANGE & SYMBOL	PERMEABILITY		POROSITY		POROSITY AVERAGE	PERMEABILITY AVERAGES		
		MAXIMUM	MINIMUM	MAX.	MIN.		ARITHMETIC	HARMONIC	GEOMETRIC
1939.0 - 1961.0	1 (O)	1000.0	0.10	46.0	0.0	12.5	16	0.60	2.5



PERMEABILITY AND POROSITY HISTOGRAMS

PENNZOIL
 SILAS ASH NO. 17 WELL
 CENTERPOINT-FLINT RUN FIELD
 DODDRIDGE COUNTY, WEST VIRGINIA

LEGEND
 ARITHMETIC MEAN POROSITY
 GEOMETRIC MEAN PERMEABILITY
 MEDIAN VALUE
 CUMULATIVE FREQUENCY
 CUMULATIVE CAPACITY LOST
 (Note: The legend uses different line styles than those shown in the histograms above.)

STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PENNZOIL WELL : SILAS ASH NO. 17 WELL
FIELD : CENTERPOINT-FLINT RUN FIELD COUNTY, STATE: DODDRIDGE COUNTY, WEST VIRGINIA

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

(PERMEABILITY UNCORRECTED FOR SLIPPAGE)

DEPTH LIMITS : 1939.0 - 1961.0 INTERVAL LENGTH : 22.0
FEET ANALYZED IN ZONE : 20.0 LITHOLOGY EXCLUDED : NONE

DATA SUMMARY

POROSITY AVERAGE	PERMEABILITY AVERAGES		
	ARITHMETIC	HARMONIC	GEOMETRIC
----- 12.8	----- 21	----- 0.57	----- 2.7

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STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PENNZOIL
 FIELD : CENTERPOINT-FLINT RUN FIELD

WELL : SILAS ASH NO. 17 WELL
 COUNTY, STATE: DODDRIDGE COUNTY, WEST VIRGINIA

GROUPING BY POROSITY RANGES

POROSITY RANGE	FEET IN RANGE	AVERAGE POROSITY	AVERAGE PERM. (GEOM.)	AVERAGE PERM. (ARITH)	FREQUENCY (PERCENT)	CUMULATIVE FREQUENCY (%)
4.0 - 6.0	2.0	5.7	0.283	0.300	10.5	10.5
6.0 - 8.0	1.0	6.7	0.200	0.200	5.3	15.8
8.0 - 10.0	5.0	9.3	0.373	0.440	26.3	42.1
10.0 - 12.0	2.0	11.6	0.447	0.450	10.5	52.6
12.0 - 14.0	1.0	12.2	6.2	6.2	5.3	57.9
14.0 - 16.0	1.0	14.7	6.5	6.5	5.3	63.2
16.0 - 18.0	3.0	16.6	22	23	15.8	78.9
18.0 - 20.0	3.0	19.1	49	63	15.8	94.7
22.0 - 24.0	1.0	22.1	130	130	5.3	100.0

TOTAL NUMBER OF FEET = 19.0

STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PENNZOIL
 FIELD : CENTERPOINT-FLINT RUN FIELD

WELL : SILAS ASH NO. 17 WELL
 COUNTY, STATE: DODDRIDGE COUNTY, WEST VIRGINIA

GROUPING BY PERMEABILITY RANGES

PERMEABILITY RANGE	FEET IN RANGE	AVERAGE FERM. (GEOM.)	AVERAGE FERM. (ARITH)	AVERAGE POROSITY	FREQUENCY (PERCENT)	CUMULATIVE FREQUENCY (%)
0.156 - 0.313	4.0	0.200	0.200	7.9	21.1	21.1
0.313 - 0.625	5.0	0.437	0.440	9.5	26.3	47.4
0.625 - 1.250	1.0	0.900	0.900	8.2	5.3	52.6
5 - 10	2.0	6.3	6.4	13.5	10.5	63.2
10 - 20	1.0	17	17	16.1	5.3	68.4
20 - 40	4.0	23	29	18.0	21.1	89.5
80 - 160	2.0	128	128	20.8	10.5	100.0

TOTAL NUMBER OF FEET = 19.0

STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PENNZOIL
 FIELD : CENTERPOINT-FLINT RUN FIELD

WELL : SILAS ASH NO. 17 WELL
 COUNTY, STATE: DODDRIDGE COUNTY, WEST VIRGINIA

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	19.0	100.0	12.8	11.5
2.0	0.0	0.0	19.0	100.0	12.8	11.5
4.0	0.0	0.0	19.0	100.0	12.8	11.5
6.0	2.0	4.6	17.0	95.4	13.7	13.0
8.0	3.0	7.4	16.0	92.6	14.1	14.0
10.0	8.0	26.4	11.0	73.6	16.3	17.0
12.0	10.0	35.9	9.0	64.1	17.4	17.7
14.0	11.0	40.9	8.0	59.1	18.0	18.0
16.0	12.0	46.9	7.0	53.1	18.5	18.3
18.0	15.0	67.4	4.0	32.6	19.9	
20.0	18.0	90.9	1.0	9.1	22.1	
22.0	18.0	90.9	1.0	9.1	22.1	
24.0	19.0	100.0	0.0	0.0		

TOTAL STORAGE CAPACITY IN POROSITY-FEET = 243.8

PERMEABILITY: MILLIDARCIES

100

10

1.0

0.10

Ka-MAX (PLUG DATA)

PERMEABILITY VS. POROSITY
PENNSYLVANIA
SILAS ASH NO. 17 WELL
CENTERPOINT-FLINT RUN FIELD
DODDRIDGE COUNTY, WEST VIRGINIA

4.0

8.0

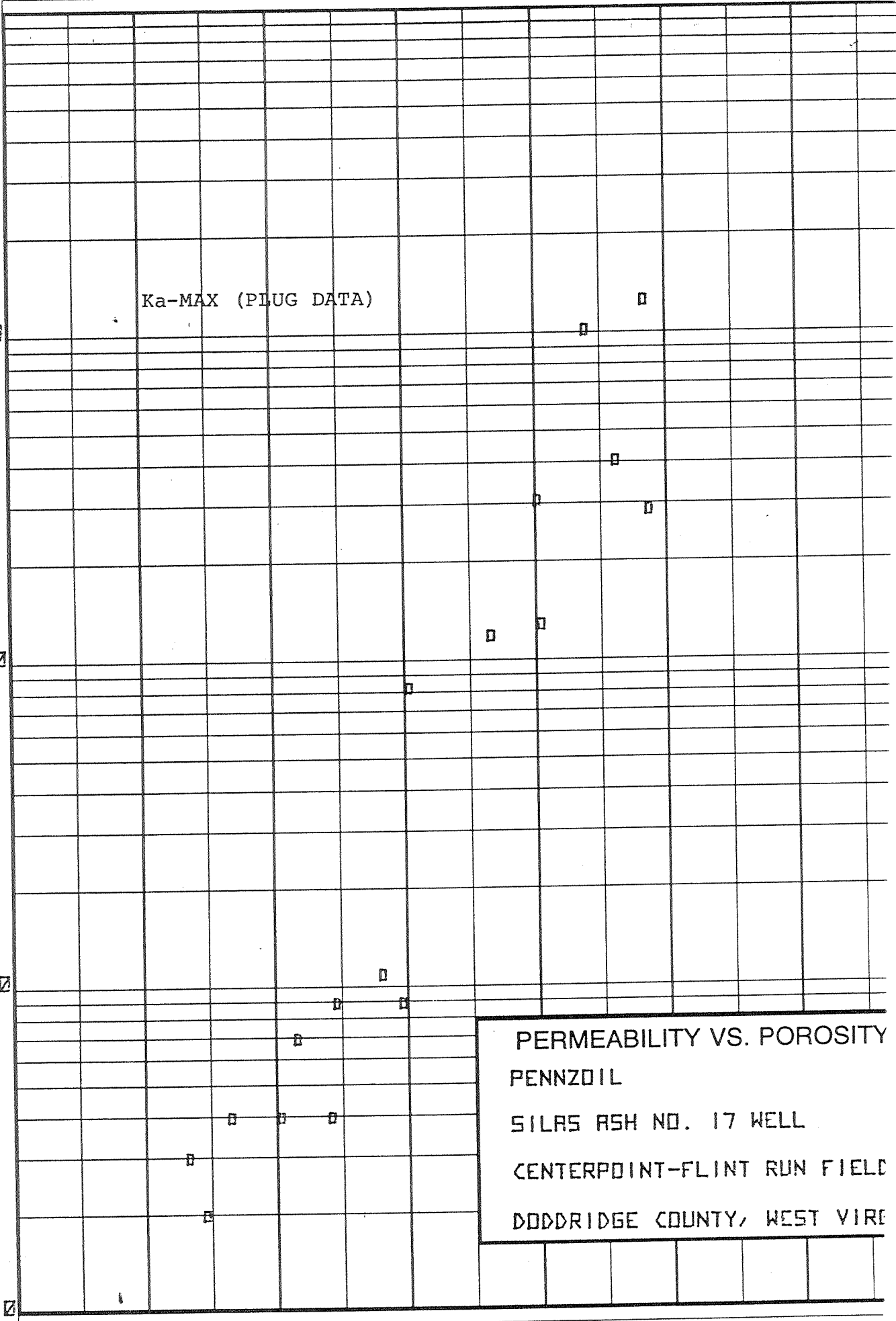
12.0

16.0

20.0

24.0

POROSITY: PERCENT



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 DALLAS, TEXAS

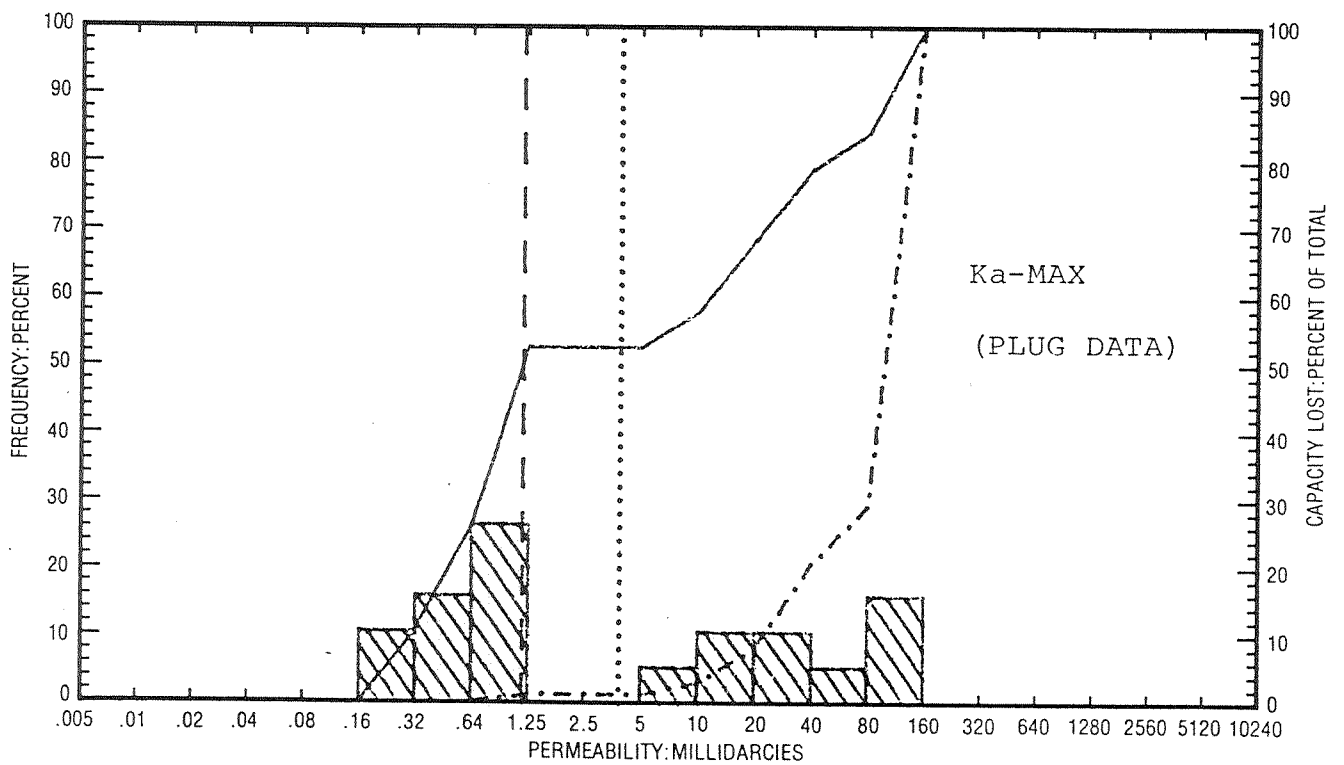
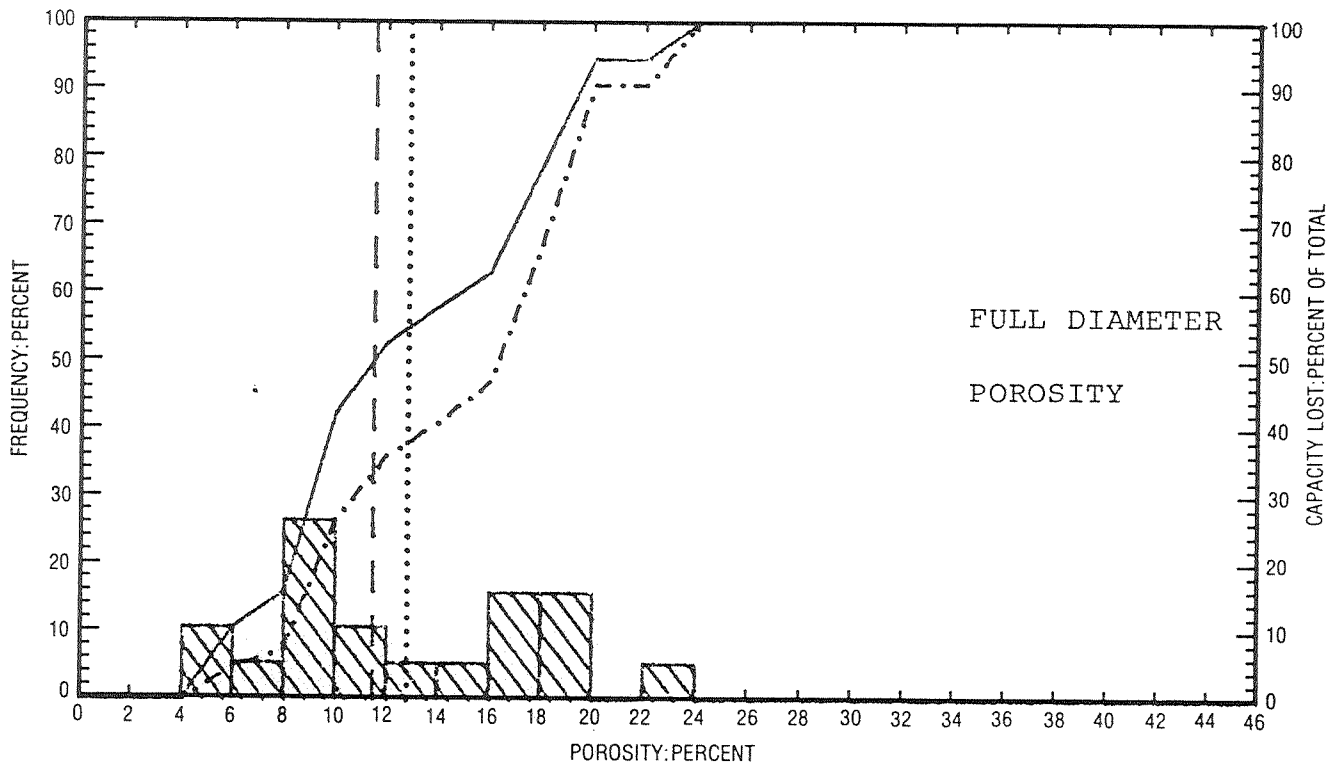
PERMEABILITY VS POROSITY

COMPANY: PENNZOIL
 FIELD : CENTERPOINT-FLINT RUN FIELD

WELL : SILAS ASH NO. 17 WELL
 COUNTY, STATE: DODDRIDGE COUNTY, WEST VIRGINIA

AIR PERMEABILITY : MD - MAX-PLUG DATA (UNCORRECTED FOR SLIPPAGE)
 POROSITY : PERCENT (GAS EXPANSION)

DEPTH INTERVAL	RANGE & SYMBOL	PERMEABILITY		POROSITY		POROSITY AVERAGE	PERMEABILITY AVERAGES		
		MAXIMUM	MINIMUM	MAX.	MIN.		ARITHMETIC	HARMONIC	GEOMETRIC
1939.0 - 1961.0	1 (0)	1000.0	0.10	46.0	0.0	12.5	22	0.82	3.5



PERMEABILITY AND POROSITY HISTOGRAMS

PENNZDIL
 SILAS ASH NO. 17 WELL
 CENTERPOINT-FLINT RUN FIELD
 DODDRIDGE COUNTY, WEST VIRGINIA

LEGEND

- ARITHMETIC MEAN POROSITY (dotted line)
- GEOMETRIC MEAN PERMEABILITY (dotted line)
- MEDIAN VALUE (dashed line)
- CUMULATIVE FREQUENCY (solid line)
- CUMULATIVE CAPACITY LOST (dash-dot line)

STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PENNZOIL WELL : SILAS ASH NO. 17 WELL
FIELD : CENTERPOINT-FLINT RUN FIELD COUNTY, STATE: DODDRIDGE COUNTY, WEST VIRGINIA

AIR PERMEABILITY : MD. (MAX-PLUG DATA) RANGE USED 0.100 TO 1000
POROSITY : PERCENT (GAS EXPANSION) RANGE USED 0.0 TO 46.0

(PERMEABILITY UNCORRECTED FOR SLIPPAGE)

DEPTH LIMITS : 1939.0 - 1961.0 INTERVAL LENGTH : 22.0
FEET ANALYZED IN ZONE : 20.0 LITHOLOGY EXCLUDED : NONE

DATA SUMMARY

POROSITY AVERAGE	PERMEABILITY AVERAGES		
	ARITHMETIC	HARMONIC	GEOMETRIC
----- 12.8	----- 25	----- 0.86	----- 3.8

STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PENNZOIL
 FIELD : CENTERPOINT-FLINT RUN FIELD

WELL : SILAS ASH NO. 17 WELL
 COUNTY, STATE: DODDRIDGE COUNTY, WEST VIRGINIA

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	2.0	0.245	0.250	5.7	10.5	10.5
0.313 - 0.625	3.0	0.400	0.400	8.2	15.8	26.3
0.625 - 1.250	5.0	0.847	0.860	10.3	26.3	52.6
5 - 10	1.0	8.3	8.3	12.2	5.3	57.9
10 - 20	2.0	12	13	15.5	10.5	68.4
20 - 40	2.0	30	30	17.8	10.5	78.9
40 - 80	1.0	41	41	18.5	5.3	84.2
80 - 160	3.0	114	114	19.7	15.8	100.0

TOTAL NUMBER OF FEET = 19.0

STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PENNZOIL
 FIELD : CENTERPOINT-FLINT RUN FIELD

WELL : SILAS ASH NO. 17 WELL
 COUNTY, STATE: DODDRIDGE COUNTY, WEST VIRGINIA

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	19.0	100.0	12.8	11.5
2.0	0.0	0.0	19.0	100.0	12.8	11.5
4.0	0.0	0.0	19.0	100.0	12.8	11.5
6.0	2.0	4.6	17.0	95.4	13.7	13.0
8.0	3.0	7.4	16.0	92.6	14.1	14.0
10.0	8.0	26.4	11.0	73.6	16.3	17.0
12.0	10.0	35.9	9.0	64.1	17.4	17.7
14.0	11.0	40.9	8.0	59.1	18.0	18.0
16.0	12.0	46.9	7.0	53.1	18.5	18.3
18.0	15.0	67.4	4.0	32.6	19.9	
20.0	18.0	90.9	1.0	9.1	22.1	
22.0	18.0	90.9	1.0	9.1	22.1	
24.0	19.0	100.0	0.0	0.0		

TOTAL STORAGE CAPACITY IN POROSITY-FEET = 243.8

STATISTICAL DATA FOR POROSITY AND PERMEABILITY HISTOGRAM

COMPANY: PENNZOIL
 FIELD : CENTERPOINT-FLINT RUN FIELD

WELL : SILAS ASH NO. 17 WELL
 COUNTY, STATE: DODDRIDGE COUNTY, WEST VIRGINIA

MILLIADRCY-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	19.0	100.0	3.82	1.17
0.010	0.0	0.0	19.0	100.0	3.82	1.17
0.020	0.0	0.0	19.0	100.0	3.82	1.17
0.039	0.0	0.0	19.0	100.0	3.82	1.17
0.078	0.0	0.0	19.0	100.0	3.82	1.17
0.156	0.0	0.0	19.0	100.0	3.82	1.17
0.313	2.0	0.1	17.0	99.9	5.28	7.07
0.625	5.0	0.4	14.0	99.6	9.19	14.14
1.250	10.0	1.2	9.0	98.8	34.54	33.64
2.500	10.0	1.2	9.0	98.8	34.54	33.64
5	10.0	1.2	9.0	98.8	34.54	33.64
10	11.0	3.0	8.0	97.0	41.27	40.00
20	13.0	8.1	6.0	91.9	61.48	80.00
40	15.0	20.6	4.0	79.4	88.03	100.79
80	16.0	29.1	3.0	70.9	113.57	
160	19.0	100.0	0.0	0.0		

TOTAL FLOW CAPACITY IN MILLIDARCY-FEET (ARITHMETIC) = 482.30

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

CORE LABORATORIES, INC.



Petroleum Reservoir Engineering

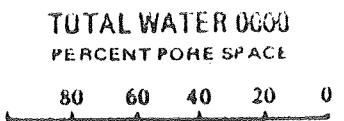
COMPANY PENNZOIL FIELD CENTERPOINT-FLINT FILE 3602-533
 WELL SILAS ASH NO. 17 COUNTY DODDRIDGE DATE 12-3-79
 LOCATION _____ STATE WEST VIRGINIA ELEV. _____

CORE-GAMMA CORRELATION

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VERTICAL SCALE: 5" = 100'
 Ka- MAX (PLUG DATA)

OVERLAY



GAMMA RAY
 RADIATION INCREASE
 →

PERMEABILITY Ka- MAX (PLUG DATA)
 MILLIDARCS

POROSITY GEX (FULL DIAMETER)
 PERCENT

OIL SATURATION XXXX
 PERCENT PORE SPACE

100.0 10.0 1.0 0.1 30 20 10 0 0 20 40 60 80

