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The Log Analysis Yellow Pages
An Excel 5 Workbook of Core and Log Petrophysical Functions

by

John H. Doveton

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THE LOG ANALYSIS YELLOW PAGES

INTRODUCTION

The EXCEL workbook on the diskette of this manual consists of worksheets that perform simple but powerful core and log petrophysical functions. The set is in the public domain, so users are free to adapt or combine sheet functions or add sheets of their own devising. Neither the author nor the Kansas Geological Survey take any responsibility for the accuracy or validity of the software or the use of the results. However, the sheets have been developed and tested over several years as part of the teaching component of the course on well logging in the Chemical & Petroleum Engineering Department of the University of Kansas.

Each sheet consists of either "yellow" cells (the majority) or "white" cells. White cells identify input values required from the user; output values are computed within the yellow cell area. The sheets are intended to be used as templates for petrophysical analysis and contain examples to allow the user to become familiar with the operations of the sheet, both computationally and petrophysically. In applications to the user's data, it is suggested that a copy of the sheet be made and the new data substituted into the appropriate cells. In instances where the user data set is larger than the template example, the user will click and drag the computation cells to complete output columns.

The workbook was created in EXCEL 5 (perhaps a "standard" EXCEL) so that the functions are compatible with the variety of successor versions.

Comments and suggestions on this workbook should be sent to
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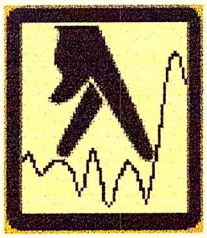
John H. Doveton
December, 2001



THE LOG ANALYSIS YELLOW PAGES

CORE-M	Core measurements of porosity and formation factor
VUGS	Watfa-Nurmi equation to estimate vug porosity
SENSITIVITY	Archie equation water saturation sensitivity analysis
ARPS	Arps' equation (temperature conversion of Rw1 to Rw2)
CHEMRW	Water resistivity estimation from brine composition
ARCHIE	Archie equation estimation of water saturation
RWA	Reconaissance water resistivity (Rwa) method
PICKETT	Resistivity-porosity Pickett plot
BUCKLES	Buckles' plot (porosity versus water saturation)
TIMUR	Timur equation to predict permeability
MOVE	Movable and residual hydrocarbon saturation estimation
SPRW	SP log estimation of formation water resistivity
SONIC	Archie equation used with sonic log
DENSITY	Archie equation used with density log
DENS-NEUT	Archie equation used with density and neutron logs
NDXPLOT	Neutron-density log crossplot
RHOmaa-Umaa	RHOmaa-Umaa computation and crossplot
NUGENT	Nugent equation estimation of variable m
SHSS	Simandoux equation for shaly sandstone analysis
r35	Winland equation to estimate r35
Cp	Pittman equation modelling of capillary pressure function
COMP	Compositional analysis of minerals and porosity

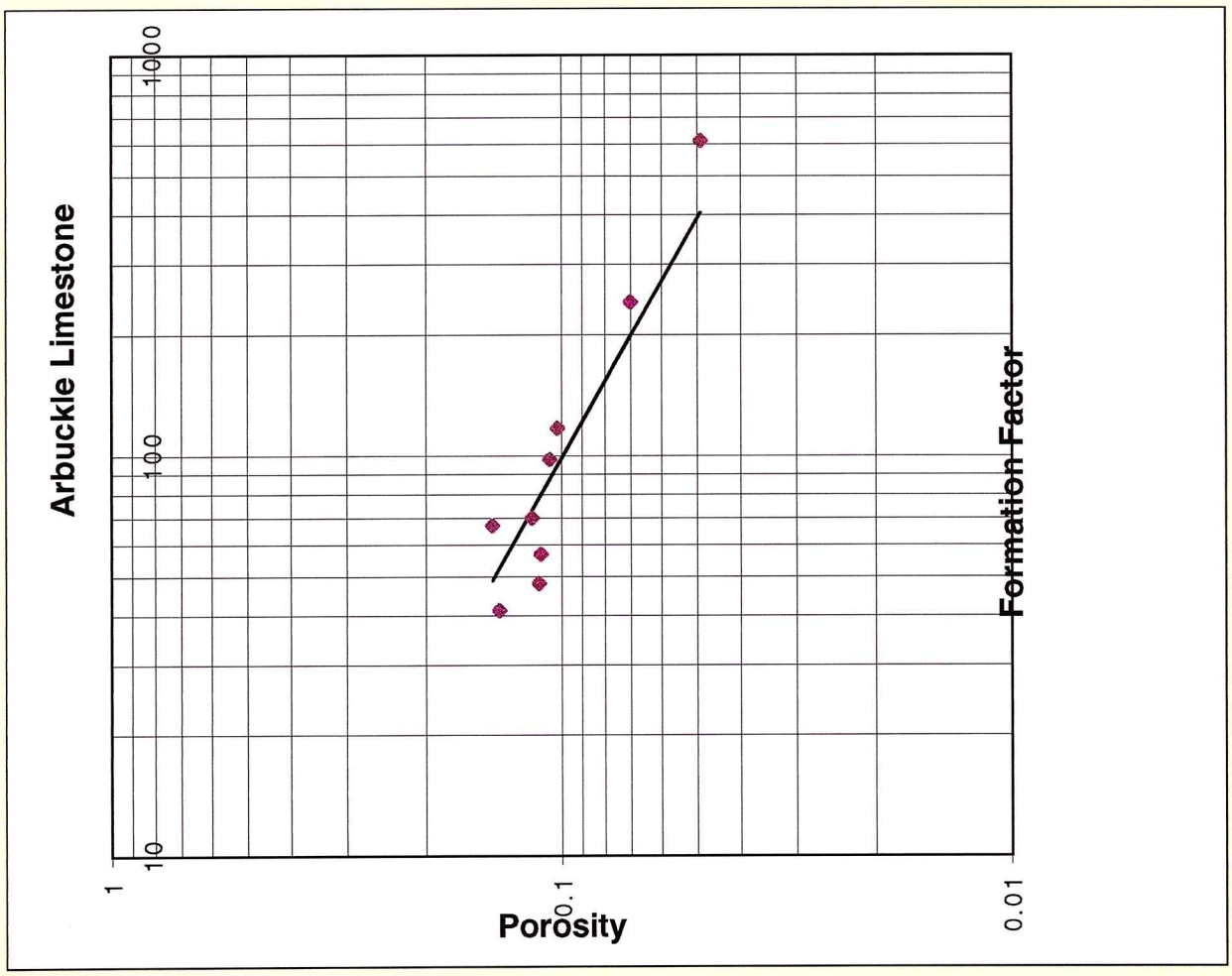
ESTIMATION OF THE ARCHIE EQUATION CEMENTATION EXPONENT, m
FROM CORE MEASUREMENTS OF POROSITY AND FORMATION FACTOR

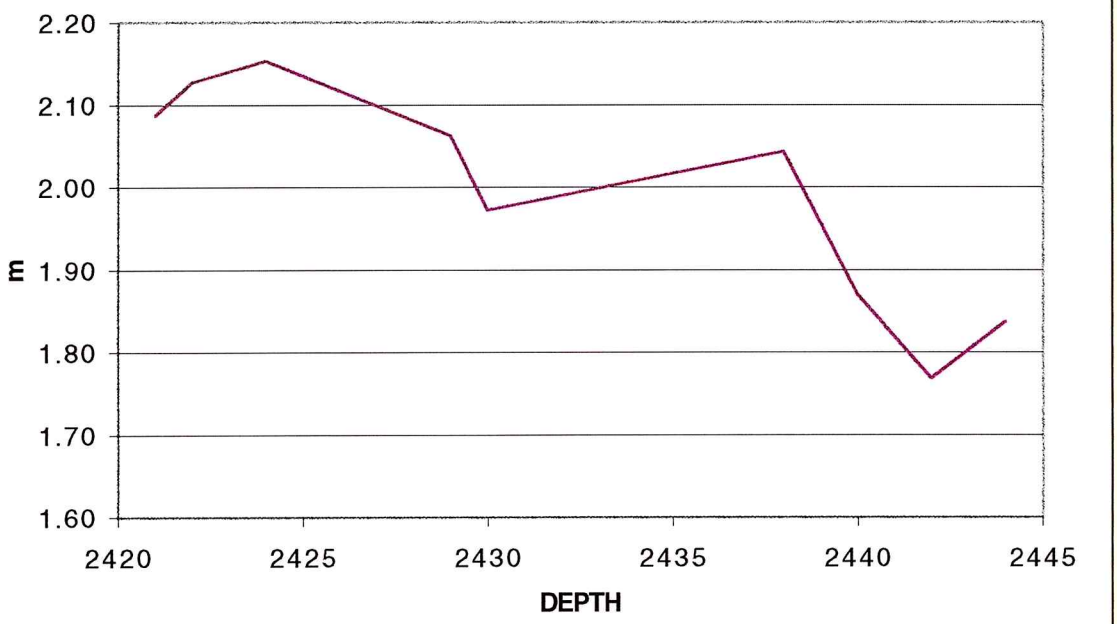
Well:	USGS-KGS Big Springs #1 13-12S-17E, Douglas Co., Ks
Formation:	Arbuckle Limestone (Cambro-Ordovician)

Parameters	
a	1
m	1.99

Depth	Phi	F	Fa	Ma
2421	0.102	117	93.9	2.09
2422	0.049	611	404.1	2.13
2424	0.142	66.9	48.6	2.15
2429	0.07	241	198.7	2.06
2430	0.116	70	72.7	1.97
2438	0.106	98	87.0	2.04
2440	0.137	41.1	52.2	1.87
2442	0.112	48	78.0	1.77
2444	0.111	56.7	79.4	1.84

MEAN m
1.99

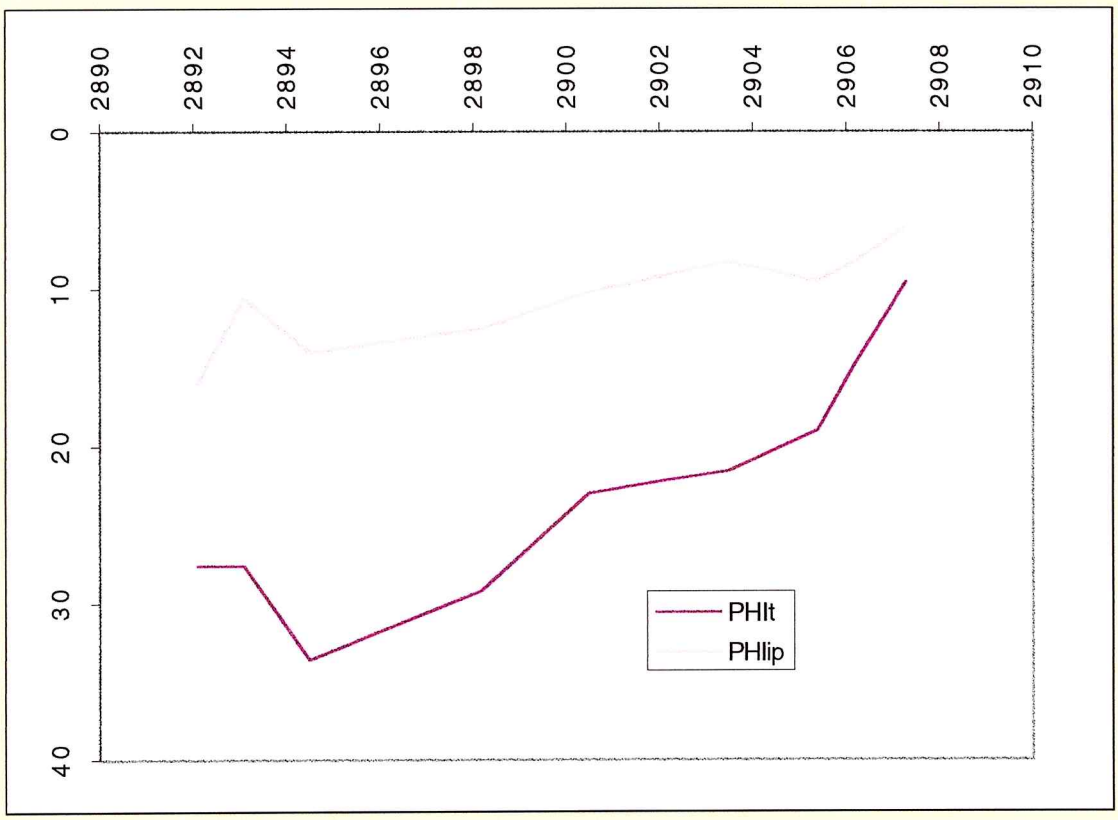



2.20
2.10
2.00
m 1.90
1.80
1.70
1.60
2420
2425
2430
2435
2440
2445
DEPTH

WATFA-NURMI EQUATION TO ESTIMATE VUG POROSITY

Well:	Murfin Carter-Colliver#1 28-14S-13W	
Formation:	Lansing 'C' oomoldic limestone	

			A=1	POROSITY%		
Depth	**Phi**	**F**	**Ma**	**PHIt**	**PHIip**	**PHIvug**
2892.1	0.276	39	2.85	27.6	16.0	11.6
2893.1	0.276	89.8	3.49	27.6	10.6	17.0
2894.5	0.336	51	3.61	33.6	14.0	19.6
2898.2	0.292	63.6	3.37	29.2	12.5	16.7
2900.5	0.23	96.2	3.11	23	10.2	12.8
2902.1	0.222	118.8	3.17	22.2	9.2	13.0
2903.5	0.216	145.2	3.25	21.6	8.3	13.3
2905.4	0.19	109.8	2.83	19	9.5	9.5
2906.2	0.148	145.4	2.61	14.8	8.3	6.5
2907.3	0.096	271.4	2.39	9.6	6.1	3.5

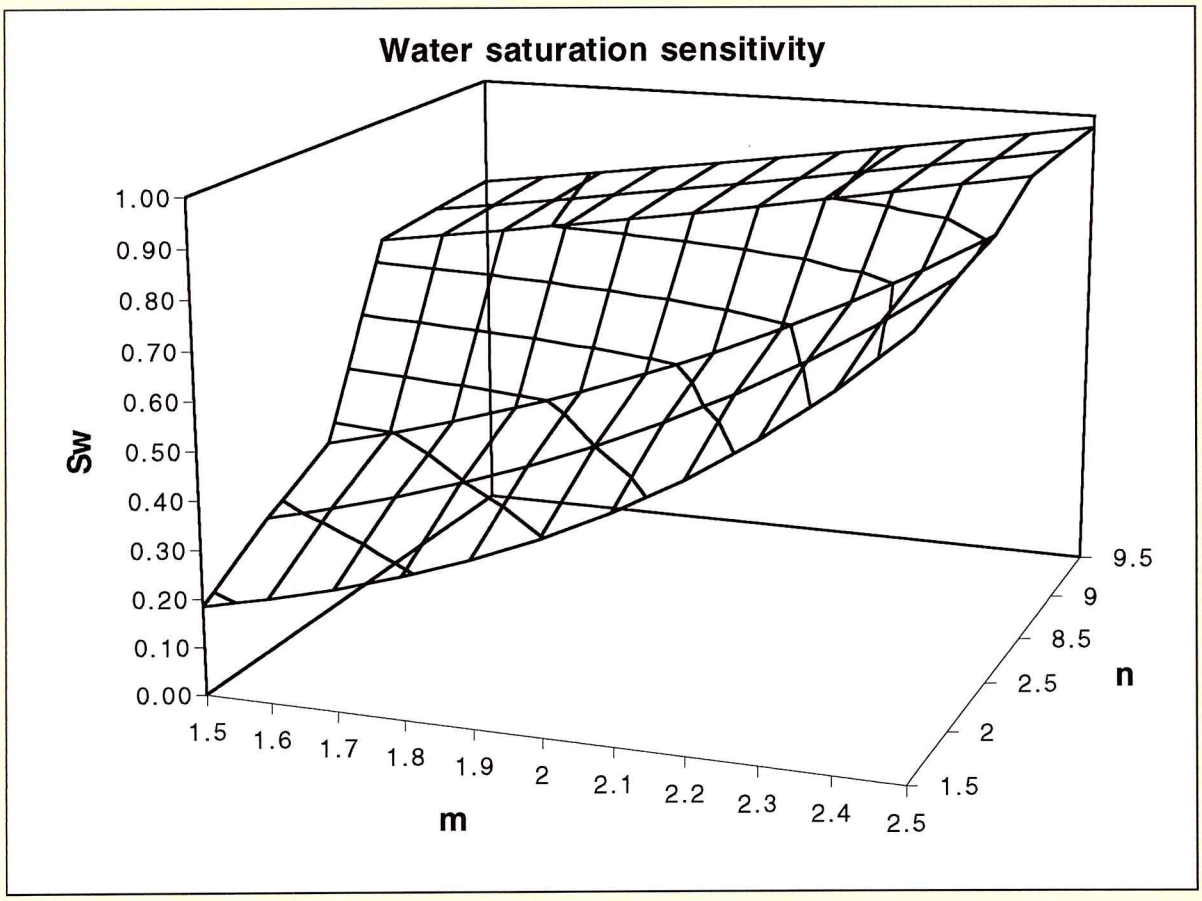


ARCHIE EQUATION WATER SATURATION SENSITIVITY ANALYSIS

ZONE	Rw	Phi	Rt
	0.1	0.1	40

A=1

		Sw	N= Water-wet			Oil-wet		
			1.5	2	2.5	8.5	9	9.5
		1.5	0.18	0.28	0.36	0.74	0.75	0.77
		1.6	0.21	0.32	0.40	0.76	0.77	0.78
Fractures		1.7	0.25	0.35	0.44	0.78	0.79	0.80
		1.8	0.29	0.40	0.48	0.80	0.81	0.82
		1.9	0.34	0.45	0.52	0.83	0.84	0.84
Interparticle	M=	2	0.40	0.50	0.57	0.85	0.86	0.86
		2.1	0.46	0.56	0.63	0.87	0.88	0.89
		2.2	0.54	0.63	0.69	0.90	0.90	0.91
Vugs		2.3	0.63	0.71	0.76	0.92	0.93	0.93
		2.4	0.73	0.79	0.83	0.95	0.95	0.95
		2.5	0.85	0.89	0.91	0.97	0.97	0.98



CONVERSION OF FORMATION WATER RESISTIVITIES FROM A MEASUREMENT TEMPERATURE TO A FORMATION TEMPERATURE COMPUTED USING ARPS' EQUATION (FAHRENHEIT VERSION)

Well:	Shell Robbins #1-32 (Glick)			
Formation:	Mississippi "Chat"			

Formation temperature calculation:

	DEPTH		TEMPERATURE	
Surface	0		ST	57
Formation	FD	4838	**FT**	111.7
Bottom hole	TD	5398	BHT	118

KEY:
ST = Mean annual surface temperature
TD = Total depth
BHT = Bottom-hole temperature
FD = Formation depth
FT = Formation temperature

Arps' equation:

	Rw1	0.05	T1	75
	RwFT	0.035	FT	111.7

Rw1 = Formation water resistivity at temperature T1
RwFT = Formation water resistivity corrected to Ft

WATER RESISTIVITY ESTIMATION FROM BRINE COMPOSITION

Well:	Oasis Deutsch #1 C-NE-SE 33-21S-24W Hodgeman Co, Ks
Formation:	Warsaw Formation (Mississippian)

Well Parameters	
ST	57
TD	4723
BHT	117
FormD	4650

Formation Estimates	
FormT	116
Measured Rw @ FormT =	0.116
Estimated Rw @ FormT =	0.1043

Measured Rw @ T deg F =	0.17
T =	77
Measured Rw @75 DEG F=	0.1741

Water data:

Density (gm/cc)=	1.032
pH =	6.7

CATIONS	**mg/l**	**meq/l**
Sodium	12990	564.8
Potassium		0.0
Calcium	2010	100.5
Magnesium	660	54.3
	Sum equiv. cations =	719.6

ANIONS	**mg/l**	**meq/l**
Chloride	23520	663.3
Bicarbonate	350	5.7
Sulfate	2440	50.8
Carbonate		0.0
	Sum equiv. anions =	719.9

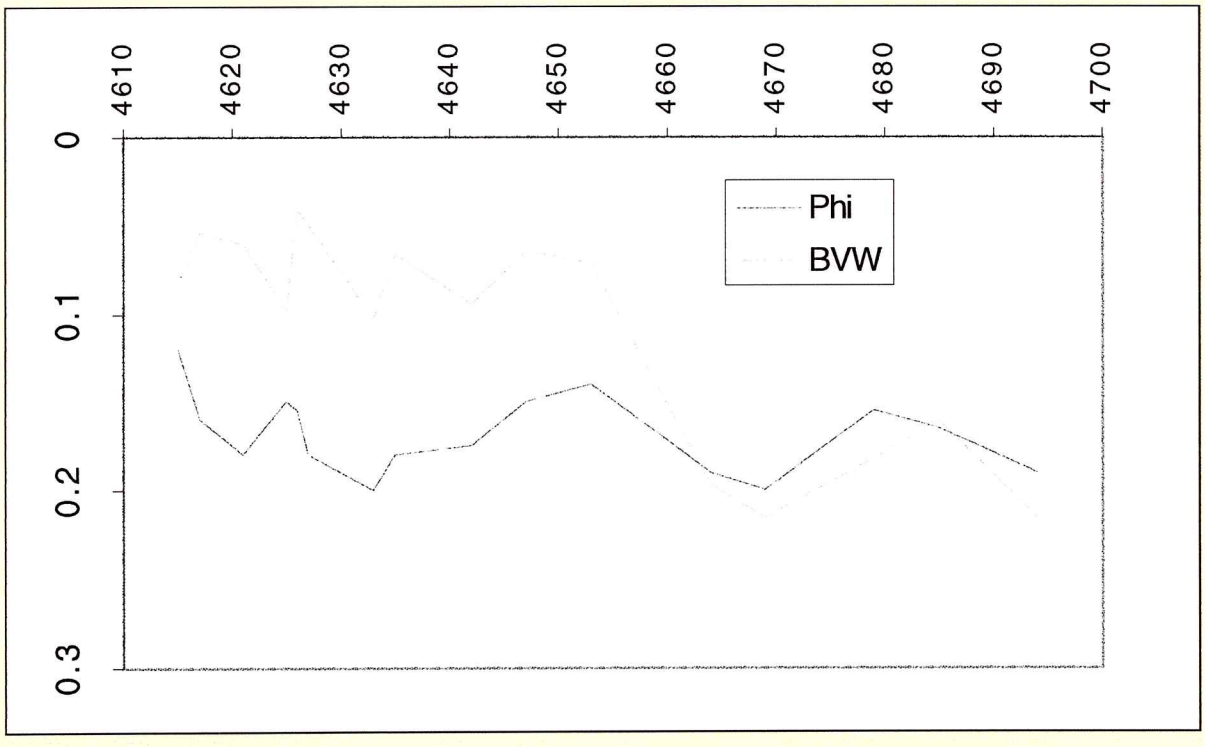
Anion/cation imbalance% =	0.0
TDS (mg/l)	41970
TDS Equiv.NaCl (mg/l)	42077
TDS Equiv.NaCl (ppm)	40772
Estimated Rw @75 DEG F=	0.157

ARCHIE EQUATION ESTIMATION OF WATER SATURATION

Well:	Oasis Deutsch #1 C-NE-SE 33-21S-24W
Formation:	Warsaw Formation (Mississippian)

Parameters	
a	1
m	2
n	2
Rw	0.116

Depth	Phi	Rt	Sw	BVW
4615	0.12	17	0.69	0.08
4617	0.16	40	0.34	0.05
4621	0.18	32	0.33	0.06
4625	0.15	12	0.66	0.10
4626	0.155	70	0.26	0.04
4627	0.18	48	0.27	0.05
4633	0.2	11	0.51	0.10
4635	0.18	27	0.36	0.07
4642	0.175	13	0.54	0.09
4647	0.15	28	0.43	0.06
4653	0.14	23	0.51	0.07
4664	0.19	3	1.03	0.20
4669	0.2	2.5	1.08	0.22
4679	0.155	3.5	1.17	0.18
4685	0.165	4.5	0.97	0.16
4694	0.19	2.5	1.13	0.22



RECONNAISSANCE WATER RESISTIVITY (Rwa) METHOD TO ESTIMATE Rw

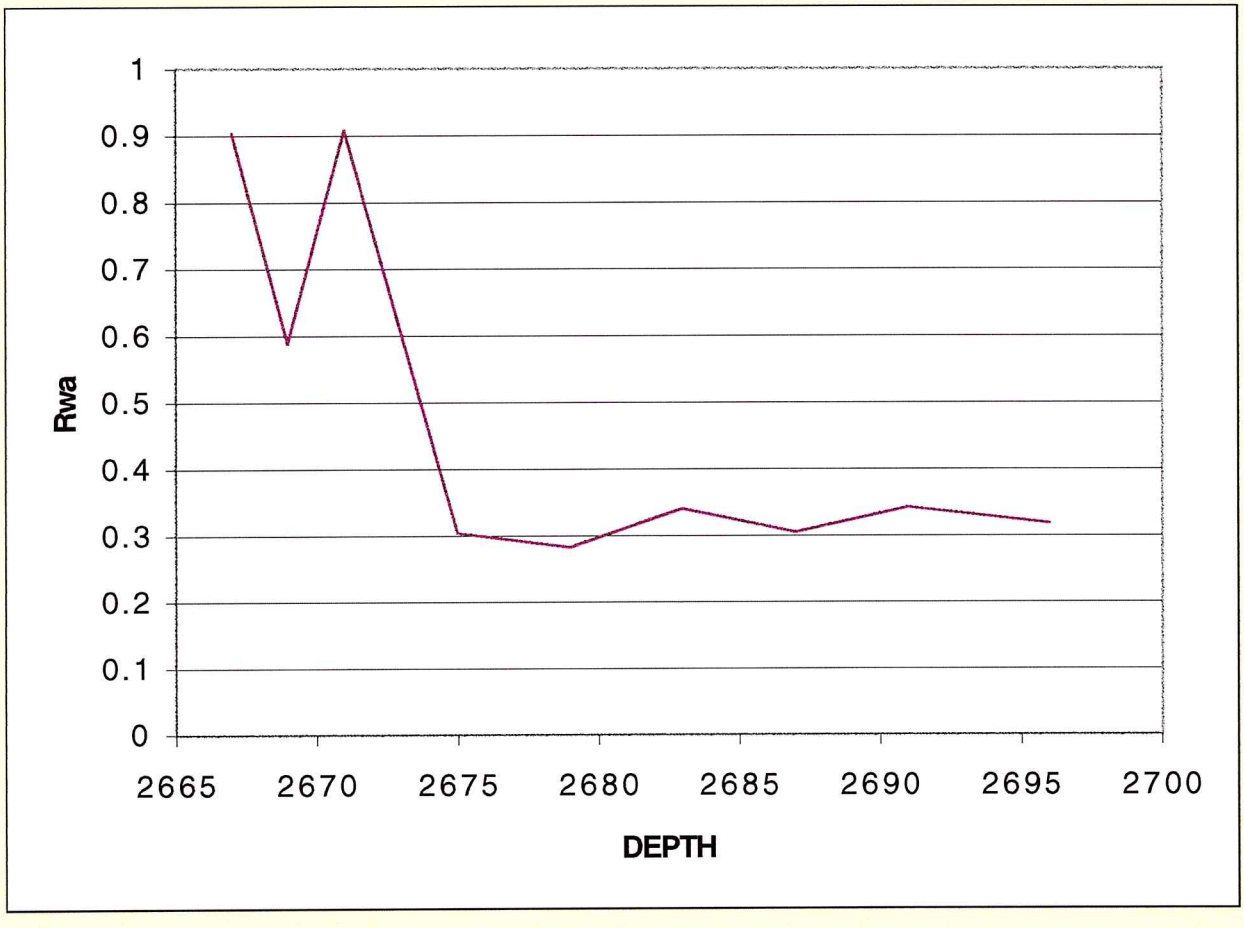
Well:	Cities Service Beck A-1 14-5S-12E	
Formation:	St.Peter Sandstone (Middle Ordovician)	

Parameters	
a	0.62
m	2.15
n	2
Rw	0.315

Depth	Phi	Rt	Rwa	SQRTRwa	Sw
2667	0.13	45	0.903	0.950385	0.591
2669	0.14	25	0.588	0.767117	0.732
2671	0.19	20	0.908	0.952751	0.589
2675	0.17	8.5	0.304	0.551	1.018
2679	0.16	9	0.282	0.531	1.056
2683	0.19	7.5	0.340	0.583	0.962
2687	0.2	6	0.304	0.551	1.018
2691	0.23	5	0.342	0.585	0.959
2696	0.19	7	0.318	0.564	0.996

MEAN SQUARE ROOT RWA **FOR WATER ZONES =** 0.561

SQUARED MSR RWA ESTIMATE OF RW = 0.315

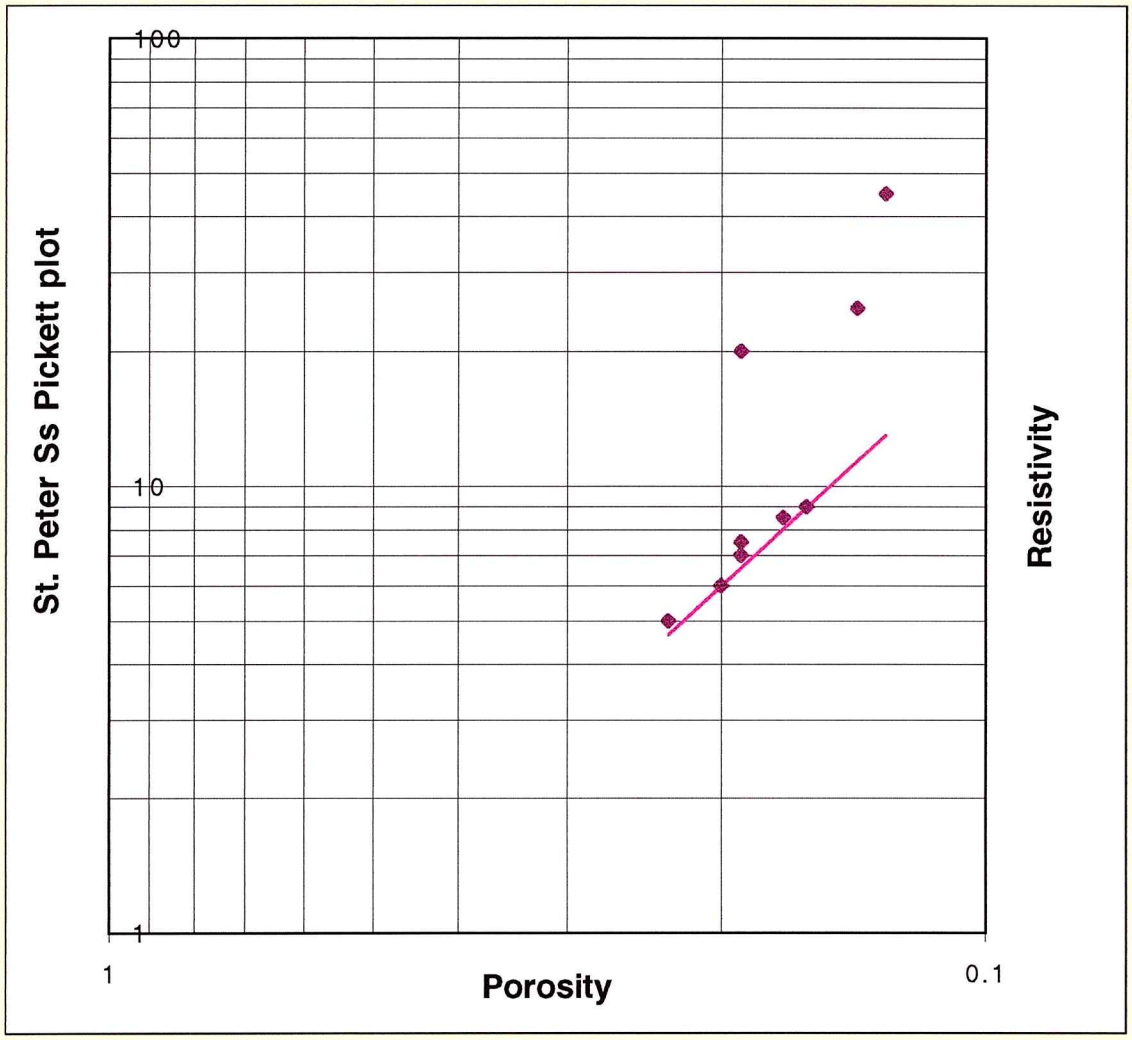


PICKETT PLOT METHOD TO ESTIMATE M AND RW

Well:	Cities Service Beck A-1 14-5S-12E	
Formation:	St.Peter Sandstone (Middle Ordovician)	

Parameters	
a	1
m	1.8
n	2
Rw	0.33

Depth	Phi	Rt	Ro	MA	Sw
2667	0.13	45	12.98	2.409	0.537
2669	0.14	25	11.36	2.201	0.674
2671	0.19	20	6.558	2.471	0.573
2675	0.17	8.5	8.011	1.833	0.971
2679	0.16	9	8.935	1.804	0.996
2683	0.19	7.5	6.558	1.881	0.935
2687	0.2	6	5.979	1.802	0.998
2691	0.23	5	4.649	1.849	0.964
2696	0.19	7	6.558	1.839	0.968



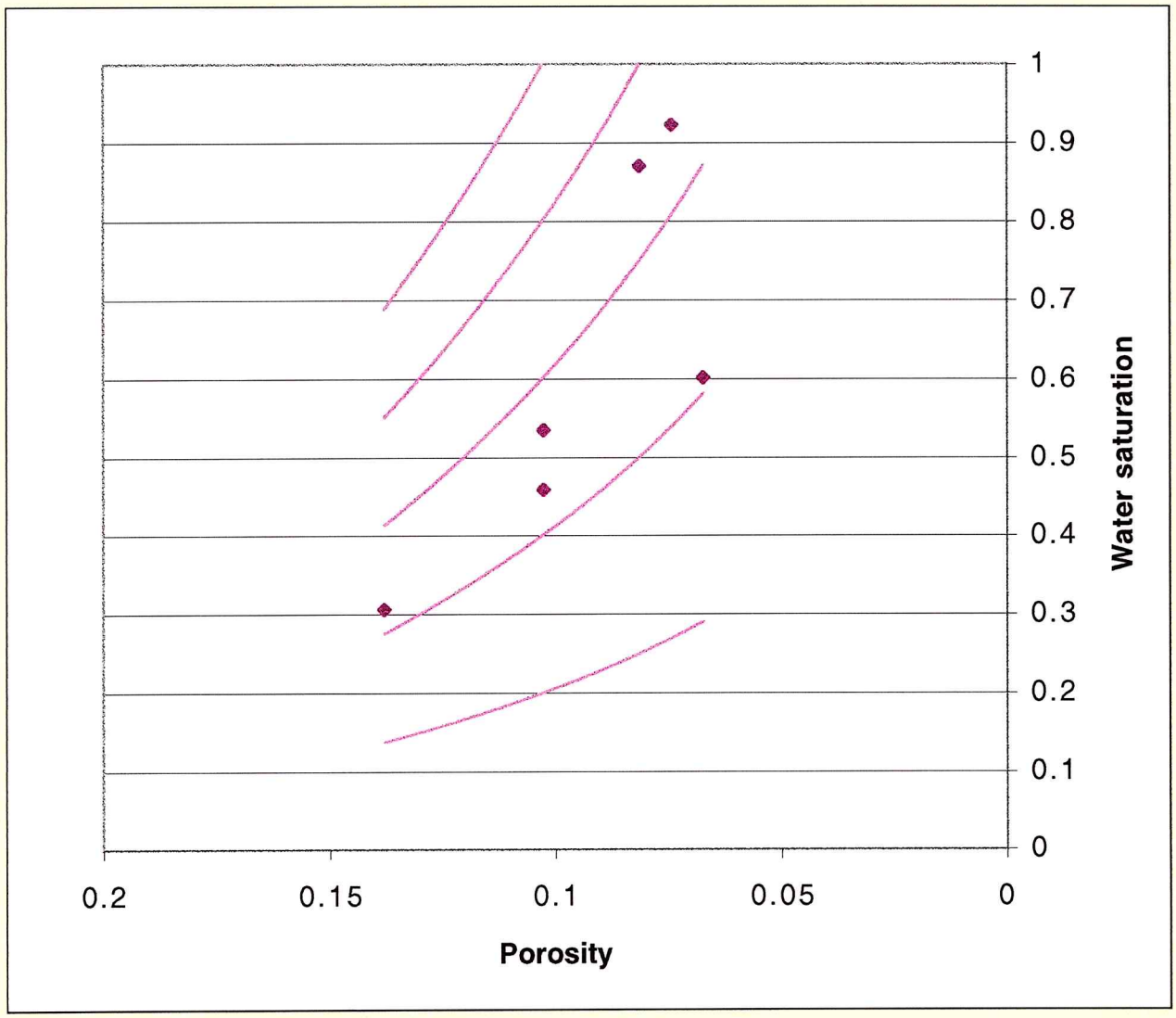
BUCKLES' PLOT

Well: Skelly Bartosovsky #19-1S-34W Rawlins Co., Ks
Formation: Lansing and Kansas City Groups (Pennsylvanian)

Depth	Phi	Sw	BVW
3987	0.07	0.601	0.04
4037	0.07	0.923	0.07
4081	0.1	0.535	0.05
4134	0.1	0.458	0.05
4180	0.14	0.307	0.04
4217	0.08	0.87	0.07

BVW contours

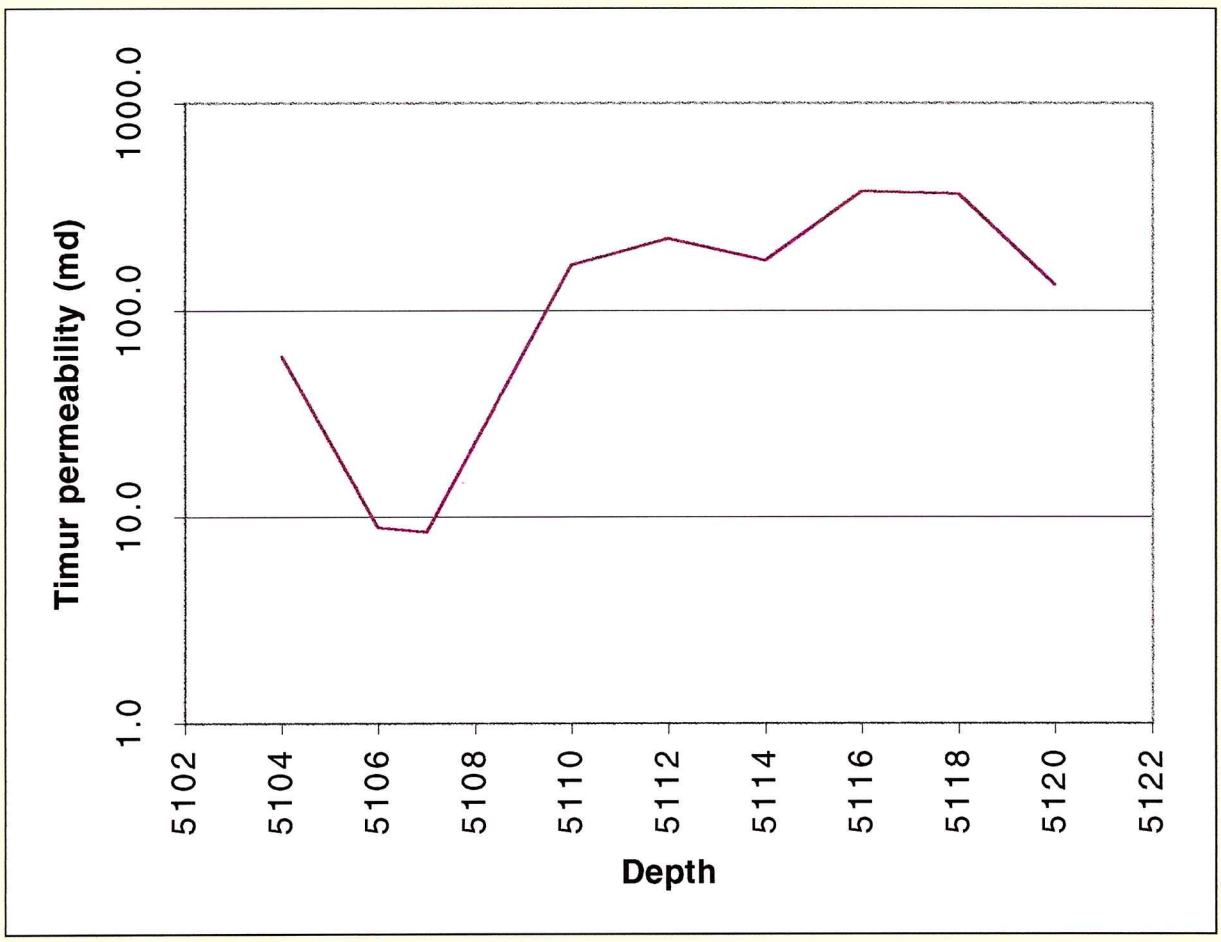
BVW 0.02	BVW 0.04	BVW 0.06	BVW 0.08	BVW 0.1
0.298	0.596	0.894	1.192	1.489
0.270	0.539	0.809	1.078	1.348
0.195	0.390	0.586	0.781	0.976
0.195	0.390	0.586	0.781	0.976
0.145	0.290	0.435	0.581	0.726
0.246	0.492	0.738	0.984	1.230



TIMUR EQUATION PREDICTION OF PERMEABILITY (SANDSTONES)

Well:	Petroleum Inc. Palen #2 32-15S -42W, Wallace Co., Ks
Formation:	Morrow Sandstone (Pennsylvanian)

Depth	Phi	Swi	Timur k
5104	0.194	0.32	60.0
5106	0.133	0.37	8.9
5107	0.124	0.32	8.4
5110	0.203	0.22	165.9
5112	0.207	0.195	221.7
5114	0.197	0.197	174.0
5116	0.223	0.176	375.2
5118	0.225	0.183	363.5
5120	0.188	0.203	132.9

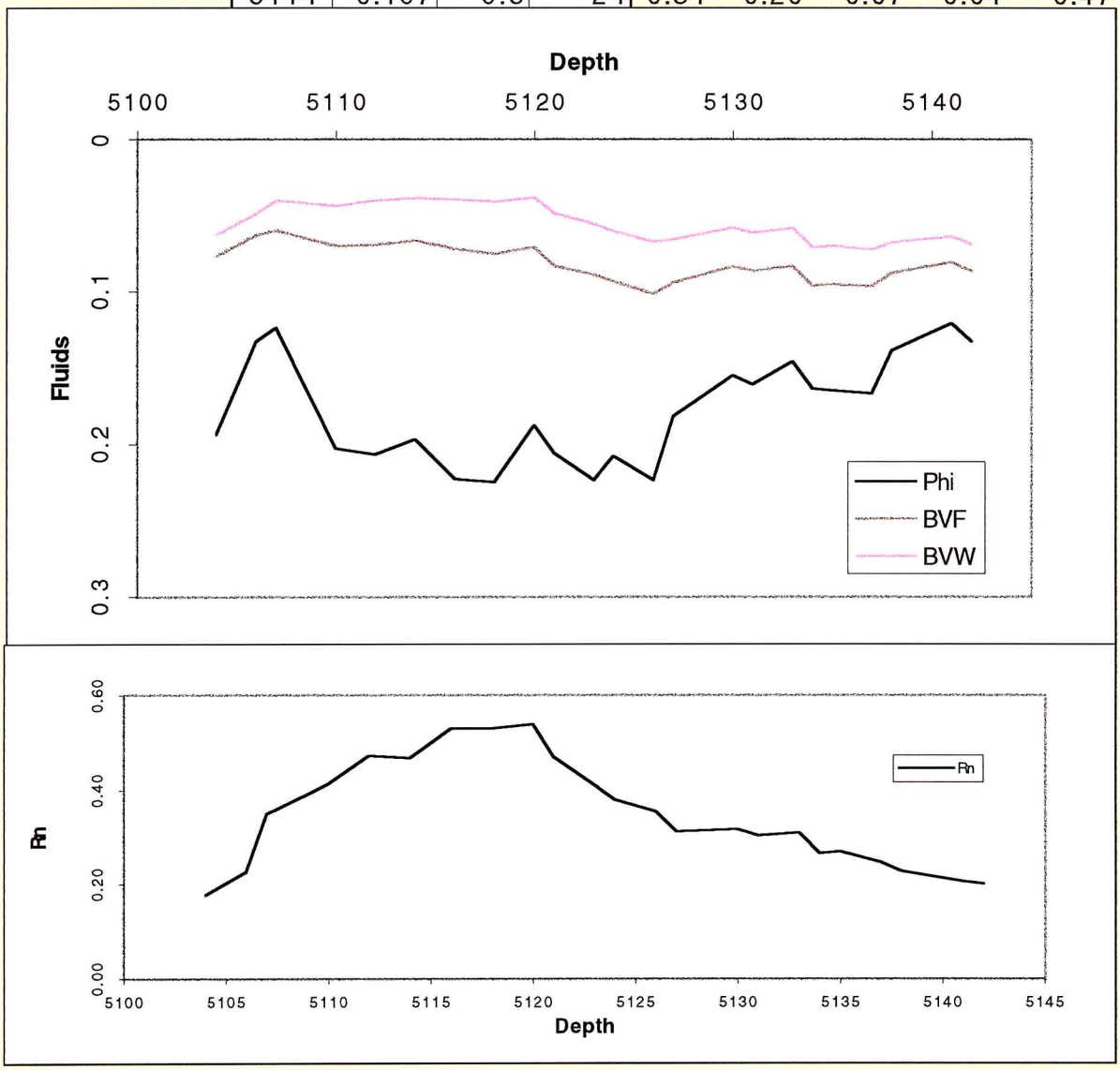


MOVABLE HYDROCARBON CALCULATIONS

Well:	Petroleum Inc. Palen #2 32-15S-42W Wallace Co., Ks
Formation:	Morrow Sandstone (Pennsylvanian)

Parameters	
a	1
m	1.8
n	2
Rw	0.05
Rmf	0.06

Depth	Phi	Rxo	Rt	Sxo	Sw	BVF	BVW	Rn
5104	0.194	7.3	9.1	0.40	0.32	0.08	0.06	0.17
5106	0.133	10	14	0.48	0.37	0.06	0.05	0.23
5107	0.124	11	20.5	0.48	0.32	0.06	0.04	0.35
5110	0.203	8.8	19	0.35	0.22	0.07	0.04	0.41
5112	0.207	9.1	22.5	0.34	0.19	0.07	0.04	0.47
5114	0.197	9.8	24	0.34	0.20	0.07	0.04	0.47



SP ESTIMATION OF FORMATION WATER RESISTIVITY, Rw
USING THE BATEMAN-KONEN ALGORITHM (DEGREES FAHRENHEIT)

Well:	Natural Gas Burke #1 27-12S-41W Wallace Co., Ks
Formation:	Nippewalla Group (Lower Permian)

Data:

Well parameters:	ST	DEPTH	TD	BHT
	52	2800	5237	118
From log header:	**RMF**	**TMF**	**From log:**	**SSP**
	1.22	74		-90

TF	87.287
Rmf75	1.2051
K	71.635
Rmfe/Rw	18.045
Rmfe	1.0244
Rwe	0.0568
Rw75	0.0739
RwTF	0.0642
ppmNaCl	99442

KEY:

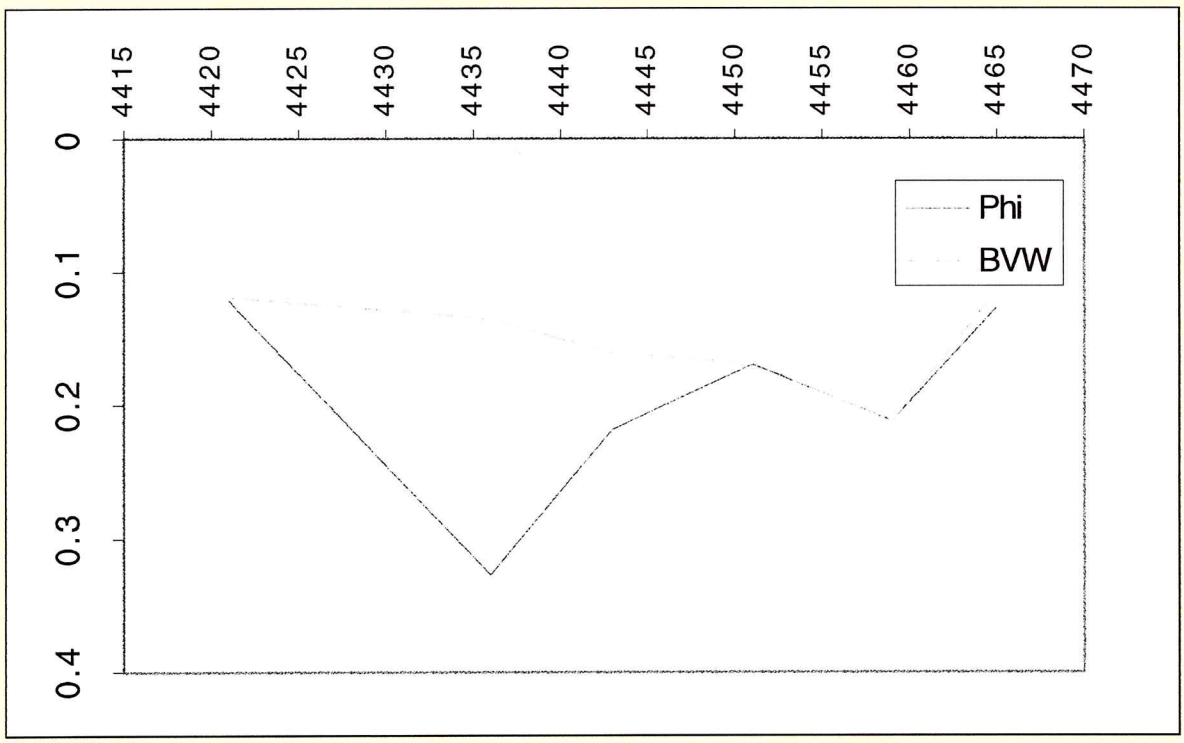
ST = mean annual surface temperature (degrees Fahrenheit)
DEPTH = midpoint depth of the SP analyzed unit
TD = Total Depth
BHT = Bottom-hole Temperature (degrees Fahrenheit)
RMF = mud filtrate resistivity
TMF = temperature of RMF measurement (degrees Fahrenheit)
SSP = Static Self-Potential (millivolts)
RW75 = formation water resistivity at 75 degrees Fahrenheit
RwTF = formation water resistivity at formation temperature
ppmNaCl = estimated salinity of the formation water

ARCHIE EQUATION AND DENSITY LOG

Well:	Holl 1-11 Tubbs-Burr 11-25S-17W Edwards Co., Ks
Formation:	Mississippi "Chat" (Osage)

Parameters	
a	1
m	2.36
n	2
Rw	0.075
ρma	2.65
ρf	1

Depth	**ρb**	**Phi**	**Rt**	**Sw**	**BVW**
4421	2.45	0.121	11.3	0.98	0.119
4436	2.11	0.327	6.1	0.41	0.136
4443	2.29	0.218	5	0.74	0.161
4451	2.37	0.17	5	0.99	0.169
4459	2.3	0.212	2.9	1.00	0.213
4465	2.44	0.127	12.1	0.90	0.114

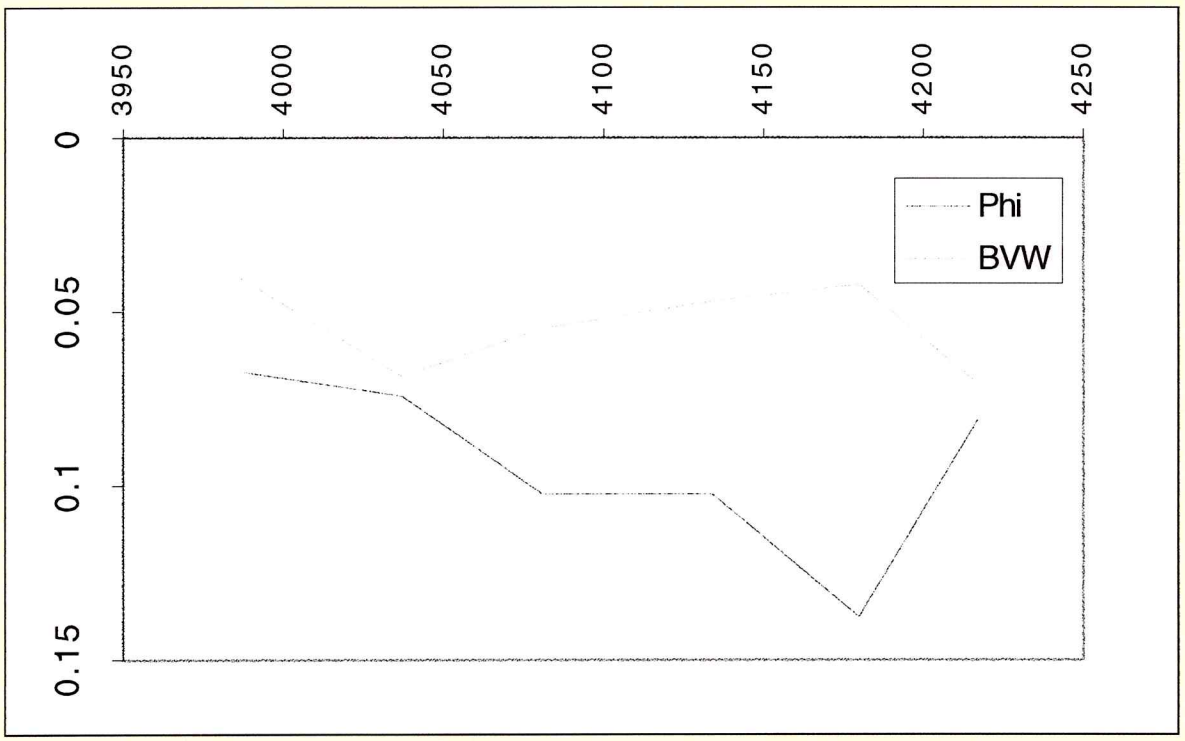


ARCHIE EQUATION AND SONIC LOG

Well:	Skelly Bartosovsky #19-1S-34W Rawlins Co., Ks	
Formation:	Lansing and Kansas City Groups (Pennsylvanian)	

Parameters	
a	1
m	2
n	2
Rw	0.075
Dtma	47.5
Dtf	189

Depth	Dt	Phi	Rt	Sw	BVW
3987	57	0.067	46	0.60	0.040
4037	58	0.074	16	0.92	0.068
4081	62	0.102	25	0.53	0.055
4134	62	0.102	34	0.46	0.047
4180	67	0.138	42	0.31	0.042
4217	59	0.081	15	0.87	0.071

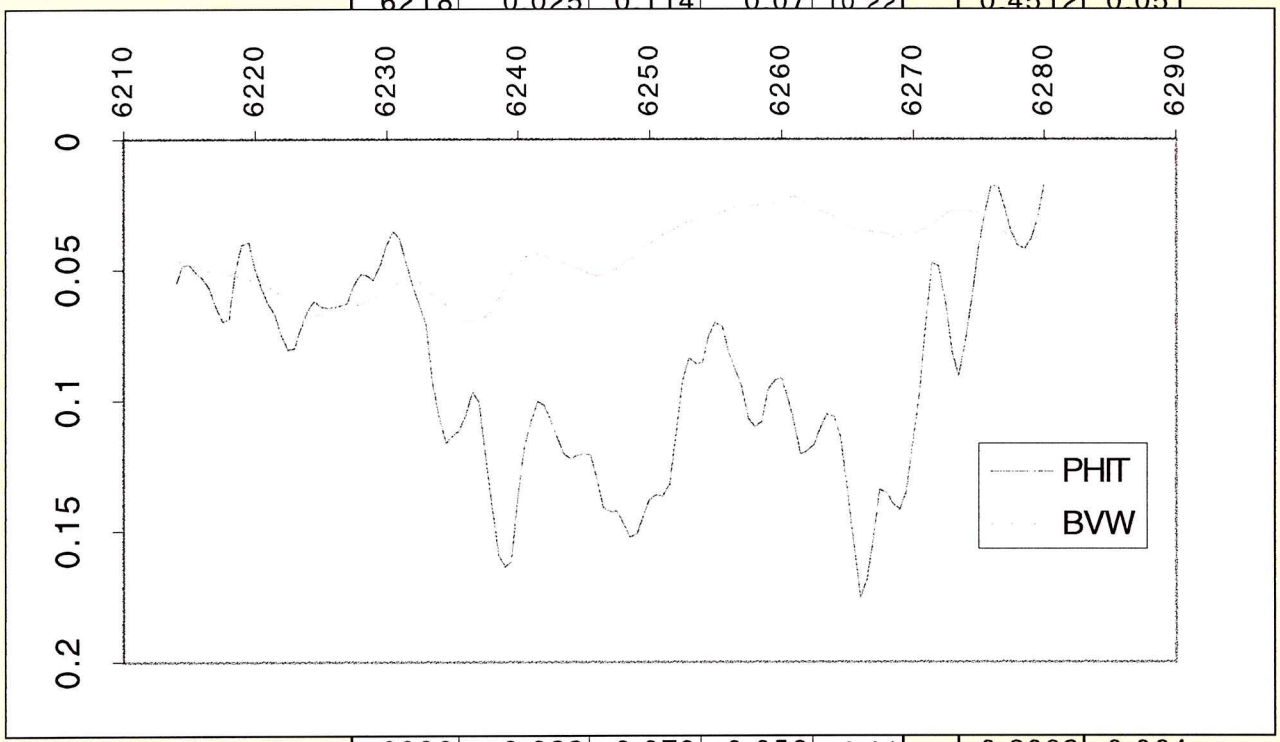


ARCHIE EQUATION WITH DENSITY AND NEUTRON LOGS

Well:	Roberts & Murphy Miller #3-34 34-34S-20W
Formation:	Viola Limestone

Parameters	
a	1
m	2
n	2
Rw	0.027

Depth	PHID	PHIN	PHIT	Rt	Sw	BVW
6214	-0.001	0.111	0.055	12.59	0.42	0.046
6215	0.001	0.095	0.048	12.19	0.50	0.047
6215	0.007	0.089	0.048	11.89	0.54	0.048
6216	0.012	0.090	0.051	11.43	0.54	0.049
6216	0.014	0.092	0.053	10.99	0.54	0.050
6217	0.015	0.099	0.057	10.73	0.507	0.050
6217	0.019	0.109	0.064	10.47	0.466	0.051
6218	0.025	0.114	0.07	10.22	0.4512	0.051



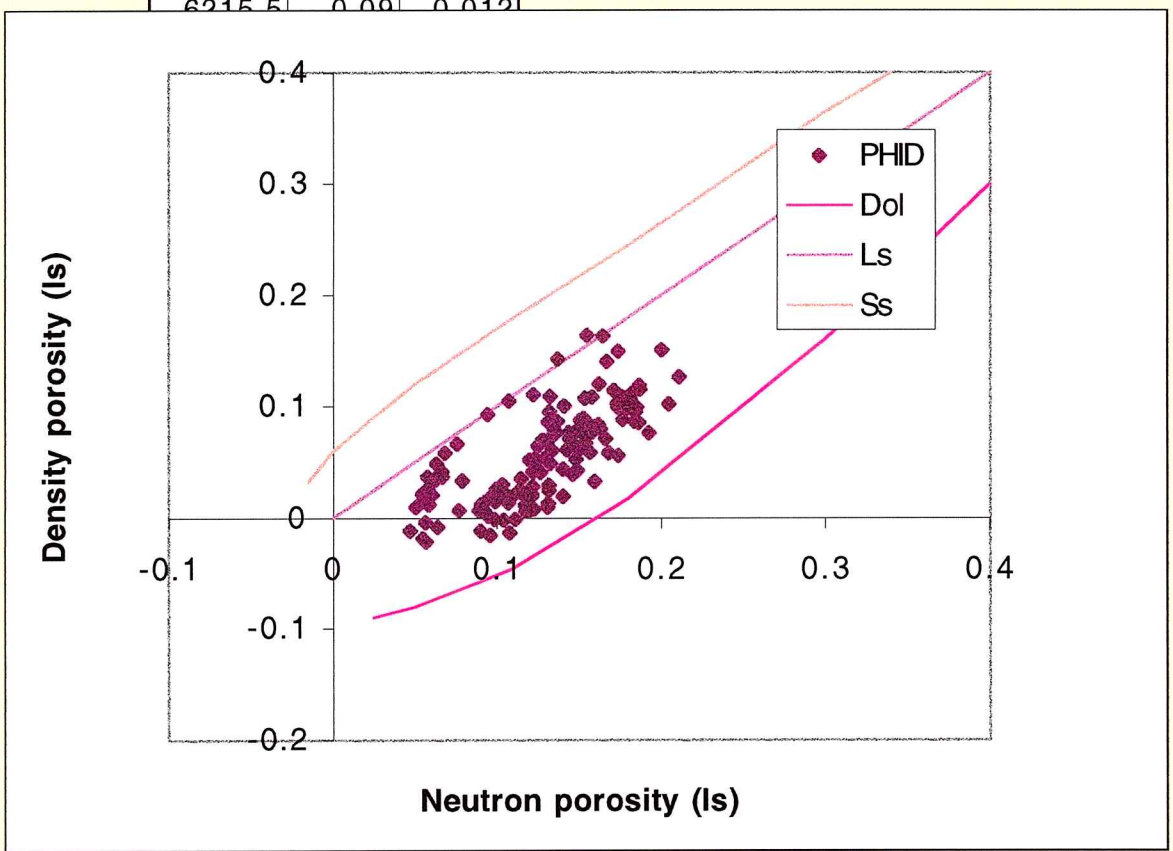
6228	0.033	0.079	0.056	6.64	0.8093	0.064
6228	0.037	0.067	0.052	6.802	0.9455	0.063
6229	0.039	0.065	0.052	7.08	0.9465	0.062
6229	0.042	0.066	0.054	7.315	0.9168	0.061
6230	0.035	0.063	0.049	7.731	0.9416	0.059
6230	0.024	0.057	0.04	8.177	1.0155	0.057
6231	0.016	0.055	0.035	8.549	1.0247	0.056
6231	0.020	0.056	0.038	9.22	0.9737	0.054

NEUTRON-DENSITY CROSSPLOT(ls equiv units)

Well:	Roberts & Murphy Miller #3-34 34-34S-20W						
Formation:	Viola Limestone						

PHIN	**PHID**	Dol	Ls	Ss
-0.015				0.032
0			0	0.06
0.025		-0.09	0.025	0.09
0.05		-0.08	0.05	0.12
0.11		-0.05	0.11	0.18
0.18		0.018	0.18	0.245
0.3		0.16	0.3	0.365
0.34		0.215	0.34	0.4
0.4		0.3	0.4	

Depth		
6214	0.111	-0.001
6214.5	0.095	0.0015
6215	0.089	0.0069
6215.5	0.09	0.012



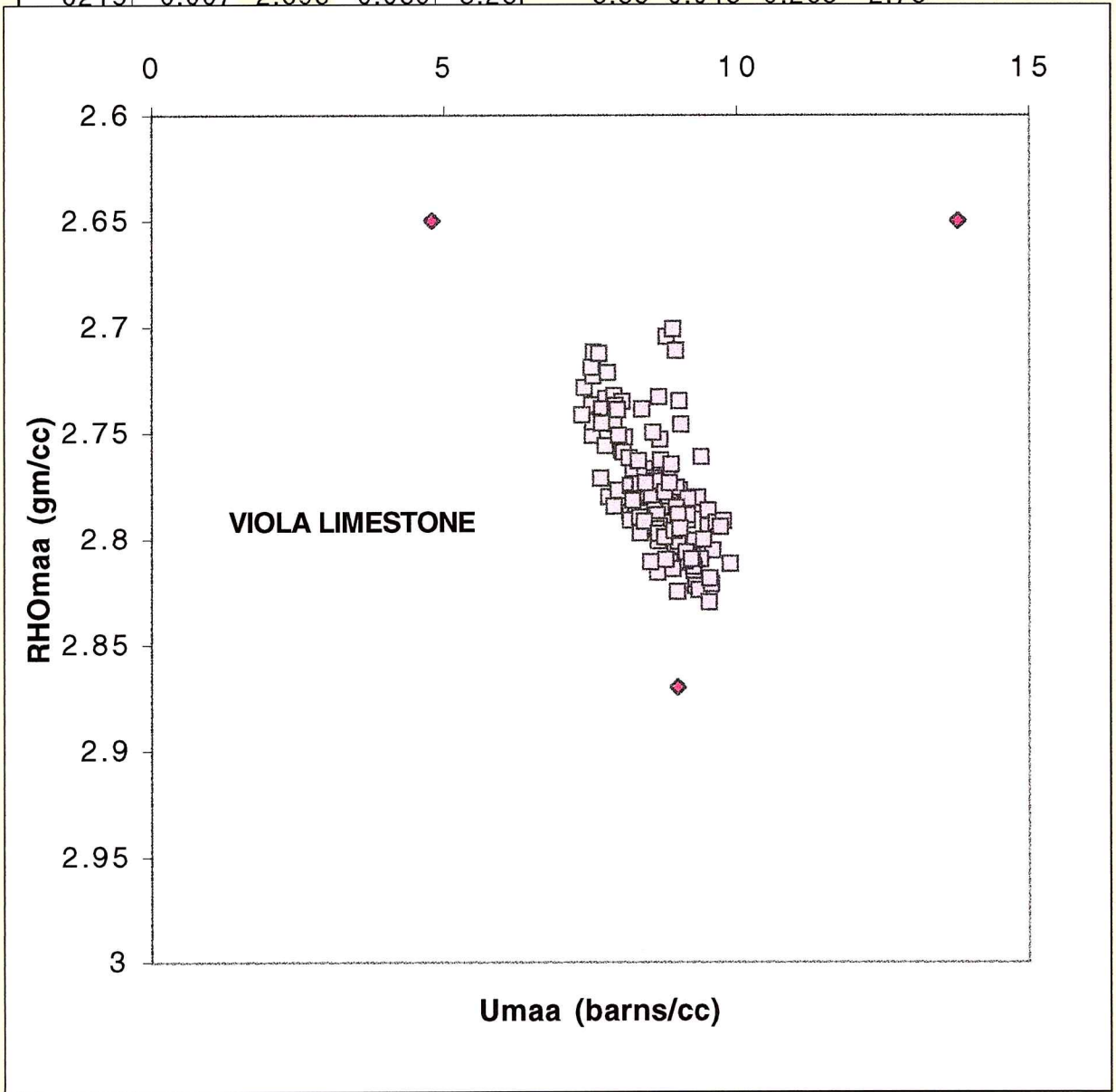
6227	0.100	0.025

RHOmaa - Umaa CROSSPLOT

Well:	Roberts & Murphy Miller #3-34 34-34S-20W
Formation:	Viola Limestone

Umaa	ρmaa	ρma	
13.8		2.65	**Calcite**
9		2.87	**Dolomite**
4.8		2.65	**Quartz**

Depth	PHID	ρb	PHIN	Pe	U	PHIT	Umaa	ρmaa
6214	-0.001	2.712	0.111	3.46	9.38	0.055	9.897	2.81
6214.5	0.001	2.707	0.095	3.35	9.08	0.048	9.518	2.79
6215	0.007	2.698	0.089	3.28	8.85	0.048	9.268	2.78



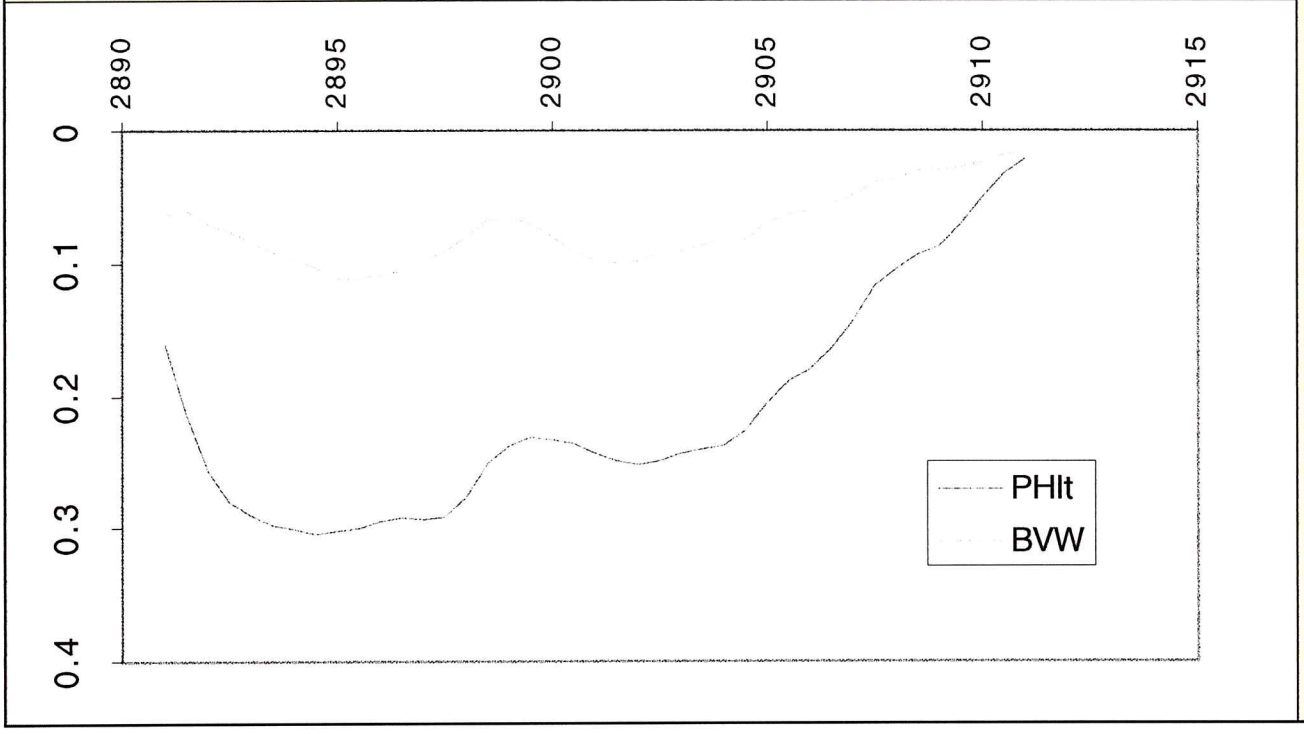
6231.5	0.037	2.647	0.058	2.67	7.07	0.047	7.398	2.73

ARCHIE EQUATION USING NUGENT VARIABLE m

Well:	Carter Colliver #1-Co2 28-14S-13W
Formation:	Lansing 'C' Zone

Parameters	
a	1
m is variable	
n	2
Rw	0.054

Depth	PHIt	PHIs	Rt	m	Sw	BVW
2891	0.1605	0.1478	16.094	2.09	0.39	0.06
2892	0.2135	0.1807	20.911	2.216	0.28	0.06
2892	0.257	0.181	21.703	2.516	0.28	0.07
2893	0.2805	0.1891	20.647	2.621	0.27	0.08
2893	0.2905	0.1873	18.351	2.71	0.29	0.08
2894	0.298	0.1844	16.836	2.793	0.31	0.09
2894	0.301	0.1926	14.414	2.744	0.32	0.10
2895	0.3045	0.1899	13.059	2.795	0.34	0.10
2895	0.3025	0.1846	11.724	2.826	0.37	0.11
2896	0.3005	0.1805	12.14	2.848	0.37	0.11
2896	0.295	0.1754	13.115	2.852	0.37	0.11
2897	0.292	0.1701	14.241	2.878	0.36	0.11
2897	0.2935	0.1687	17.063	2.904	0.33	0.10
2898	0.2915	0.1679	19.591	2.895	0.31	0.09
2898	0.2765	0.156	26.944	2.89	0.29	0.08
2899	0.251	0.1404	38.156	2.841	0.27	0.07
2899	0.237	0.1291	41.486	2.844	0.28	0.07

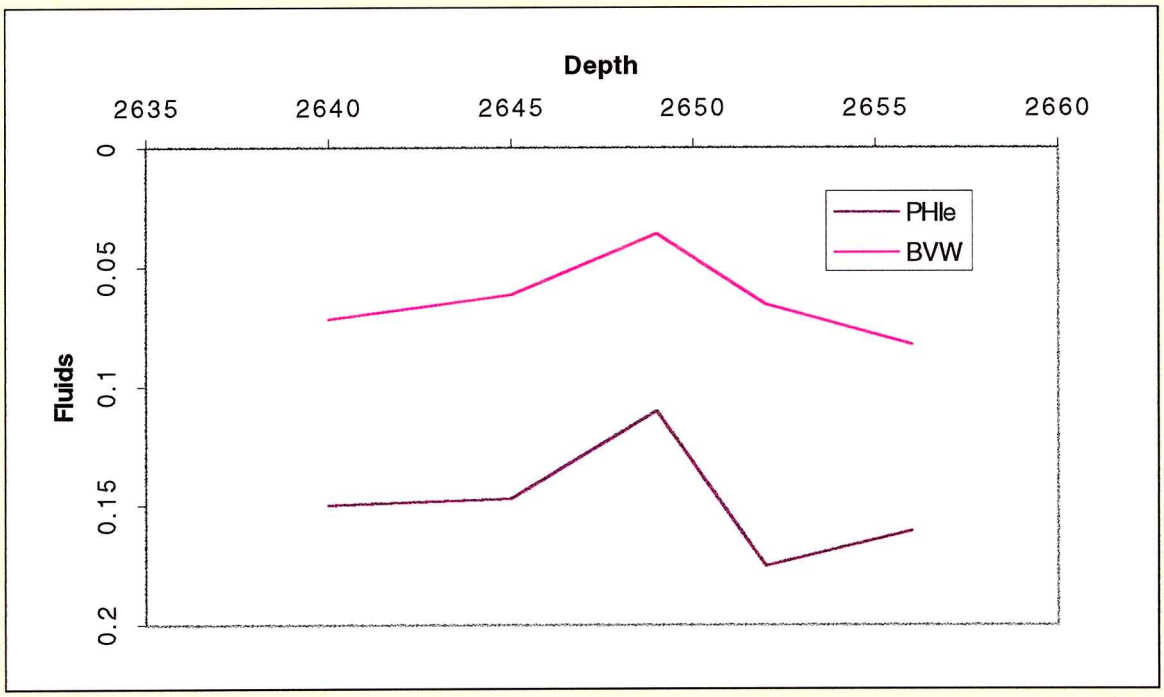


SHALY SANDSTONE ANALYSIS BY SIMANDOUX EQUATION

Well:	TXO Rottering #B1 35-28S-11W Pratt Co., Kansas
Formation:	Indian Cave Sandstone (Lower Permian)

Parameters	
a=0.81	
m2	
n=2	
Rw	0.04
Rsh	1.9
GRcl	30
GRsh	130
PHIsh	0.15

Depth	GR	PHI	Rt	GRI	Vsh	PHIe	Sw	BVW
2640	105.0	0.225	3.5	0.75	0.5	0.15	0.479	0.072
2645	110.0	0.233	4.1	0.8	0.571	0.147	0.419	0.062
2649	125.0	0.24	5.3	0.95	0.864	0.11	0.327	0.036
2652	91.0	0.227	5.0	0.61	0.343	0.176	0.373	0.066
2656	102.0	0.23	3.0	0.72	0.462	0.161	0.512	0.082

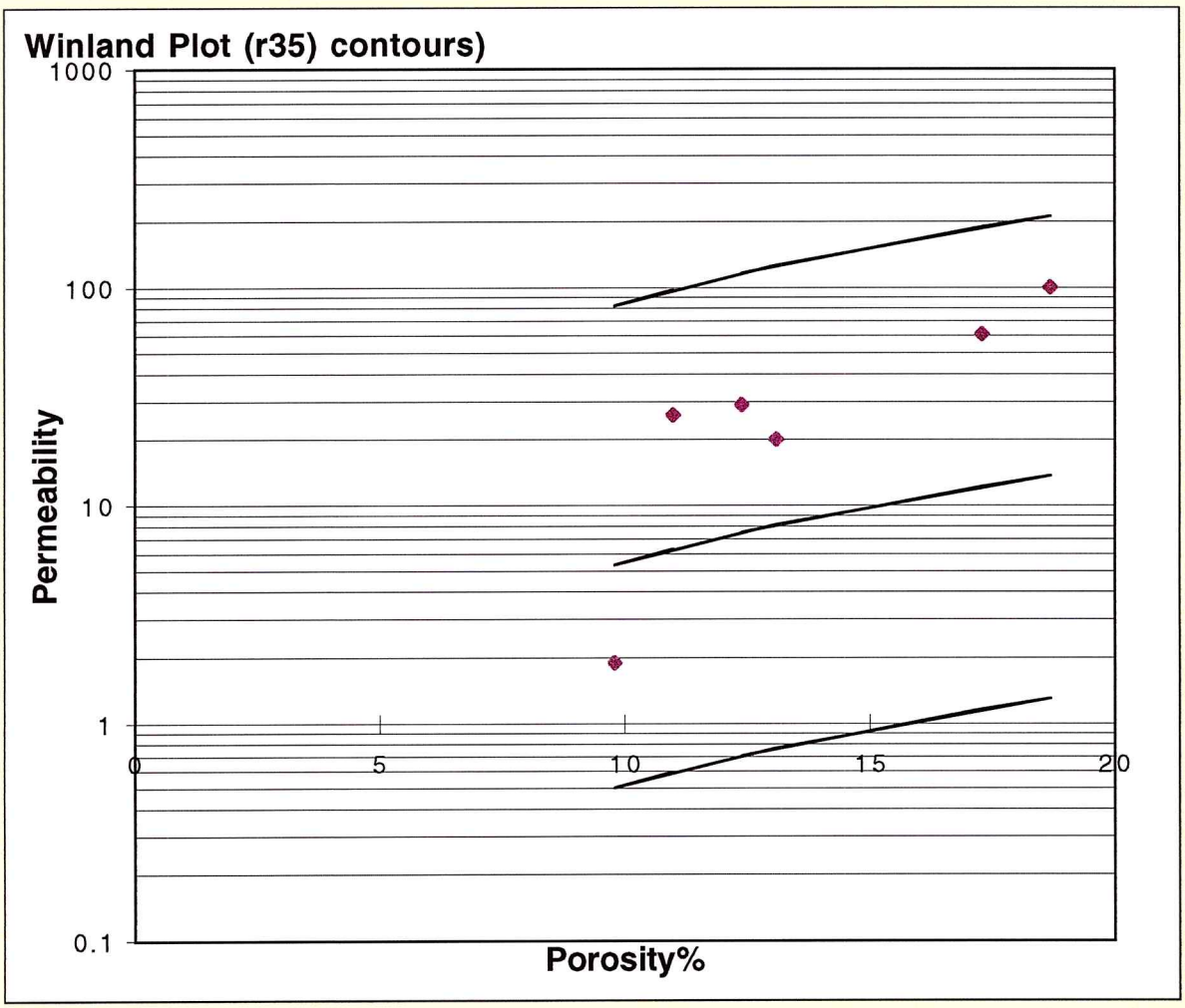


WINLAND EQUATION ESTIMATION OF r35 IN MICRONS

Well:	Total #31-30 Ickes and #42-30 Ickes, Campbell Co., Wyoming
Formation:	Minnelusa Sandstone (Upper Permian)

log r35 = 0.732 + 0.588*log k - 0.864*log Phi%

Phi%	k	r35	r35 contours: r35 0.5 kest	r35 2 kest	r35 10 kest
11	26	4.6	0.6	6.3	96.8
9.8	1.9	1.1	0.5	5.3	81.7
13.1	20	3.4	0.8	8.1	125.2
18.7	100	6.4	1.3	13.7	211.2
17.3	61	5.2	1.2	12.2	188.3
12.4	29	4.4	0.7	7.5	115.5

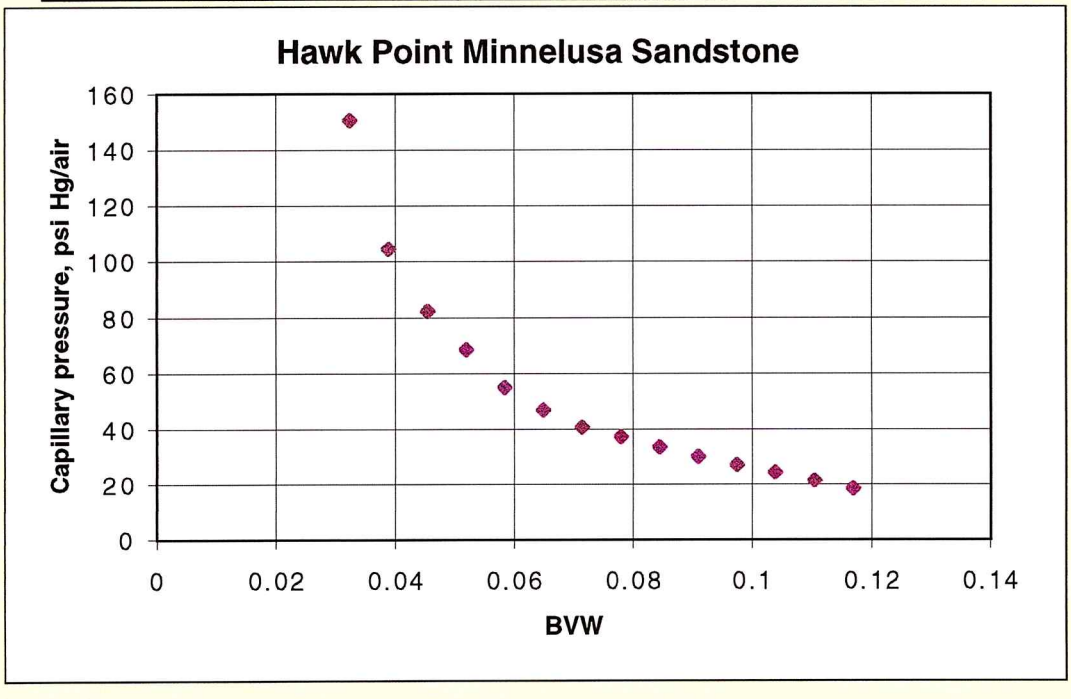


PITTMAN'S EQUATIONS FOR SANDSTONES TO PREDICT HYDROCARBON COLUMN HEIGHT OVER A RANGE OF MERCURY SATURATIONS, BASED ON CORE POROSITY AND PERMEABILITY

Well:	Hawk Point Field, Wyoming		
Formation:	Minnelusa Sandstone (Upper Permian)		

Porosity		**Permeability**	
13	%	30	md

Hg Sat.%	log r	r, microns	Sw%	Pc	BVW
10	0.77	5.87	90	18.3	0.117
15	0.70	5.03	85	21.4	0.1105
20	0.65	4.44	80	24.2	0.104
25	0.60	3.97	75	27.1	0.0975
30	0.56	3.59	70	30.0	0.091
35	0.51	3.21	65	33.5	0.0845
40	0.46	2.90	60	37.1	0.078
45	0.42	2.64	55	40.7	0.0715
50	0.36	2.29	50	46.9	0.065
55	0.29	1.96	45	54.8	0.0585
60	0.20	1.58	40	68.3	0.052
65	0.12	1.31	35	82.1	0.0455
70	0.01	1.03	30	104.5	0.039
75	-0.15	0.72	25	150.5	0.0325



ROCK COMPOSITIONAL ANALYSIS

Well: Roberts & Murphy Miller #3-34 34-34S-20W

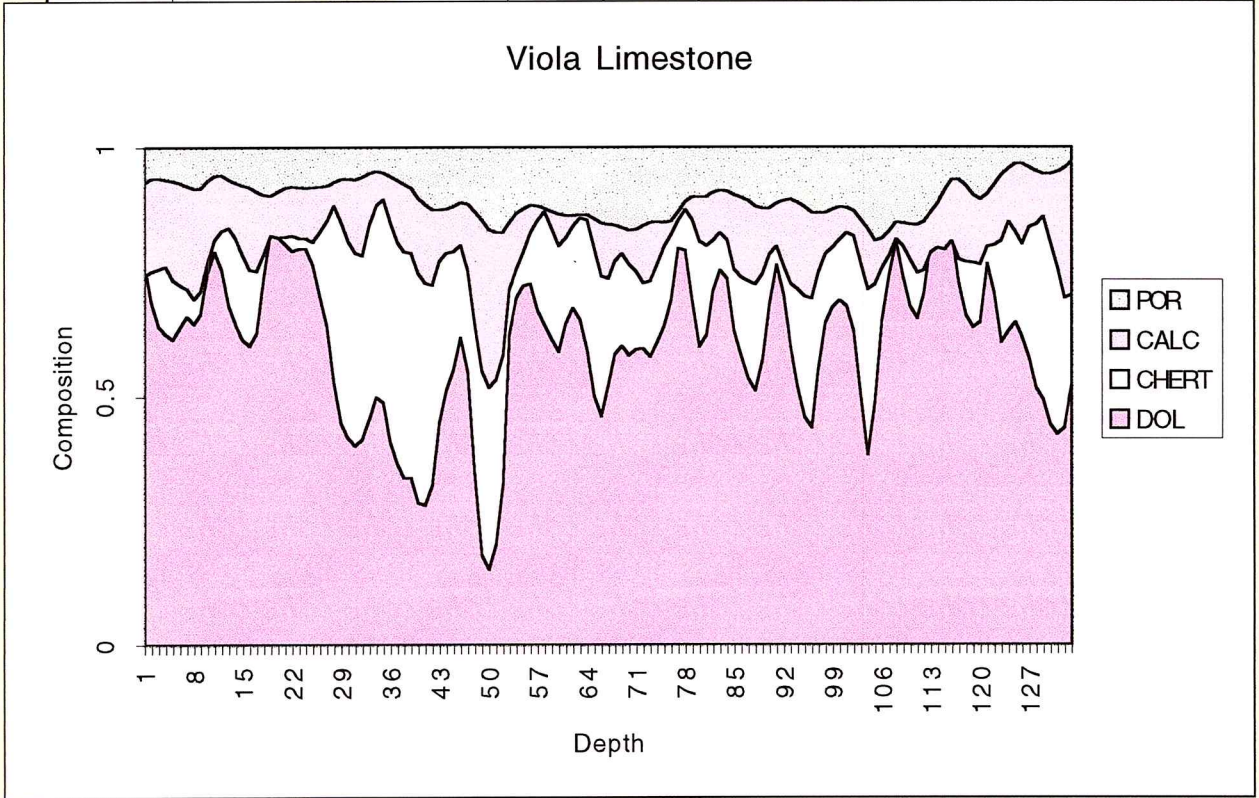
Formation: Viola Limestone

Depth	% PHID	ρb	% PHIN	b/e Pe	U
6214	-0.104	2.71	11.13	3.46	9.38
6214.5	0.149	2.71	9.487	3.35	9.08
6215	0.687	2.70	8.899	3.28	8.85
6215.5	1.204	2.69	9.018	3.23	8.69
6216	1.445	2.69	9.242	3.30	8.87
6216.5	1.479	2.68	9.897	3.35	9
6217	1.892	2.68	10.9	3.39	9.07
6217.5	2.546	2.67	11.39	3.42	9.12
6218	2.311	2.67	11.48	3.40	9.09
6218.5	-0.176	2.71	10.41	3.37	9.13
6219	-1.555	2.74	9.612	3.30	9.03
6219.5	-1.142	2.73	9.028	3.20	8.72
6220	0.718	2.70	9.199	3.06	8.25
6220.5	1.821	2.68	9.612	3.06	8.19
6231.5	3.673	2.65	5.759	2.67	7.07
6232	4.865	2.63	6.31	2.72	7.15

C:	DOL	CHERT	CALC	POR
PHIN	5	-5	0	100
RHOB	2.87	2.65	2.71	1
U	9	4.79	13.77	0.5
UNITY	1	1	1	1

INVERSE C:

0.05	3.252	-0.05	-8.14
-0.03	-1.39	-0.08	4.894
-0.02	-1.64	0.134	3.593
0.01	-0.23	-0	0.652



DOL	CHERT	CALC	POR
0.768	-0.02	0.2	0.072
0.688	0.063	0.2	0.064
0.64	0.115	0.2	0.063
0.625	0.136	0.2	0.066
0.614	0.12	0.2	0.068
0.638	0.087	0.2	0.071
0.66	0.056	0.2	0.079
0.646	0.05	0.2	0.084
0.665	0.044	0.2	0.084
0.748	0.019	0.2	0.068
0.791	0.022	0.1	0.058
0.754	0.078	0.1	0.056
0.683	0.155	0.1	0.066
0.644	0.172	0.1	0.072
0.615	0.17	0.1	0.077
0.601	0.154	0.2	0.081
0.627	0.125	0.2	0.09
0.738	0.047	0.1	0.097
0.833	-0.01	0.1	0.098
0.82	-0	0.1	0.09
0.806	0.013	0.1	0.083
0.791	0.031	0.1	0.079
0.797	0.02	0.1	0.081
0.797	0.02	0.1	0.082
0.765	0.045	0.1	0.081
0.702	0.127	0.1	0.08
0.642	0.209	0.1	0.078
0.527	0.355	0	0.07
0.447	0.402	0.1	0.064
0.417	0.395	0.1	0.064
0.401	0.387	0.1	0.066
0.414	0.369	0.2	0.06
0.455	0.388	0.1	0.053
0.499	0.382	0.1	0.049
0.488	0.407	0.1	0.052
0.407	0.442	0.1	0.059
0.364	0.444	0.1	0.067