

THE CWLS LOG ANALYSIS EXAMPLE BOOK — A PREVIEW

E.R. Crain
D&S Petrophysical, a division of
D&S Petroleum Consulting Group Ltd.
Calgary, Alberta

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This paper is to be presented at the 8th Formation Evaluation Symposium of the Canadian Well Logging Society in Calgary, September 27, 28, 29 30, 1981. Discussion of this paper is invited. Such discussion may be presented at the Symposium and will be considered for publication if filed in writing with the Technical Program Chairman prior to the conclusion of the Symposium.

The CWLS Log Analysis Handbook is an ambitious project by the CWLS to provide examples of high quality log analysis for use by the oil and gas industry in Canada. The Handbook is intended to illustrate modern log evaluation methods, using computers and hand calculators, along with core, drill stem test, hydrocarbon mud log and production data. We hope that such examples will demonstrate the utility of log analysis in general, the wide range of methods available, and the accuracy of volumetric predictions made from log data. The project will be funded by the Corporate members fees, and their contributions to date are sincerely appreciated.

The examples contained here are meant to illustrate the format of the book, and to encourage CWLS members to contribute worked examples for inclusion in the Handbook. Blank forms are available from the author, who is Chairman of the Handbook Sub-committee.

To date, some 25 examples have been completely or partially prepared. However, many more examples are needed as those created to date rely heavily on the authors own methodology. We would hope for a better balanced set of examples than this.

Publication of this Handbook was meant to coincide, both in timing and content, with a companion volume of Oil and Gas Fields of Canada, to be created by the Canadian Society of Petroleum Geologists. Neither our Handbook nor the CSPG volume are on schedule, so we have elected to proceed separately until sufficient material is available for both projects to warrant further co-operation. We believe that ultimately the two companion volumes will be an ongoing effort, with new material and updates being provided by both societies at regular intervals.

The expected publication date for the first 50 examples, in a loose leaf binder, is the fall of 1983. Please consider contributing some examples from your own stock of interesting wells.

CWLS LOG ANALYSIS HANDBOOK

LOCATION:
WELL NAME:

POOL(S):
FIELD:
PROVINCE:

LOGS AVAILABLE

CORE AVAILABLE

Type	Interval
1 Borehole Comp. Sonic	345-3244
2 Induction Electric	345-3244
3	
4	
5	
6	

Interval Recovery

LOG INTERPRETATION CONSTANTS

Depth 3070-3230
 Rw @ 25°C 0.500
 Rw @ FT 0.397
 Rsh @ FT 8.0
 Rwb @ FT 2.0
 a .620
 m 2.150
 n 2.000
 FT 97.8

RHOma 2.65
 DELTma 55.00
 RHOw 1.00
 DELTw 188
 PHINsh 30
 PHIDsh 0
 DELTsh 95
 Cp 100

Depth
 Rw @ 25°C
 Rw @ FT
 Rsh @ FT
 Rwb @ FT
 a
 m
 n
 FT

RHOma
 DELTma
 RHOw
 DELTw
 PHINsh
 PHIDsh
 DELTsh
 Cp

DST INFORMATION

UNITS: ENGLISH METRIC

UNITS: ENGLISH METRIC

DST # None
 Interval
 IHP
 Preflow (min)
 ISIP (min)
 VO (min)
 FSIP (min)
 FHP
 Recovery:

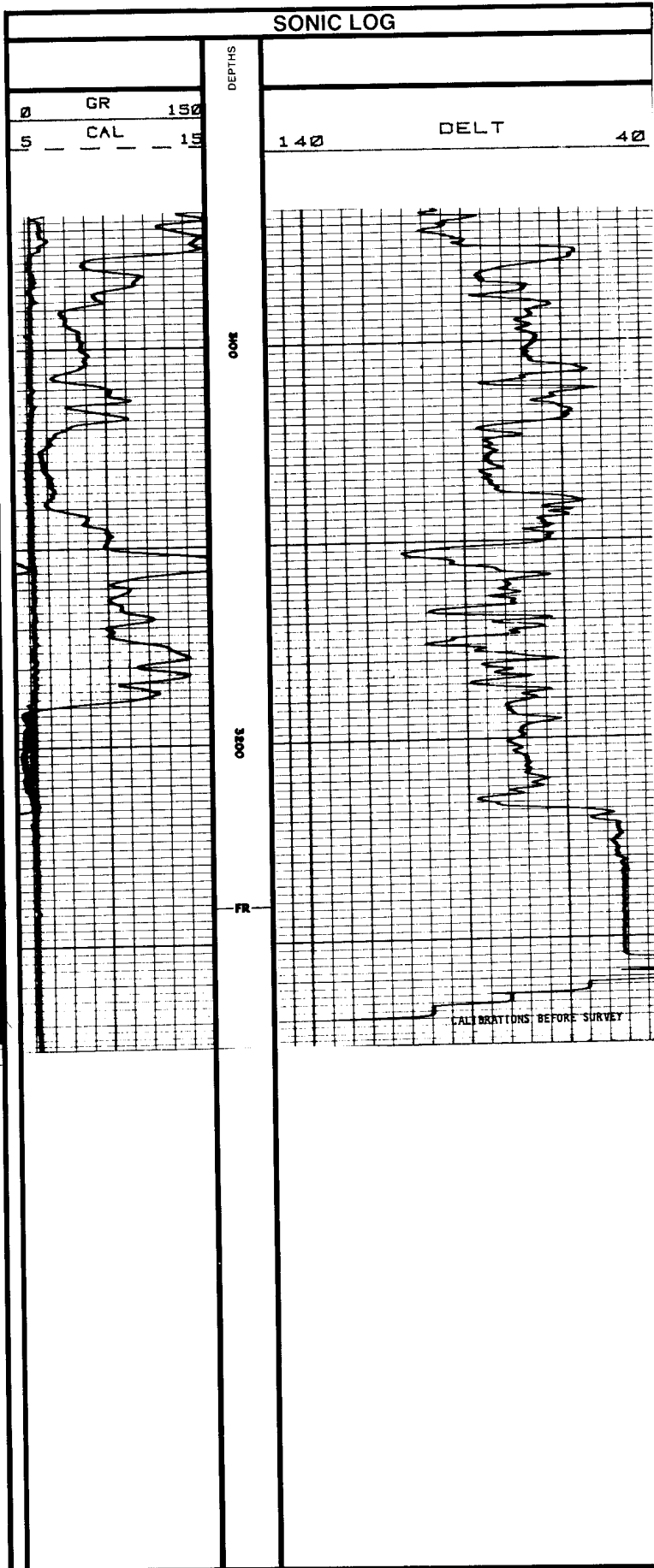
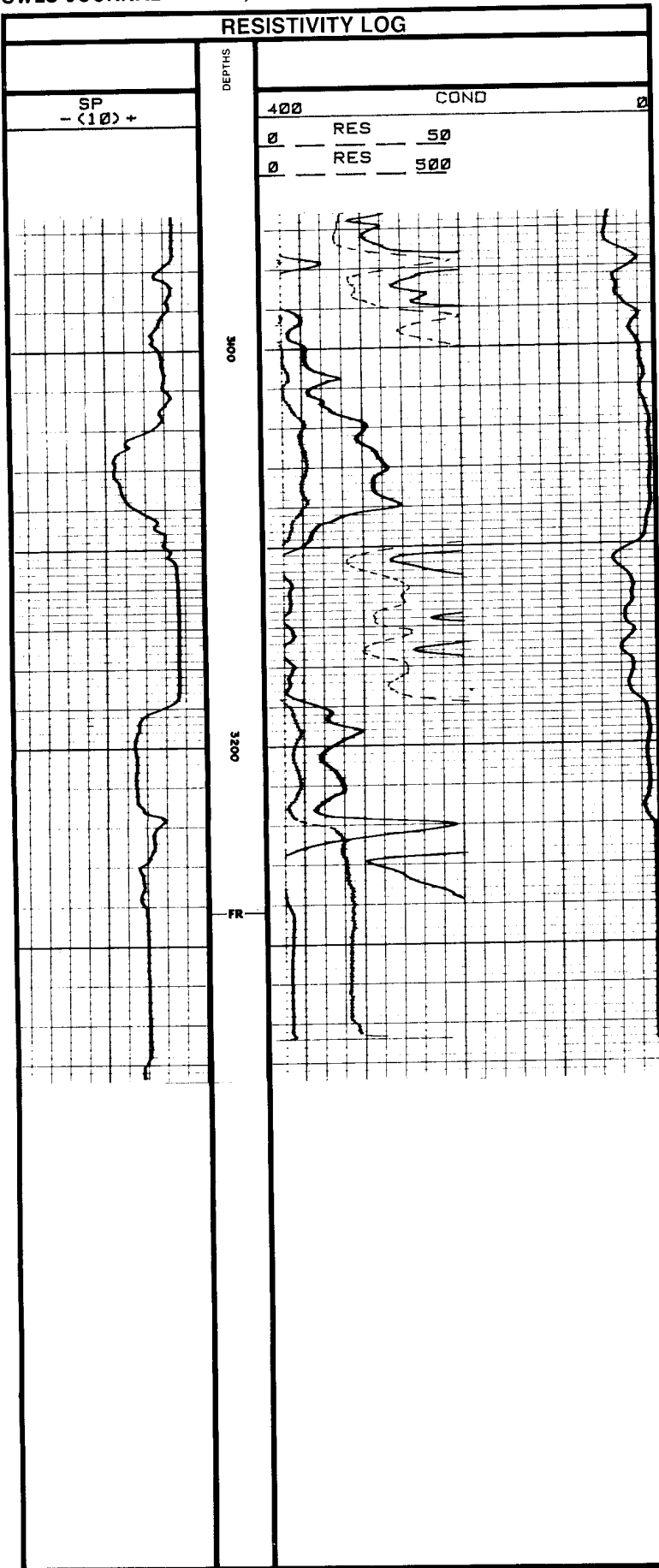
DST #
 Interval
 IHP
 Preflow (min)
 ISIP (min)
 VO (min)
 FSIP (min)
 FHP
 Recovery:

Comments:

PRODUCTION TEST RESULTS

PERF # 1: 3121-3127
 3 shots per foot
 Frac.





CWLS LOG ANALYSIS HANDBOOK

LOCATION: 12-33-8-16 W4M
 WELL NAME: CPOG Horsefly

POOL(S):
 FIELD: Horsefly Lake
 PROVINCE: Alberta

HAND CALCULATED ANALYSIS

P T	ZONE/DEPTH	LOG DATA								RESULTS					
		RESD	RESM	RESS	PHIN	PHID	DELT	GR		Vsh	PHIe	Sw	PHI-H	HYD-H	NET-H
1	3114-3141	100		250			85	27		0	23	27	5.06	3.69	22
2															
3	3189-3214	75		175			77	27		0	16.5	44	4.12	2.31	25
4	3214-3218	65		125			87	27		0	24.1	33	.96	.65	4
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															

LOG ANALYSIS COMMENTARY

This analysis is based on a porosity determination from the shale corrected sonic log as no density-neutron log was available. Shale correction is derived from the shale volume determined from the GR log and by the sonic log reading in the shale at 936 meters. Water saturation was computed using the Simandoux equation and a water resistivity from the CWLS Water Resistivity Catalogue. The log analysis matches core porosity very well. The relation between porosity and permeability from core is also very good. The water saturation in the Sawtooth suggests the zone will make water or that the assumed R_w is incorrect. No test or offset data is available to confirm either case.

ACKNOWLEDGEMENTS

WELL OPERATOR: Hillis
 LOGS PROVIDED BY: Riley's
 OPEN HOLE LOGS BY: Schlumberger
 HYDROCARBON LOGS BY:

PREPARED BY: Vickie E. Sels DATE: Dec./81
 COMMENTARY BY: E. R. Crain
 COMPUTED LOG BY: Log/Mate Limited
 CWLS CORPORATE MEMBERS FUNDED THIS PROJECT



DENSITY-NEUTRON LOG

LOG/MATE ANALYSIS

12-33-8-16W4 Top= 938 Bottom= 985 (m)
0 GR 150
5 CAL 15
0.20 RESD 2000
140 DELT 40

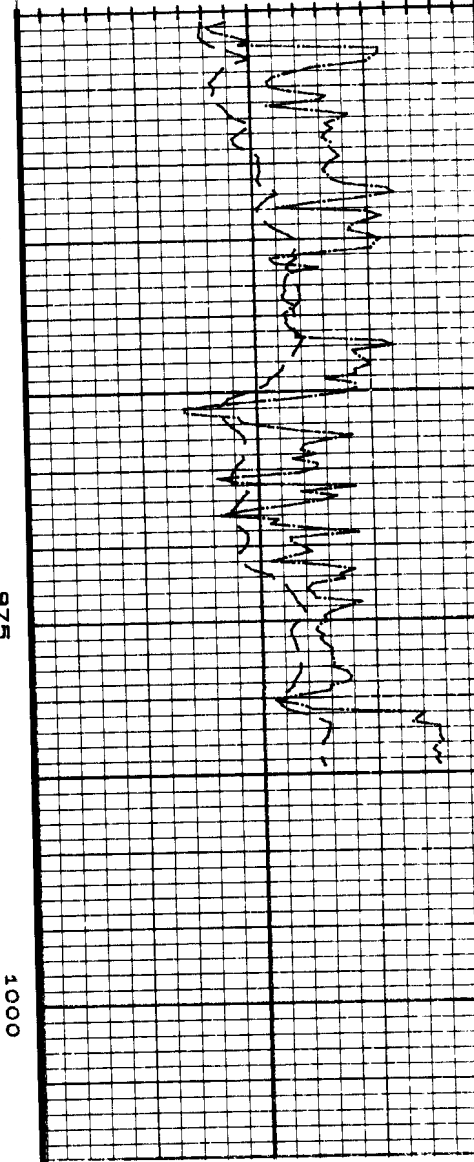
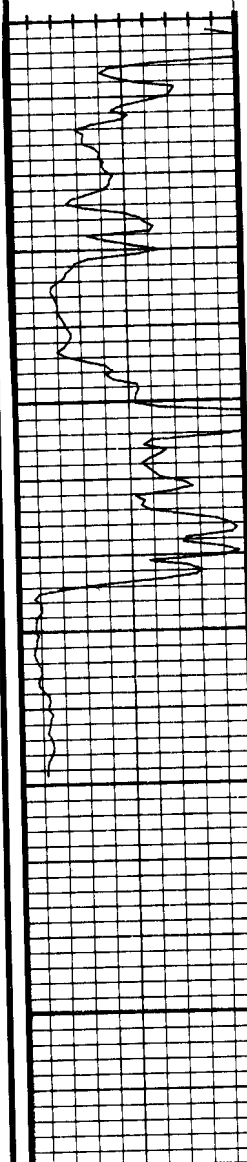
DEPTH

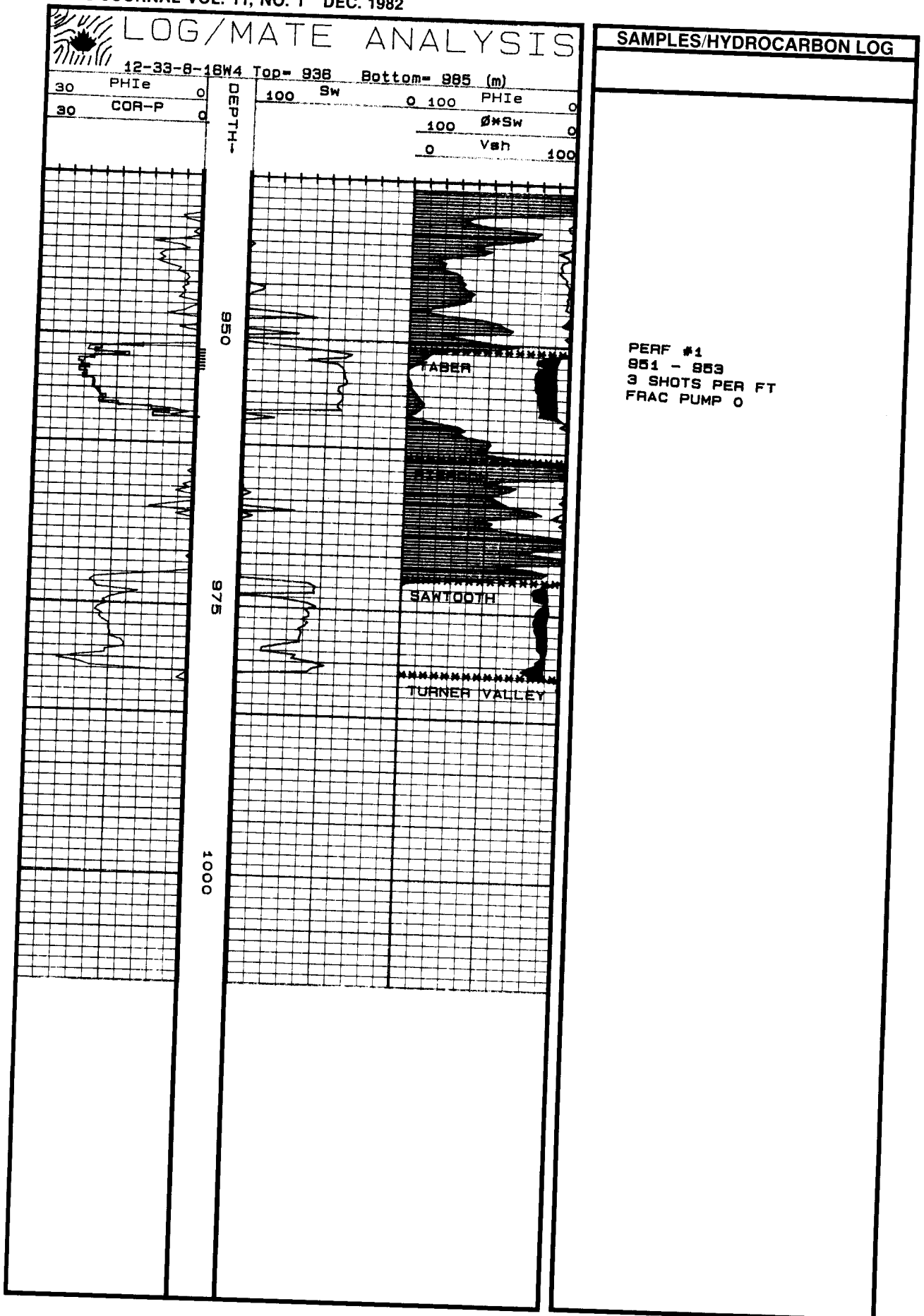
DEPTH

950

975

1000



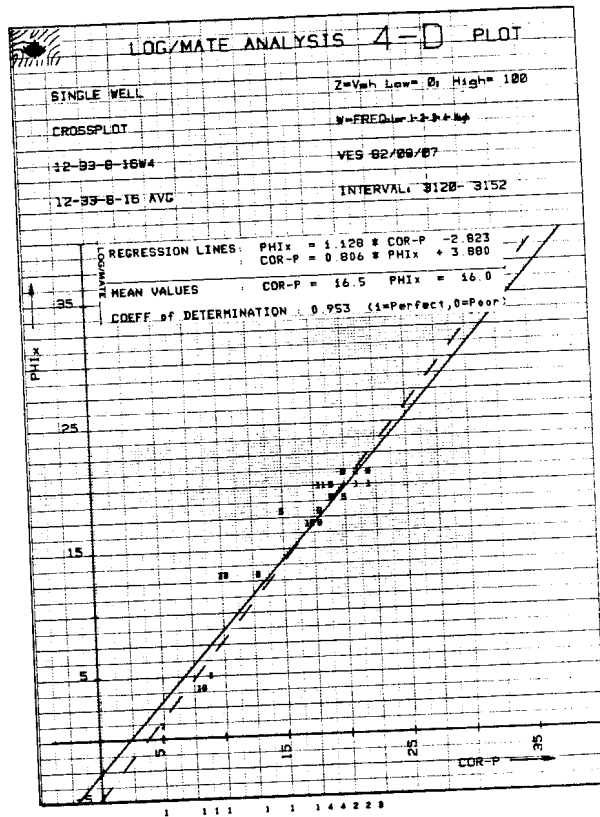
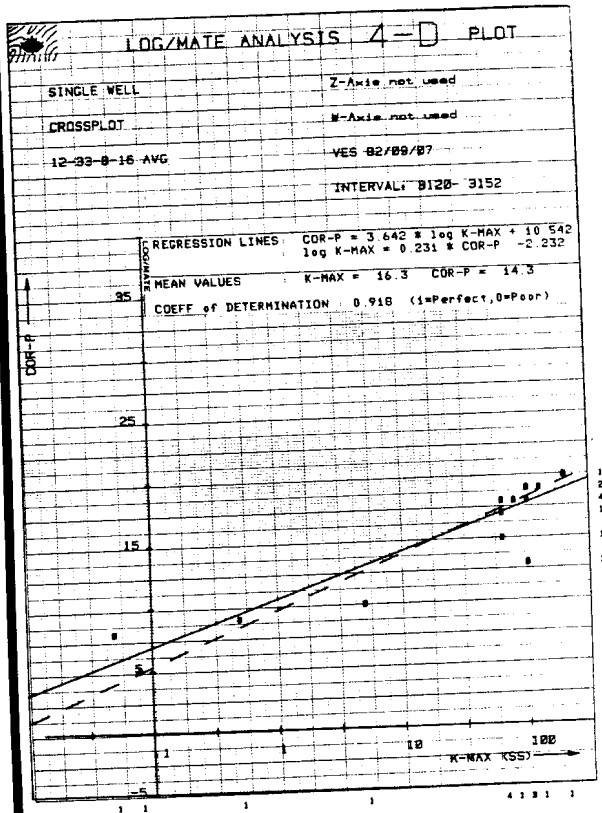
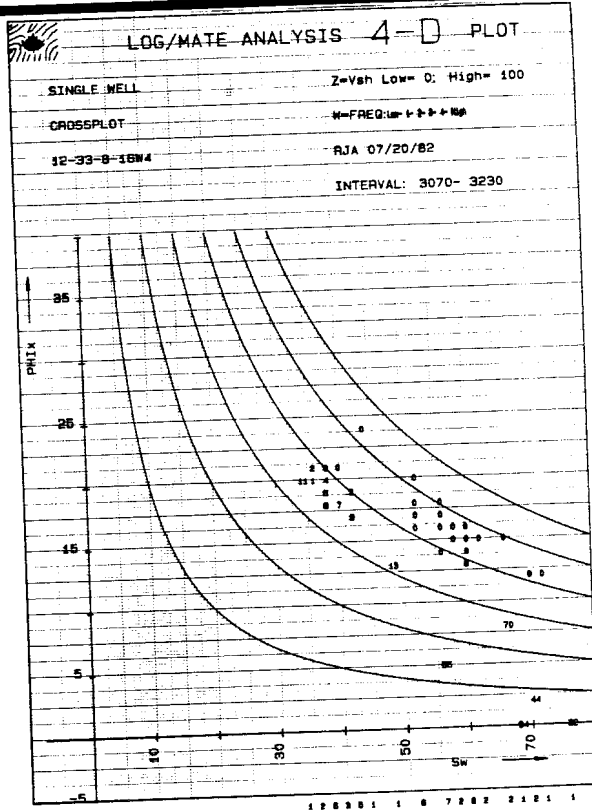


CWLS LOG ANALYSIS HANDBOOK

LOCATION:
WELL NAME:

POOL(S):
FIELD:
PROVINCE:

CROSS PLOTS



CWLS LOG ANALYSIS HANDBOOK

LOCATION: Dome Total Goodfare
 WELL NAME: 10-7-72-11W6

POOL(S): Paddy, Cadotte
 FIELD: Goodfare
 PROVINCE: Alberta

LOGS AVAILABLE

CORE AVAILABLE

#	Type	Interval	Interval	Recovery
1	DIL/SFL	230-2037	1851-1867.3	16.3m
2	BHCS-GR	"		
3	CNL/FDC-GR	"		
4				
5				
6				

LOG INTERPRETATION CONSTANTS

Depth 1640-1710				Depth n/a	
Rw @ 25°C	--	RHOma	1690	Rw @ 25°C	RHOma
Rw @ FT	0.197	DELTma	180	Rw @ FT	DELTma
Rsh @ FT	20	RHOw	1000	Rsh @ FT	RHOw
Rwb @ FT	--	DELTw	616	Rwb @ FT	DELTw
a	0.52	PHINsh	27	a	PHINsh
m	2.15	PHIDsh	2	m	PHIDsh
n	2.00	DELTsh	252	n	DELTsh
FT	62	Cp	1.0	FT	Cp

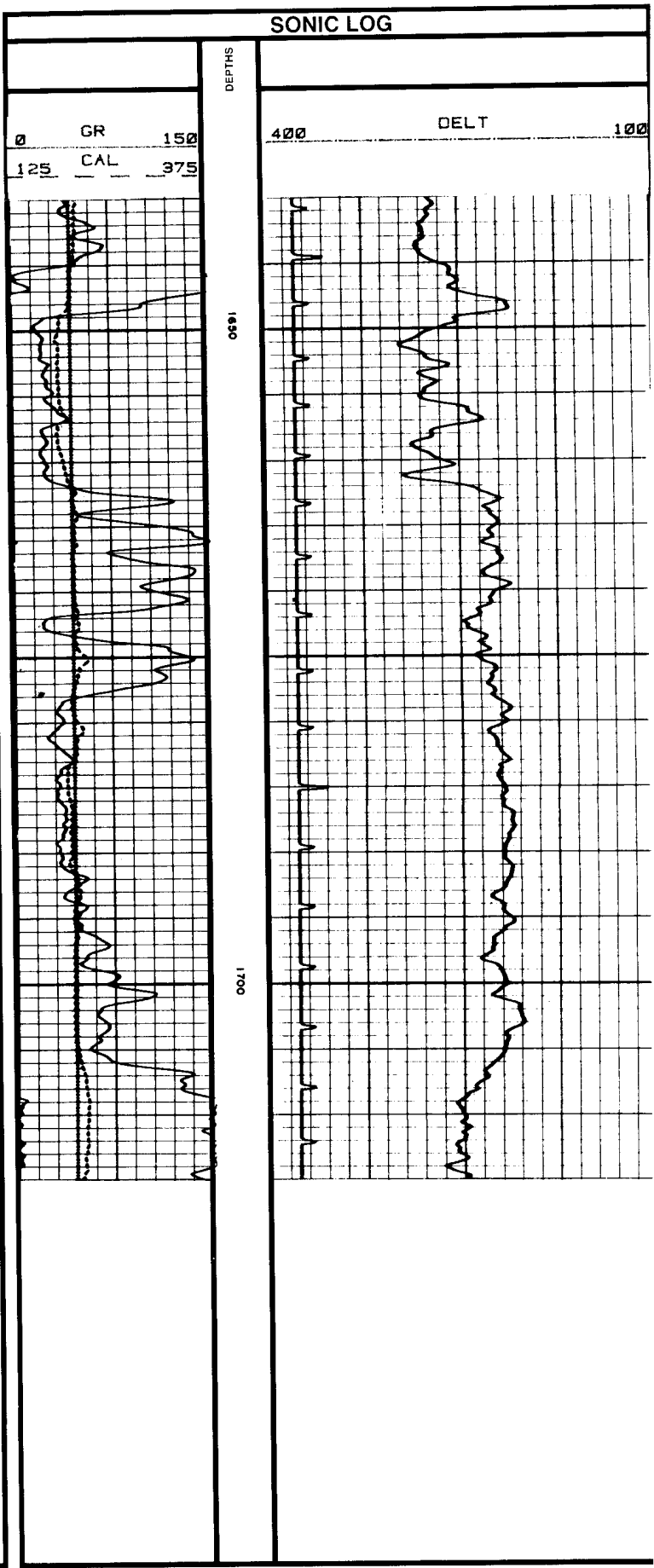
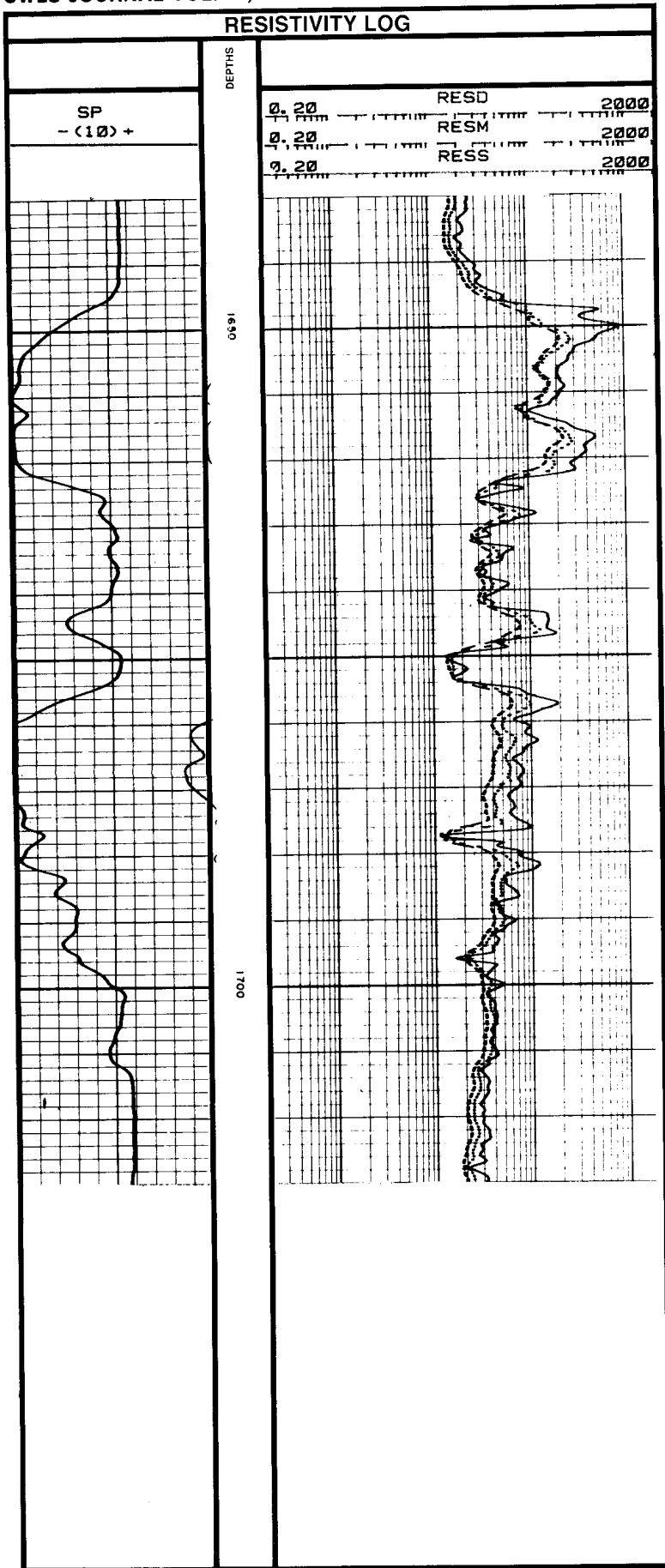
DST INFORMATION

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DST #	2	DST #	n/a
Interval	1651.0-1667.3	Interval	
IHP		IHP	
Preflow (min)		Preflow (min)	
ISIP (min)		ISIP (min)	
VO (min)		VO (min)	
FSIP (min)		FSIP (min)	
FHP		FHP	
Recovery:	CST 1.5 Min @ 308, 228 m3/d 1m condensate	Recovery:	
Comments:			

PRODUCTION TEST RESULTS

GAS WELL



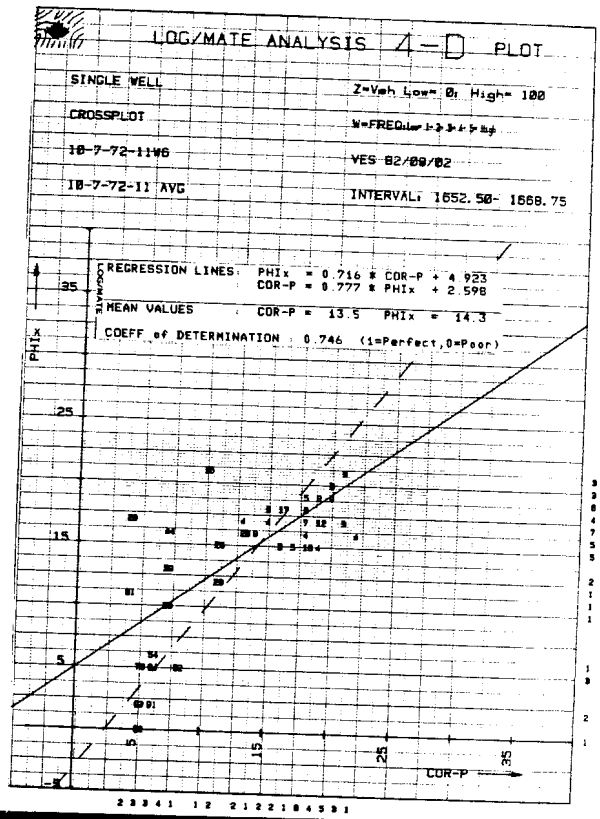
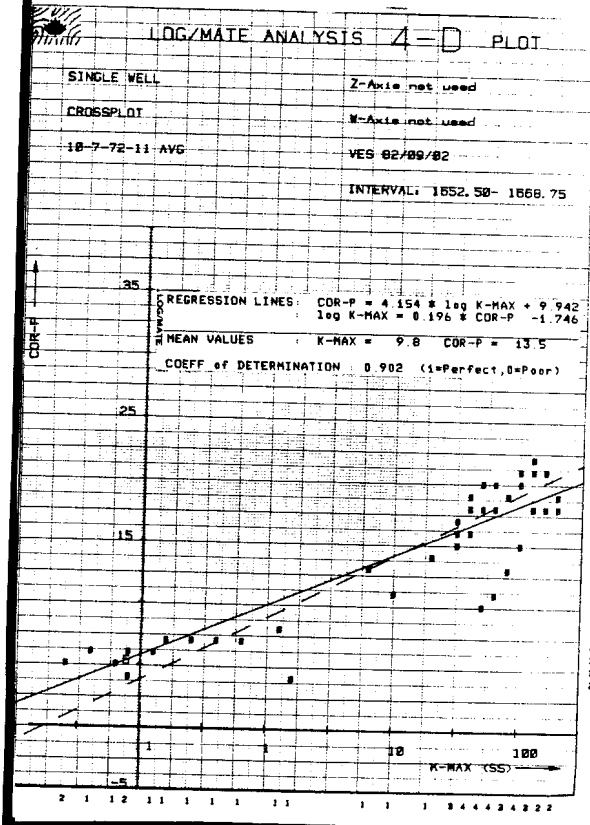
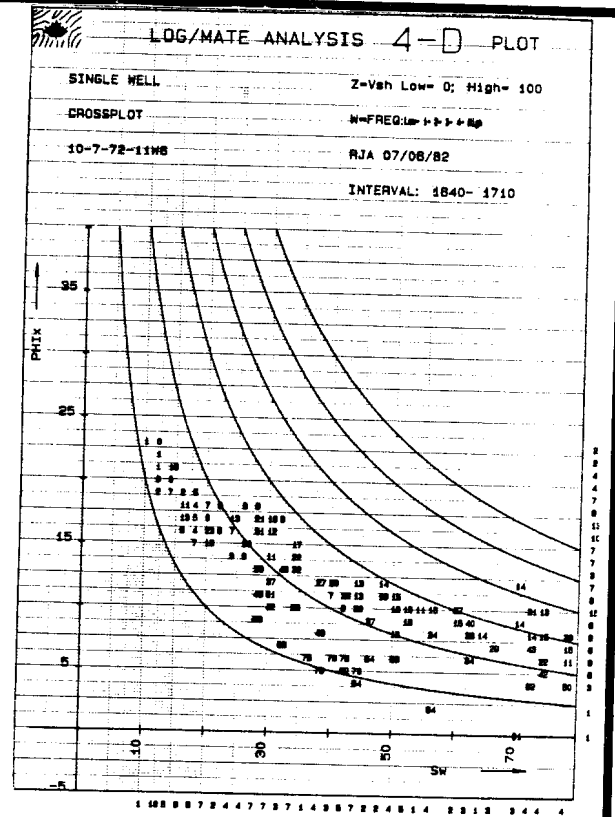
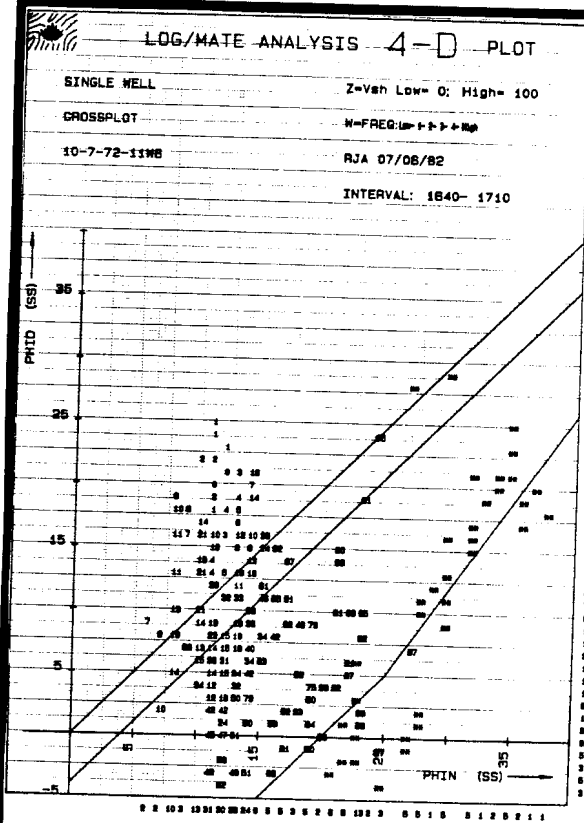


CWLS LOG ANALYSIS HANDBOOK

LOCATION:
WELL NAME:

POOL(S):
FIELD:
PROVINCE:

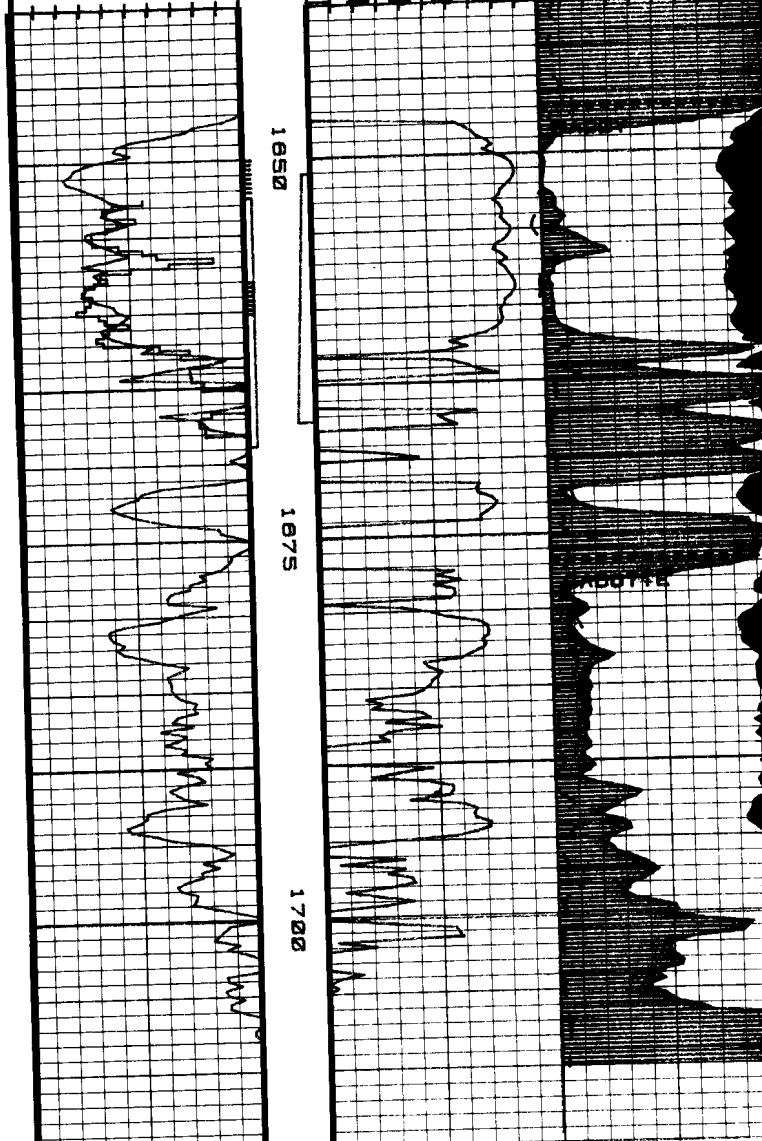
CROSS PLOTS



LOG/MATE ANALYSIS

10-7-72-11W6 Top= 1640 Bottom= 1710 (m)

30	PHI _e	0	100	S _w	0	100	PHI _e	0
30	COR-P	0			100		Q*Sw	0
					0		Veh	100
							DCAL	500



SAMPLES/HYDROCARBON LOG

PERF #3
1650.0 - 1652.0
7 SHOTS PER M

DST #2
1651.0 - 1667.3
GTS 1.5 MIN
308228m³/d
REC 1m COND

CORE #1
1652.5 - 1668.8
PERF #4
1658.0 - 1660.0
FLUID
318000m³/d
19mmCHW/COND



DENSITY-NEUTRON LOG



LOG/MATE ANALYSIS

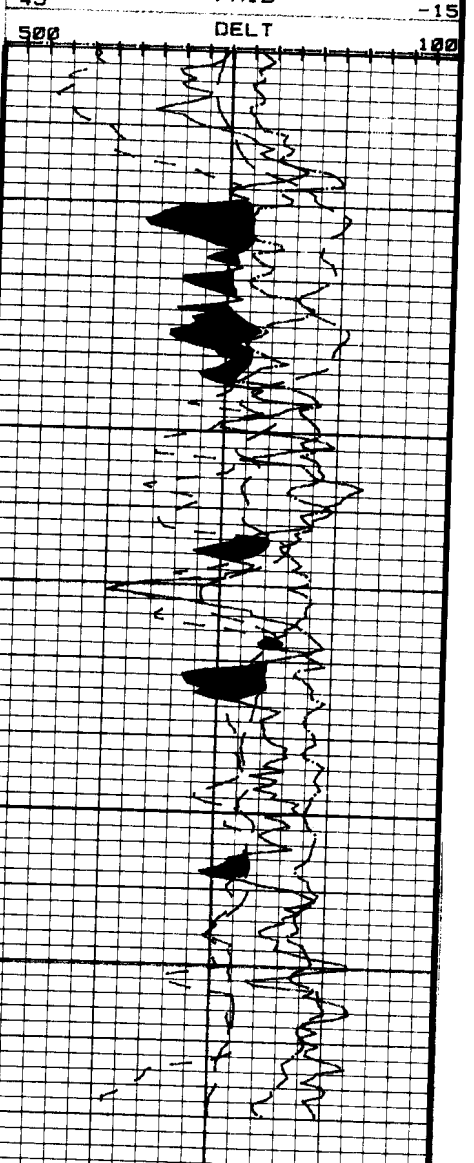
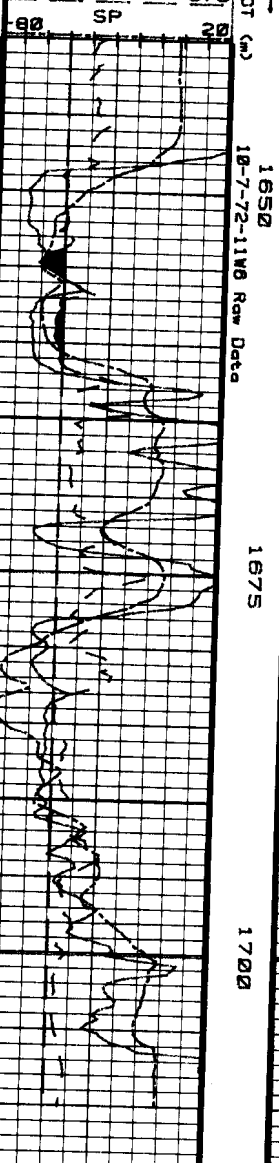
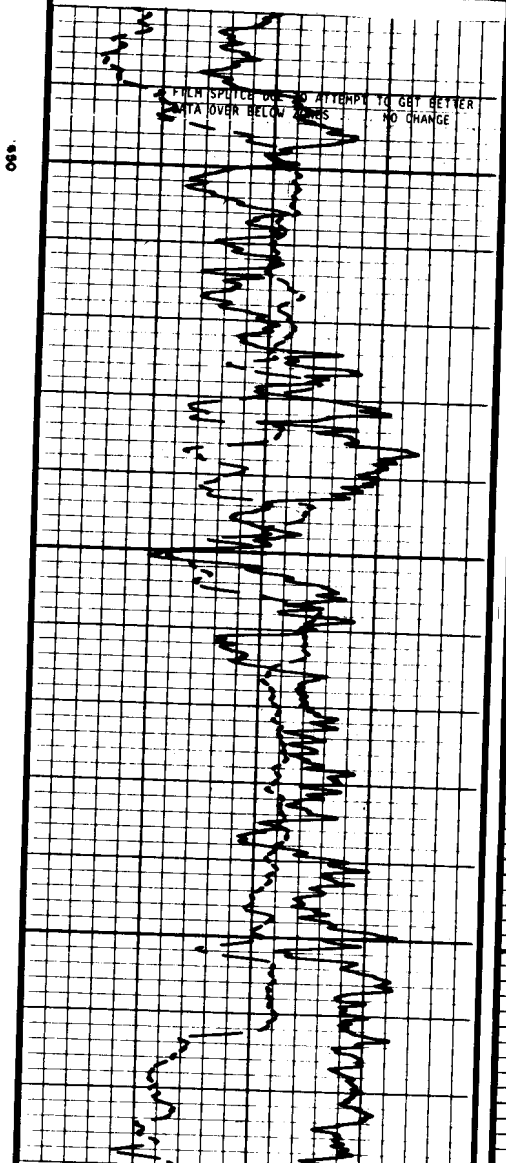
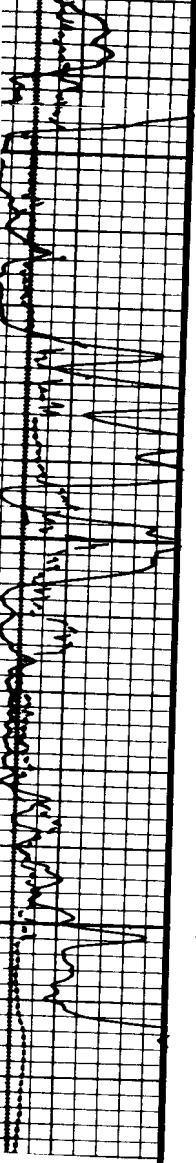
10-7-72-11W6 Top= 1640 Bottom= 1710 (m)

0	GR	150
125	CAL	375
125	BITZ	375
90	SP	20

0	RESO	2000
45	PHIN	-15
45	PHID	-15
500	DELT	100

GR	150
CAL	375

45	PHIN	-15
45	PHID	-15



CWLS LOG ANALYSIS HANDBOOK

LOCATION:
WELL NAME:

POOL(S):
FIELD:
PROVINCE:

HAND CALCULATED ANALYSIS

ZONE/DEPTH		LOG DATA							RESULTS						
P T	Paddy/ Cadotte	RESD	RESM	RESS	PHIN	PHID	DELT	GR		Vsh	PHIe	Sw	PHI-H	HYD-H	NET-H
1	1649-1653	175	200	400	11	24	280	22		0	19	18	.76	.62	4
2	1653-1656	150	150	300	15	18	280	30		6	16	23	.48	.37	3
3	1656-1663	175	225	400	12	20	280	25		2	16	21	.96	.76	6
4															
5	1672-1674	80	120	260	10	17	240	29		5	13	38	.26	.16	2
6															
7	1680-1683	45	65	100	9	19	220	32		7	14	47	.42	.22	3
8															
9	1685-1688	33	43	60	12	8	215	38		12	8.3	94	.36	.02	0
10															
11	1693-1694	40	48	60	11	16	228	45		18	12.0	58	.18	.08	1
12															
13	Net Pay Calculated using $\phi = 9$ $SW = 60$														
14															
15															

LOG ANALYSIS COMMENTARY

This interval is typical of the best Paddy/Cadotte intervals in the Deep Basin area of Alberta. Density-Neutron log crossover due to gas is present, and rough hole conditions invalidate the density log in a few places. The Gamma Ray and Density-Neutron separation are good shale indicators, as is the SP except for the rounded bed boundaries due to the high resistivity of the formation. Porosity can be derived from the density-neutron crossplot, and matches core if the density log is offset by a matrix value of 2690 Kg/m³ instead of the more usual 2650 value used in most sands. This is true for many sands in the deeper and older Cretaceous section, including the Basal Quartz further south in Alberta. Water saturation can be calculated from the Simandoux or Dual Water method with fair reliability, using a water resistivity of 0.20 at formation temperature (this is an "area average" for the zone). The higher saturations in the Cadotte reflect the finer grained, higher clay content of the sand.

ACKNOWLEDGEMENTS

WELL OPERATOR: Dome Petroleum Ltd.
LOGS PROVIDED BY: Riley's Data Share
OPEN HOLE LOGS BY: Schlumberger
HYDROCARBON LOGS BY: n/a

PREPARED BY: E.R. Crain/V. Sels DATE: 15/09/82
COMMENTARY BY: E.R. Crain
COMPUTED LOG BY: Log/iate Limited
CWLS CORPORATE MEMBERS FUNDED THIS PROJECT

