GEOLOGICAL SURVEY OF CANADA
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Vitrinite reflectance data for HB-Fina East Point E-49

M.P. Avery

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Table of Contents

Well information 1
Introduction 1
Remarks 1
Method 2
Discussion 2
References 2

Table I - Inferred Hydrocarbon Thermal Maturity Levels 1
Table II - Summary of kerogen - based vitrinite reflectance 3
Table III - Formation Tops 3

(List of remaining figures and appendices in order of appearance)

Figure 1 - VR/depth plot for East Point E-49
Figure 2 - VR Histograms/depth plot for East Point E-49
Figure 3 - VR/depth plot for East Point E-49 (Comparison with coal data)

Appendix I - Sample preparation method
Appendix II - Zones of petroleum generation and destruction
Appendix III - Data listings and basic statistics

Well information

G.S.C. Locality No.: D014 **Unique Well ID:** 300 E49 46400 61300 **Location:** 46.63975° N, 61.62391° W

R.T. Elevation: 32' (9.8m) **Water Depth:** 206' (62.8m) **Total Depth:** 11569' (3526.2m)

Sampled Interval: 960-11560' (292.6-3523.5m) **Interval Studied:** 5680-11560' (1731.3-3523.5m)

Depth Units: Feet referenced to R.T. (Metric conversions) **Rig Release Date:** November 10, 1970

Introduction

Vitrinite reflectance has been determined on 8 rotary drill cutting samples from HB-Fina East Point E-49, which was classified as an exploratory well, located in the Gulf of St. Lawrence. The well status is Plugged and Abandoned.

Sample preparation followed the procedures listed in Appendix I. Data acquisition and manipulation was done on a Zeiss Photometer III system with a custom interface to a computer for data storage and statistical summaries.

Analysis of the well reveals thermal maturity levels given in Table I. Specific maturity levels, as set out in this report, are based on those of Powell and Snowdon(1983) with modified terminology (Appendix II).

Table I
Inferred Hydrocarbon Thermal Maturity Levels

Depth		Vitrinite Reflectance*	Hydrocarbon generation levels**
feet	metres	%Ro	for type II or III kerogen
206 [sea floor]	63	(0.61)	marginally mature
2990	911	0.8	mature
5310	1617	1.00	mature
7200	2194	1.20	mature
8420	2567	1.35	entering gas and dry gas range
11569[T.D.]	3526	(1.83)	gas and dry gas range

**( )'s indicate Ro's extrapolated from linear regression slope: 0.137 log Ro/km*
*** Actual hydrocarbon products depend on type of organic matter present (Powell and Snowdon, 1983).*

Remarks

Sample coverage for vitrinite reflectance analysis (Figure 1, Table II) was reasonably complete over the studied section between 2990 and 11569' at East Point E-49. The data were plotted on a log Ro vs. linear depth scale. A regression line fitted through the data yielded a maturity slope of 0.1372 log Ro/km. There is a significant variation in the number of readings that the sample points are based on (Table II) therefore the regression line was weighted based on the 'n' value for each point. The relative size of the point symbols provide an indication of the number of readings. The 'error bars' displayed on the maturity profile indicate one standard deviation on either side of the mean and may be deceivingly small for samples with very few readings.

The histogram display (Figure 2) shows the variability in the reflectance populations, which represent the maturity of the sediments with depth. Plotting reflectance histograms on a log scale may help reveal any trends present in the Ro data. It also can help to demonstrate the effects of cavings, geology, casing points and other influences on the vitrinite reflectance populations.

These vitrinite reflectance data show that the thermal maturity of the section of East Point E-49 between 2990 and 8420' is categorized as mature for the generation of liquid hydrocarbons while between 8420 and 11569' (T.D.) it is categorized as over-mature for liquid hydrocarbons and would only produce gas. These results only reveal the maturity of the sediments penetrated, actual production of hydrocarbons depends on whether potential source rocks of the proper organic matter type and traps are present or connected to the well.

Method

Data obtained for this report were measured on polished kerogen mounts. Kerogen concentrate preparations make much more of the organic matter from the sample interval available for viewing by the operator than other methods. The lack of mineral matter makes for better polishing and since the polished surface area is much smaller the analysis time is about a third or less of that for non-concentrated whole rock preparations.

Discussion

The samples measured for this report yielded very few values which were considered indicative of the maturity of the sediments from which they were derived. Only the shallowest sample produced more than 10 values while the remainder averaged five readings (Table II). The optimal number for these analysis is around 50 but this rarely achieved on polished organic preparations derived from rotary drill well cuttings. Low numbers of vitrinite reflectance data values are also typical of the sandstone dominated lithology in this well much of which is 'red' or oxic with high potential for reworking and recycling.

The results of these kerogen based data were compared with measurements available from earlier vitrinite reflectance on coaly samples from this well (Figure 3; GSCA internal pers. comm.). The coaly based values mostly concur with these kerogen-based data. They cover a narrower section and would likely yield a trend line that is more shallow than the kerogen data but it would cross the bottom of the 'oil window' line at a similar depth.

References

Powell, T. G. and Snowdon, L. R.,1983. A composite hydrocarbon generation model. Erdöl und Kohle, Erdgas, Petrochemie, v. 36, p. 163-170.

Giles, P., Utting, J., 1999. Maritime Basin Stratigraphy, Prince Edward Island and adjacent Gulf of St. Lawrence. GSC Open File Report 3732.

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H. Wielens, GSC (Atlantic)
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MResG Files, GSC (Atlantic)
K. Osadetz,, GSC (Calgary)
C. Beaumont, Dalhousie Univ., Halifax

Table II

Summary of kerogen - based vitrinite reflectance

Sample Labels	Depth		Mean Ro (SD) non-rotated	Number of Readings	
	feet	metres		Total	Edited
K0946C	5680	1731	1.05 (±0.10)	19	19
K0946D	6180	1884	1.06 (±0.09)	8	4
K0947A	6980	2128	1.20 (±0.01)	18	2
K0947B	8480	2585	1.32 (±0.05)	32	8
K0947C	9480	2890	1.50 (±0.05)	20	9
K0947D	10580	3225	1.46 (±0.04)	12	4
K0948A	11080	3377	1.81 (±0.05)	9	4
K0948B	11560	3523	2.01 (±0.07)	4	4

Table III

Formation Tops (Giles and Utting 1999)

Formation	Top	
	feet	metres
(Unnamed Permian Sand)	260	63
Pictou Gp	2090	637
Naufrage Fm	2090	637
Cablehead Fm	5190	1582
Green Gables Fm	6155	1876
Bradelle Fm	7860	2396
Cumberland Gp	9515	2900
(Westphalian Unconf)	9515	2900
Margaree Mb	9515	2900
Port Hood Fm	9515	2900
Mabou Gp	9798	2986
Pomquet Fm	9798	2986
Hastings Fm	11248	3428
Pomquet Fm	11310	3447
Hastings Fm	11430	3484

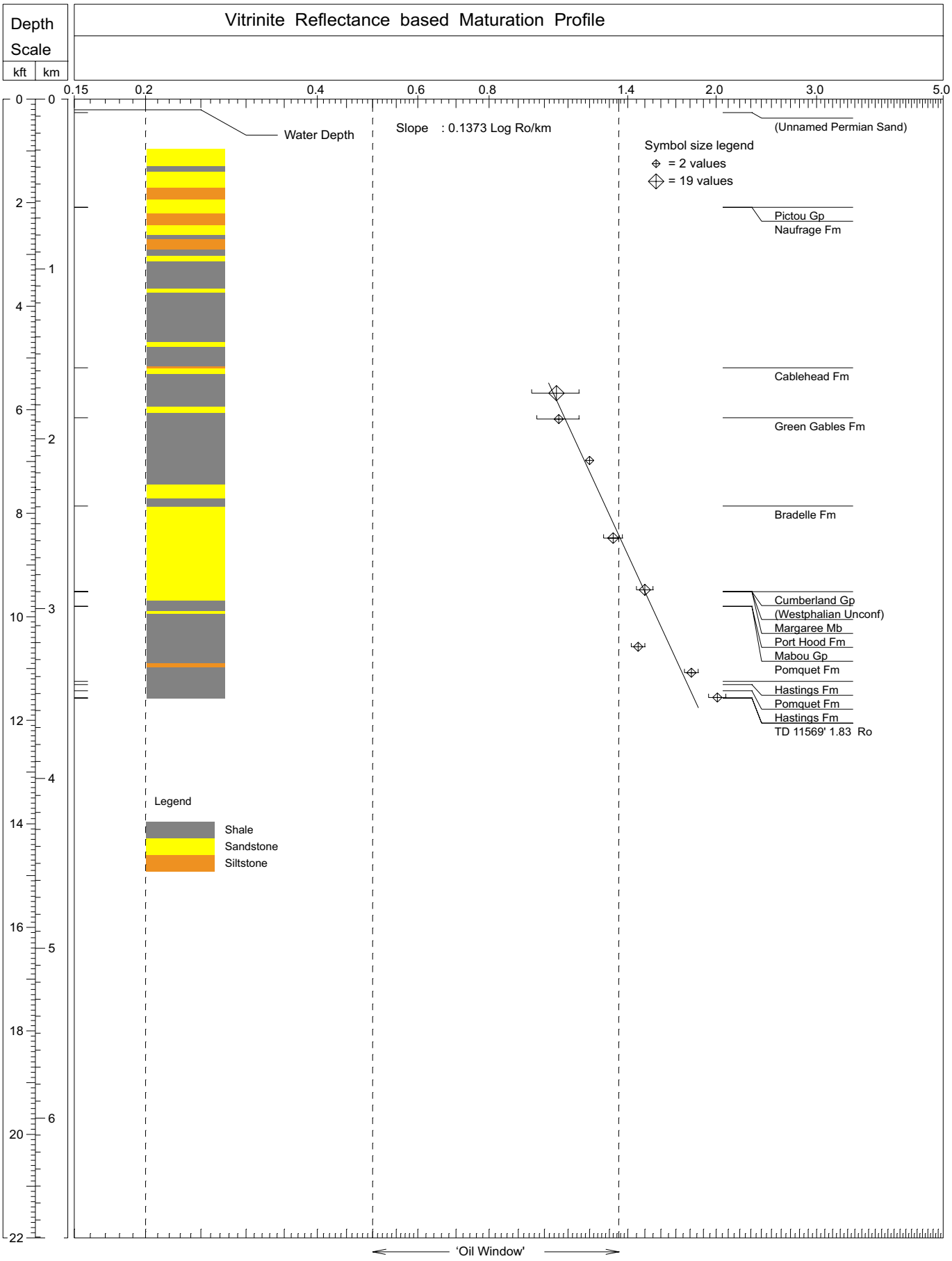


Figure 1. VR/depth plot for East Point E-49

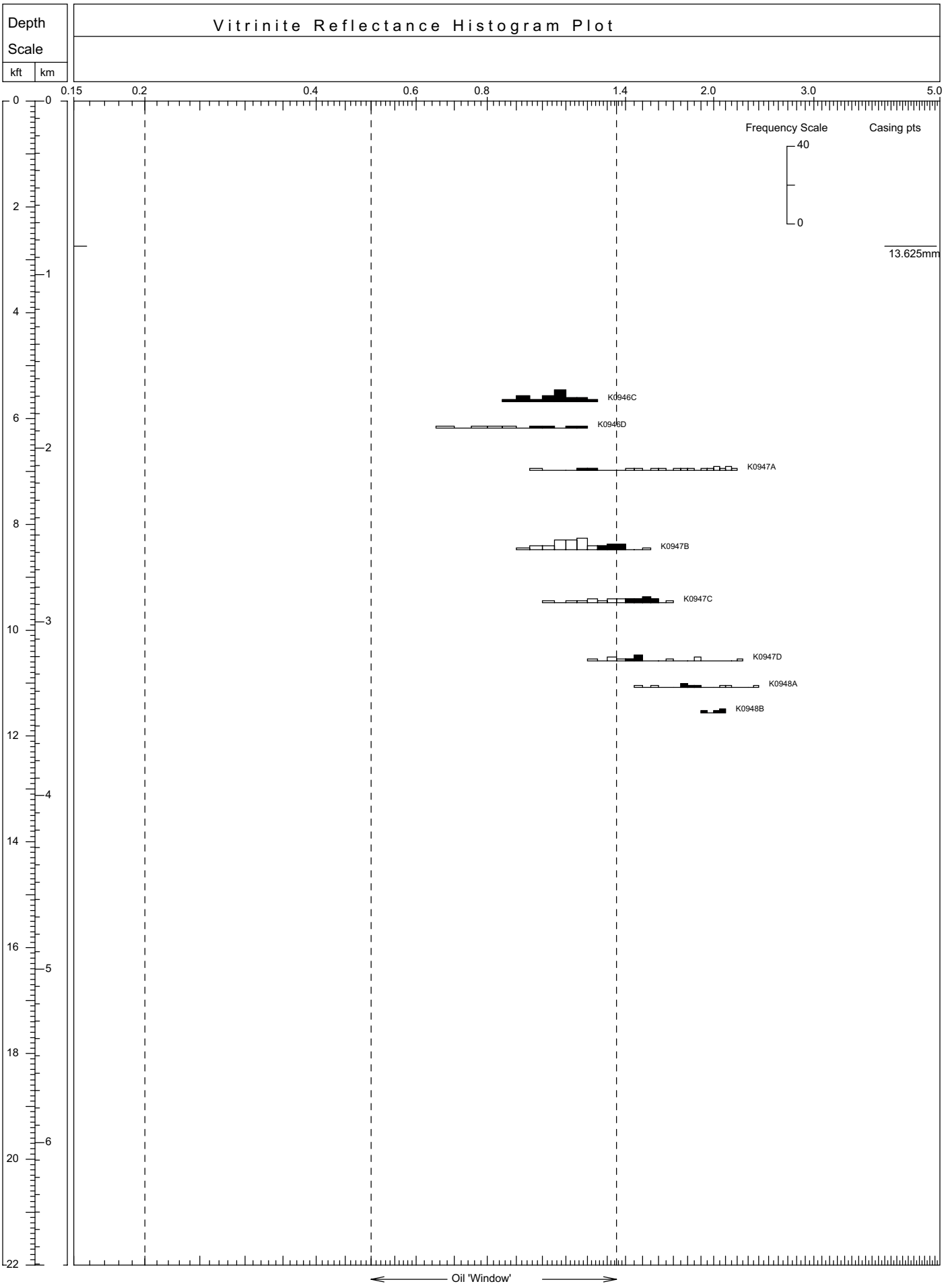


Figure 2. VR Histograms/depth plot for East Point E-49

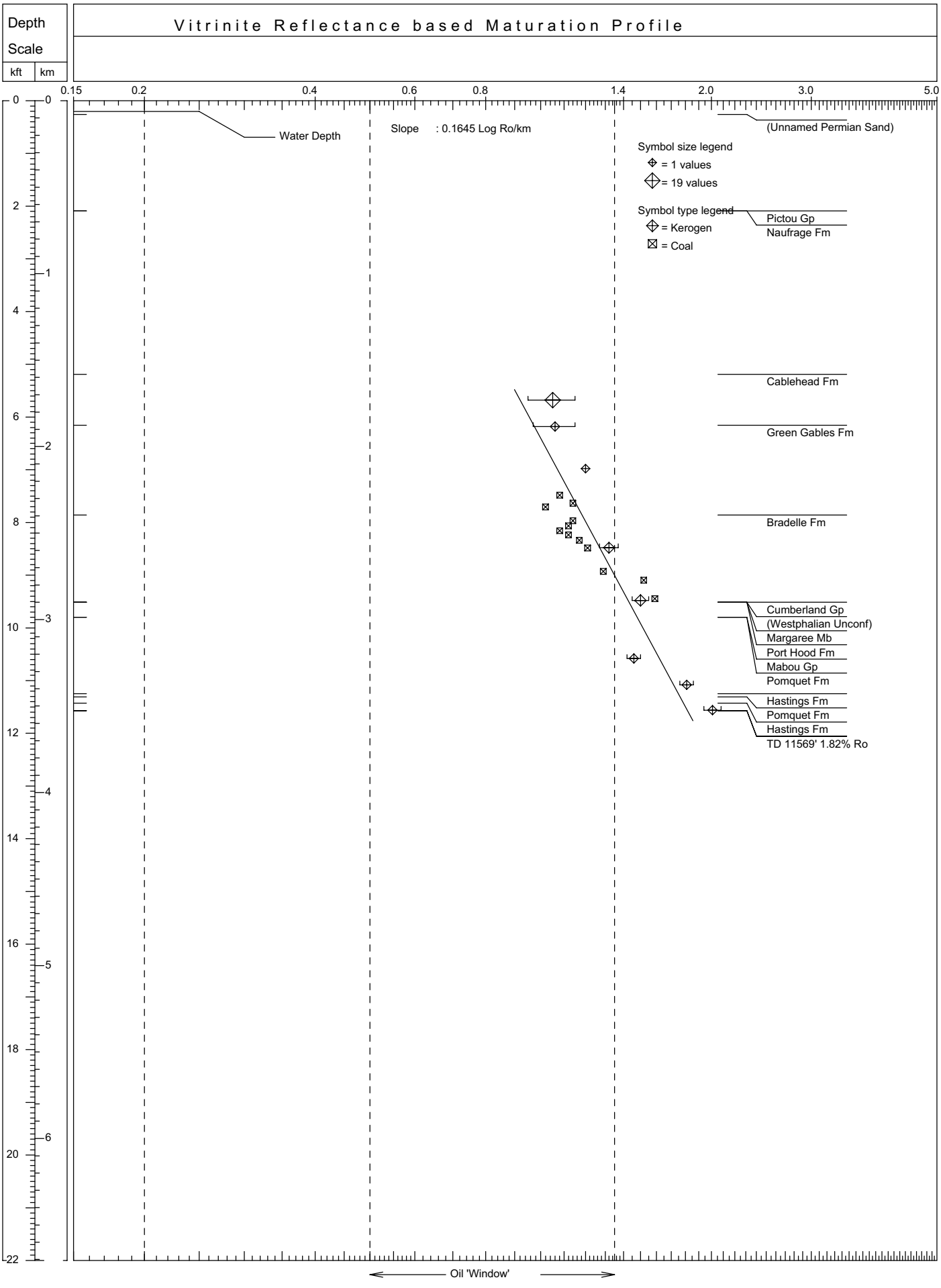


Figure 3. VR/depth plot for East Point E-49 (Comparison with coal data)

Appendix I

Sample Preparation Method

Kerogen concentrate sample preparation

Preliminary wash (preparation for drill cuttings)

Dry samples in oven (25°C)

PALYNOLOGY Lab preparation

Place 20-30 grams in 250 ml plastic beaker.
Add 10% HCl till reaction ceases (removes carbonates).
Rinse 3 times.
Immerse in hot concentrated HF overnight (removes silicates).
Rinse 3 times.
Heat (60-65°C) in concentrated HCl (removes fluorides caused by HF).
Rinse 3 times.
Transfer to 15 ml test tube with 4-5 ml 4% Alconox.
Centrifuge at 1500 rpm for 90 sec.
Decant.
Rinse and centrifuge 3 times.
Float off organic fraction using 2.0 S.G. ZnBr solution.
Centrifuge at 1000 rpm for 8 min.
Float fraction into second test tube.
Wash and centrifuge 3 times.
Make kerogen smear slide.
Remaining kerogen material is made available to Organic Petrology Lab.

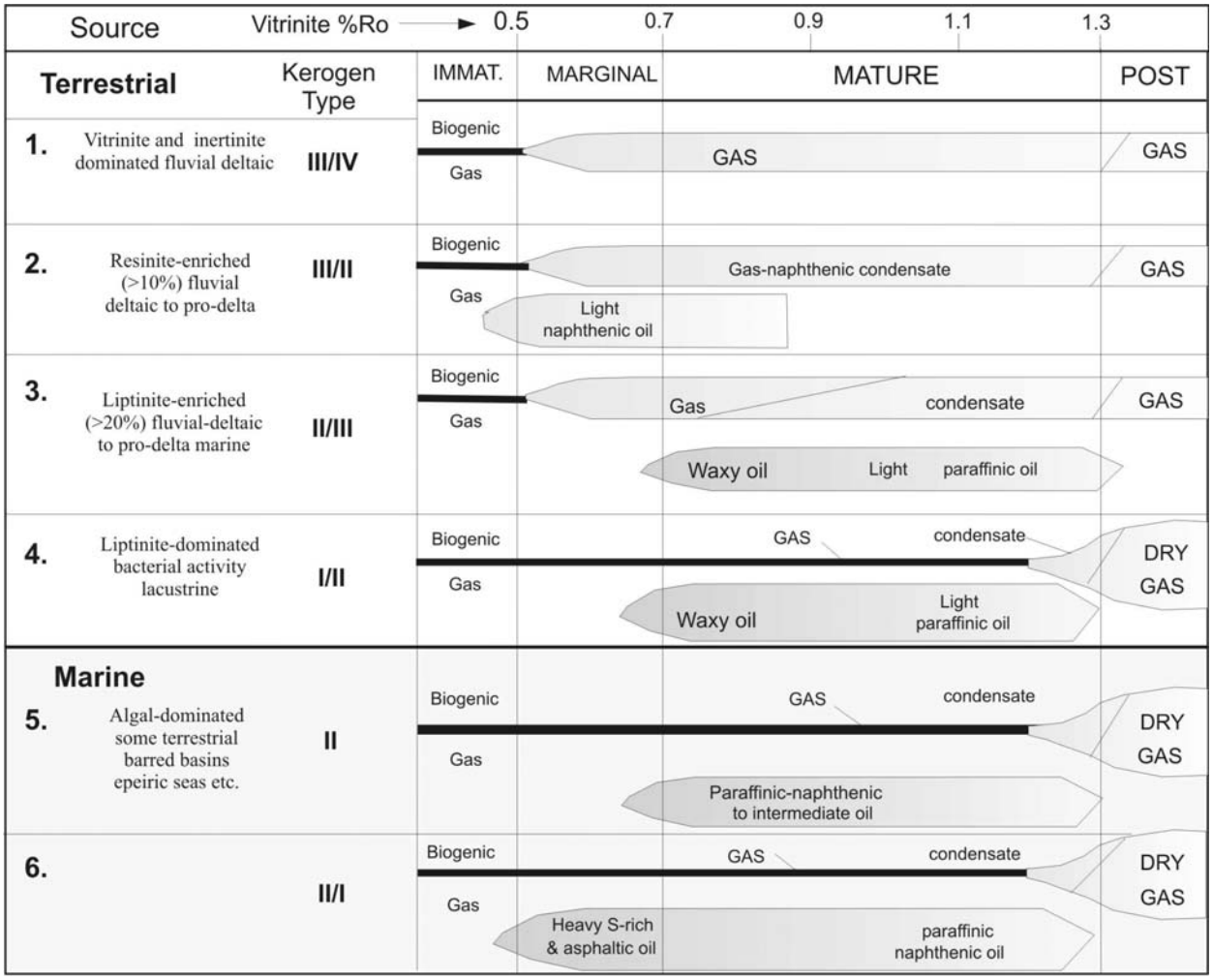
VITRINITE REFLECTANCE Lab preparation

Pipette off excess water and prepare as 2.5 cm (1") diameter plastic stubs to fit polisher.
Freeze dry and fix material for polishing with epoxy resin.
Polish with diamond-based suspension to obtain low relief, scratch-free surface.
Examine under oil lens, incident light at approximately 1000x magnification.

Whole rock sample preparation

Set washed drill cuttings in epoxy to form 2.5 cm (1") diameter plastic stubs to fit polisher.
Grind and polish to obtain low relief, scratch-free surface.
Examine under oil lens, incident light at approximately 1000x magnification.

Appendix II (Powell and Snowdon 1983)



Hydrocarbon generation model compiled from Powell and Snowdon (1983) illustrating the different thresholds of hydrocarbon generation and products as related to thermal maturity, kerogen type and paleodepositional environment.

Appendix III

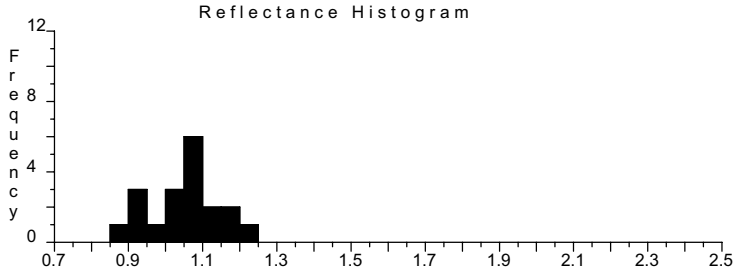
Data listings and basic statistics

Data listings and basic statistics for: East Point E-49

K0946C

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.92)	(1.04)	(1.07)	(1.04)	(1.16)	(1.10)	(1.06)	(1.07)	(0.85)	(1.07)
1	(0.98)	(1.22)	(1.17)	(1.04)	(1.09)	(1.10)	(1.09)	(0.90)	(0.90)	

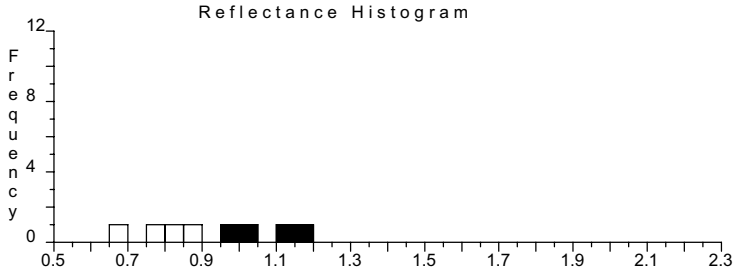
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	1.05	0.10	19	0.85	1.22	19.87
(Edit)	1.05	0.10	19	0.85	1.22	19.87



K0946D

Col >	1	2	3	4	5	6	7	
Row	(1.15)	0.67	0.81	0.85	(1.13)	0.79	(0.96)	(1.00)

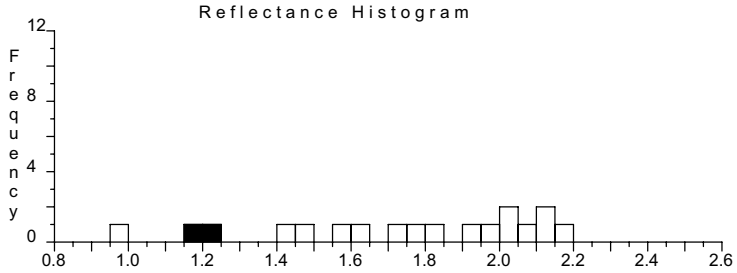
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	0.92	0.17	8	0.67	1.15	7.36
(Edit)	1.06	0.09	4	0.96	1.15	4.24



K0947A

Col >	1	2	3	4	5	6	7	8	9	0
Row	(1.20)	2.04	1.80	2.14	1.91	(1.19)	1.60	1.99	2.14	0.95
1	2.15	1.46	1.44	2.08	2.02	1.73	1.77	1.57		

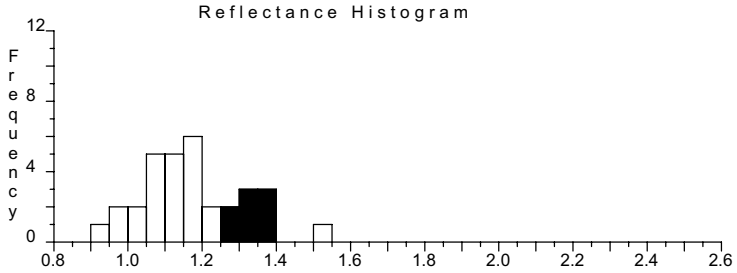
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	1.73	0.37	18	0.95	2.15	31.18
(Edit)	1.20	0.01	2	1.19	1.20	2.39



K0947B

Col >	1	2	3	4	5	6	7	8	9	0
Row	(1.37)	1.13	1.14	1.16	1.13	(1.35)	(1.38)	(1.30)	1.12	0.91
1	(1.27)	1.06	1.20	(1.31)	1.50	(1.30)	1.05	1.04	(1.25)	1.15
2	1.00	1.21	1.18	0.98	1.16	1.06	1.09	0.98	1.16	1.12
3	1.19	1.07								

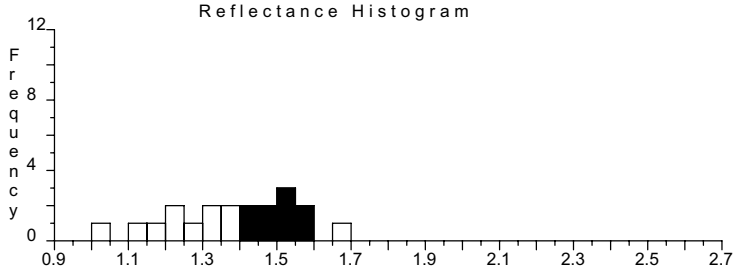
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	1.17	0.13	32	0.91	1.50	37.32
(Edit)	1.32	0.05	8	1.25	1.38	10.53



K0947C

Col >	1	2	3	4	5	6	7	8	9	0
Row	1.20	1.34	1.30	(1.56)	1.39	(1.55)	1.16	(1.51)	1.22	1.00
1	(1.44)	(1.44)	(1.52)	1.14	1.37	1.68	1.26	(1.47)	(1.54)	(1.47)

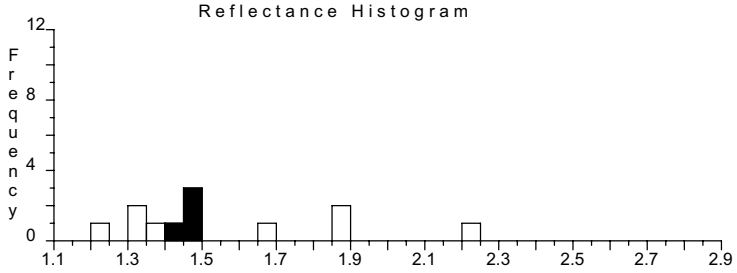
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	1.38	0.17	20	1.00	1.68	27.56
(Edit)	1.50	0.05	9	1.44	1.56	13.50



K0947D

Col >	1	2	3	4	5	6	7	8	9	0
Row	(1.45)	2.24	1.87	1.31	1.34	1.23	(1.40)	(1.49)	(1.48)	1.39
1	1.85	1.68								

	Mean	Stand Dev	Pts	Min	Max	Sum
Total	1.56	0.29	12	1.23	2.24	18.73
(Edit)	1.46	0.04	4	1.40	1.49	5.82

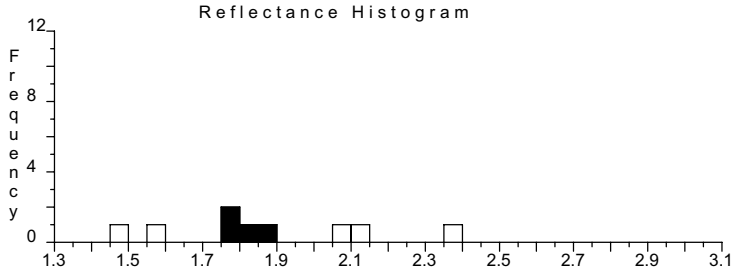


Data listings and basic statistics for: East Point E-49

K0948A

Col >	1	2	3	4	5	6	7	8	
Row	(1.79)	(1.88)	2.11	2.36	(1.76)	(1.82)	1.58	2.06	1.45

	Mean	Stand Dev	Pts	Min	Max	Sum
Total	1.87	0.28	9	1.45	2.36	16.81
(Edit)	1.81	0.05	4	1.76	1.88	7.25



K0948B

Col >	1	2	3
Row	(1.90)	(2.05)	(2.06) (2.03)

	Mean	Stand Dev	Pts	Min	Max	Sum
Total	2.01	0.07	4	1.90	2.06	8.04
(Edit)	2.01	0.07	4	1.90	2.06	8.04