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Vitrinite reflectance (Ro) of dispersed organic matter from Husky/Bow Valley et al Golconda C-64

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G.S.C. Locality No.: D302 **Unique Well ID:** 300 C64 47000 47300 **Location:** 46.88655°N, 47.66572°W

R.T. Elevation: 22.7 m **Water Depth:** 173.0m **Total Depth:** 4450.9 m

Sampled Interval: 1000-4451 m **Interval Studied:** 1025-4450 m

Depth Units: Meters referenced to R.T. **Rig Release Date:** February 2, 1987

Vitrinite reflectance has been determined on 20 rotary cuttings samples from Husky/Bow Valley et al Golconda C-64 which was classified as an exploratory well and is located on the Grand Banks approximately 388 km east of St. John's, Newfoundland. Well status is Plugged and Abandoned.

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

Analysis of the well reveals thermal maturity intervals given in Table I. Specific maturity levels, as set out in this report, are based on those of Dow (1977) with modified terminology (Appendix II).

Table I
Inferred Thermal Maturity Levels*

Depth in meters	Vitrinite Reflectance (%Ro)**	Maturity for oil generation*
Upper maturity line		
173 [Sea floor]	(0.16)	immature
1777 [unconformity]	(0.35)	immature
Lower maturity line		
1780	0.5	marginally mature
2160	0.6	onset of significant oil generation
2750	0.8	peak of oil generation
3830	1.35	oil floor
4451 [T.D.]	(1.83)	within oil window

* *Actual hydrocarbon products depend on type of organic matter present.*
***( )'s indicate Ro has been extrapolated from regression lines.* Above the unconformity the slope is 0.216 log Ro/km and *0.211 log Ro/km below.*

Remarks

Sample coverage for vitrinite reflectance analysis (Figure 1, Table II) was good over the section penetrated at Golconda C-64. The data were plotted on a log Ro vs. linear depth scale and regression lines were calculated and plotted through the data points (Figure 1). 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 slope of the upper maturity line is 0.216 log Ro/km and the slope of the lower maturity line is 0.211 log Ro/km.

The histogram display plot shows the variability in the reflectance populations which represents the maturity of the sediments with depth (Figure 2). Plotting reflectance histograms on a log scale may help reveal any trends that may be 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 provide evidence that the thermal regime of the lower section of Golconda C-64 is suitable to generate and preserve hydrocarbons within the drilled section, between 1780 and 3830m, assuming potential source rocks and traps are present. The section from 3830 to 4451m (T.D.) is within the gas generation window.

Discussion

The vitrinite reflectance based maturity profile for this Grand Banks well shows a jump in reflectance values coincidental with a significant unconformity at 1777m.. The good kerogen sample coverage available for Golconda C-64 provides a good view of this feature which is present in many wells. According to Dow (1977) an estimate of the amount of section missing can be calculated at such jumps or breaks. Graphically, the lower maturity line is projected above the unconformity to where it intersects a vertical line drawn from where the upper maturity intersects the unconformity. The exercise shows about 700 meters of eroded strata (Figure 1).

References

Dow, W.G., 1977. Kerogen studies and geological interpretations. Journal of Geochemical Exploration, no. 7, p. 77-99

McAlpine, K.D., 1990. Lithostratigraphy of fifty-nine wells, Jeanne d'Arc Basin. Geological Survey of Canada, Open File 2201, 97 p.

c.c. K.D. McAlpine, MResG, Dartmouth
A.E. Jackson, MResG, Dartmouth
MResG Files, Dartmouth
Central Technical Files, Ottawa
K. Osadetz, GSC (Calgary)
N. DeSilva, CNOPB, St. John's (3 copies)
C. Beaumont, Dalhousie Univ., Halifax

Table II

Summary of kerogen - based vitrinite reflectance

Sample Labels	Depths in meters	Mean Ro (SD) non-rotated	Number of Readings Total	Edited
K0897A	1025-1065	0.24 (±0.04)	11	11
K0897B	1205-1245	0.31 (±0.06)	18	18
K0897C	1415-1455	0.29 (±0.05)	12	12
K0897D	1595-1605	0.30 (±0.06)	5	5
K0898A	1745-1755	0.38 (±0.05)	12	12
K0898B	1925-1965	0.41 (±0.06)	17	17
K0898C	2105-2145	0.40 (±0.04)	26	26
K0898D	2285-2325	0.47 (±0.05)	17	17
K0899A	2525-2565	0.50 (±0.07)	17	17
K0899B	2705-2715	0.59 (±0.05)	10	10
K0899C	2885-2895	0.69 (±0.07)	14	13
K0899D	3035-3045	0.76 (±0.05)	18	15
K0900A	3215-3225	0.79 (±0.07)	3	3
K0900B	3425-3435	0.89 (±0.05)	6	6
K0900C	3605-3615	0.94 (±0.06)	3	3
K0900D	3815-3825	1.08 (±0.04)	7	5
K0901A	3965-3975	1.27 (±0.04)	9	5
K0901B	4115-4125	1.35 (±0.06)	17	16
K0901C	4265-4275	1.37 (±0.10)	23	23
K0901D	4405-4450	1.43 (±0.05)	27	20

Table III

Formation Tops (McAlpine, 1990)

Formation	Depth
Banquereau	in casing
(unnamed Limestone)	1767
(unconformity)	1777
(unnamed Jurassic-e Cretaceous)	1777
Voyager	1872
(unconformity)	1872
Downing	3055
Whale Mbr	3707-3802
Total Depth	4451

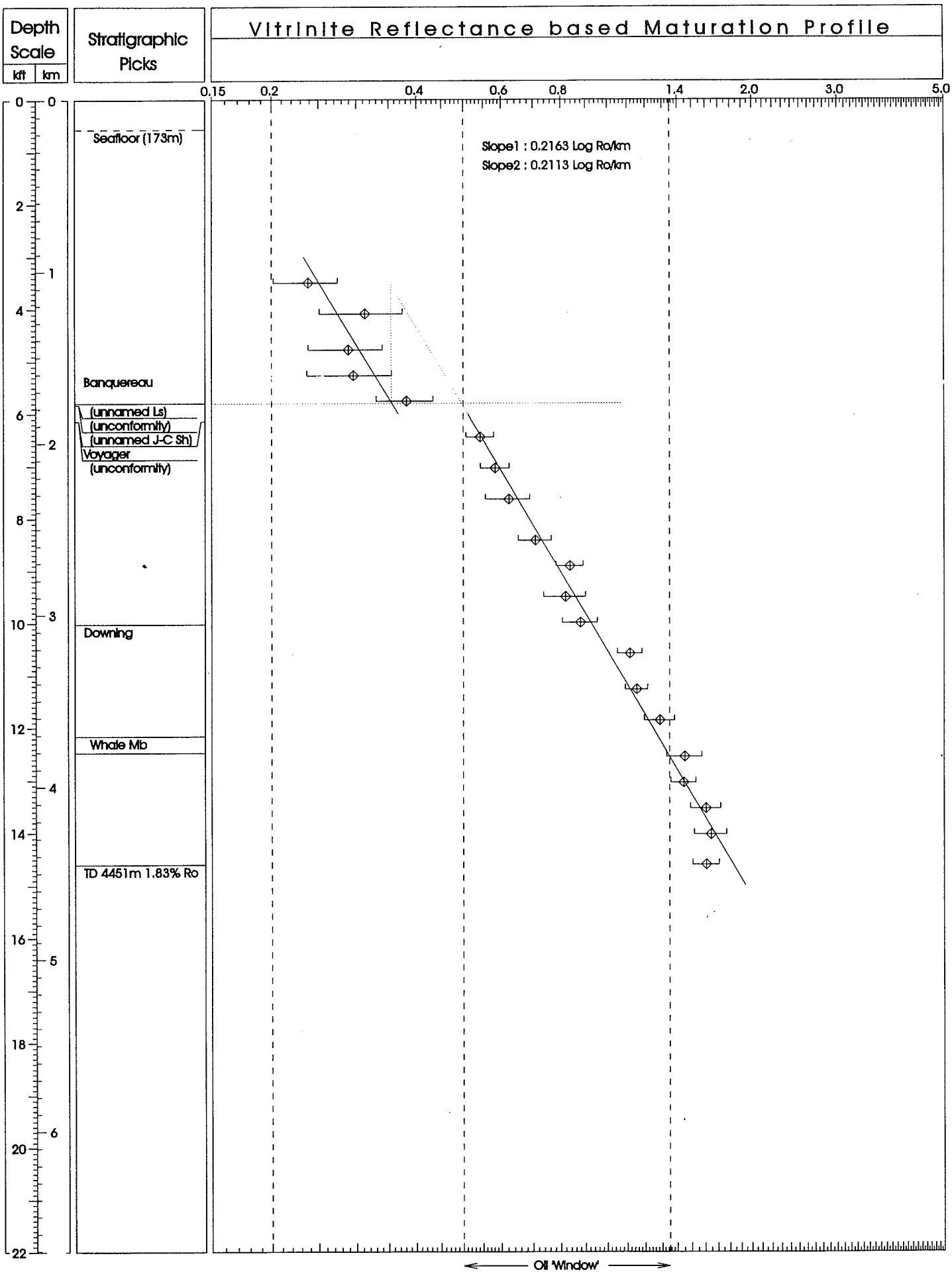


Fig. 1 Golconda C-64

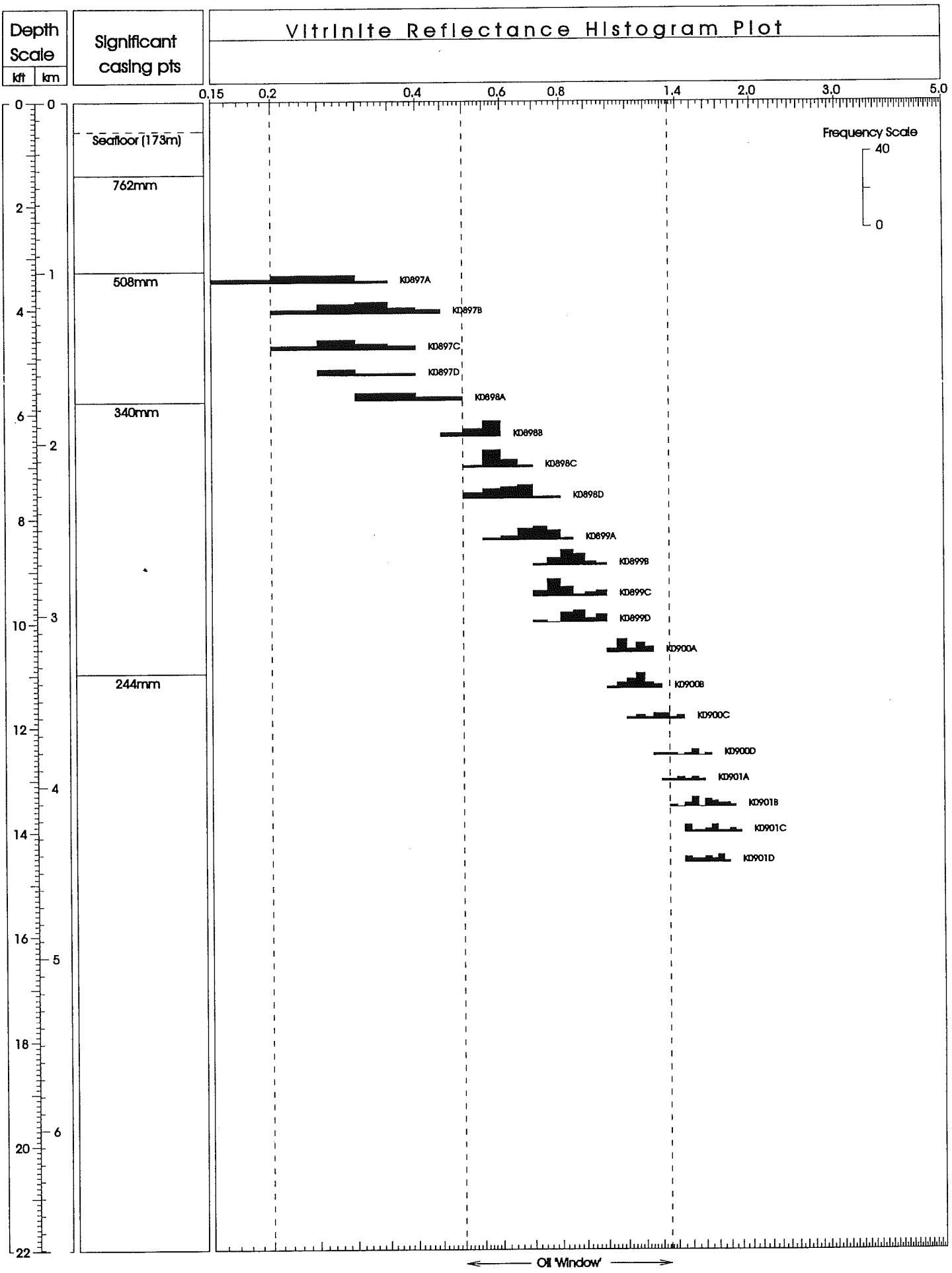


Fig. 2 Golconda C-64 <Histograms>

Appendix I

Sample Preparation Method

Kerogen Concentrate

Preliminary wash (preparation for cuttings)

Dry samples in oven (25°C)

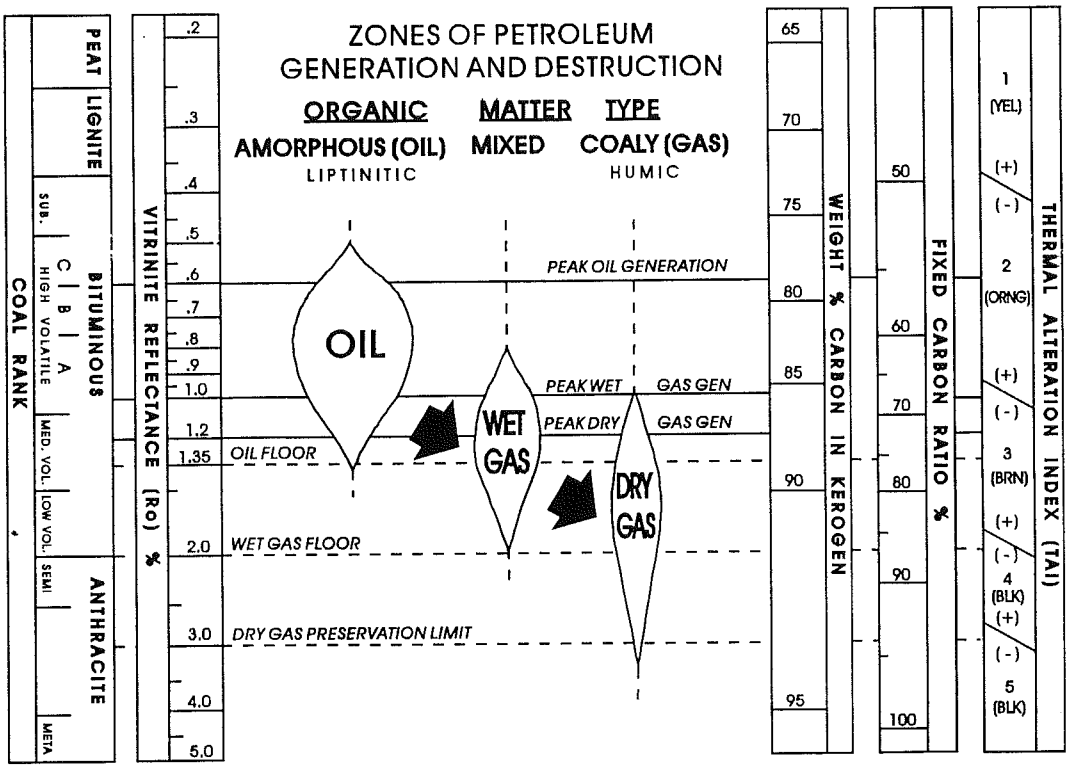
PALYNOLOGY Lab preparation

Place 20-30 grams in 250 ml plastic beaker.
Add 10% HC1 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 HC1 (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.

Appendix II (Dow, 1977)



Note: In this report, the terminology used to describe the various maturity levels has been modified. The 'peak' designation, as used in this figure, has been changed to 'onset of significant' and 0.8 %Ro is herein used as the 'peak of oil generation' (Table I, Figure 1).

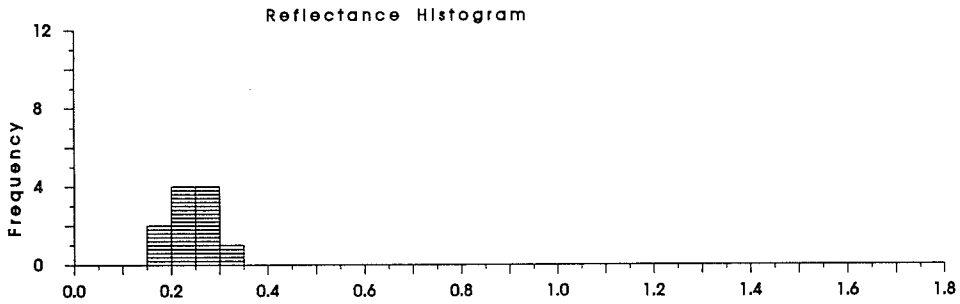
Appendix III

Reflectance Histograms

K0897A, 1025-1065m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.24)	(0.25)	(0.30)	(0.25)	(0.23)	(0.23)	(0.19)	(0.17)	(0.25)	(0.23)
1	(0.28)									

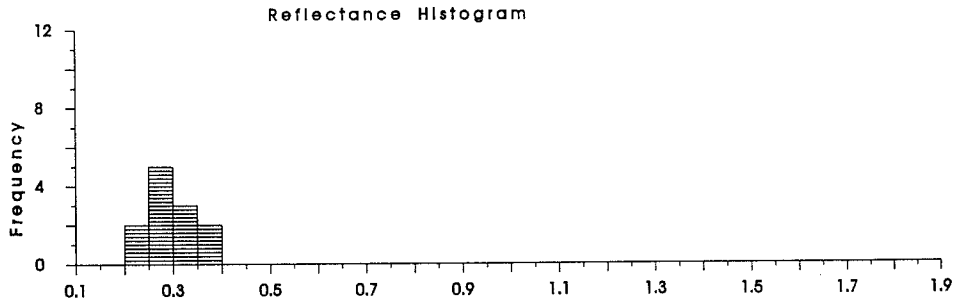
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.24	.04	11	.17	.3	2.62
(Edit)	.24	.04	11	.17	.3	2.62



K0897C, 1415-1455m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.27)	(0.31)	(0.39)	(0.28)	(0.32)	(0.35)	(0.29)	(0.25)	(0.21)	(0.22)
1	(0.30)	(0.28)								

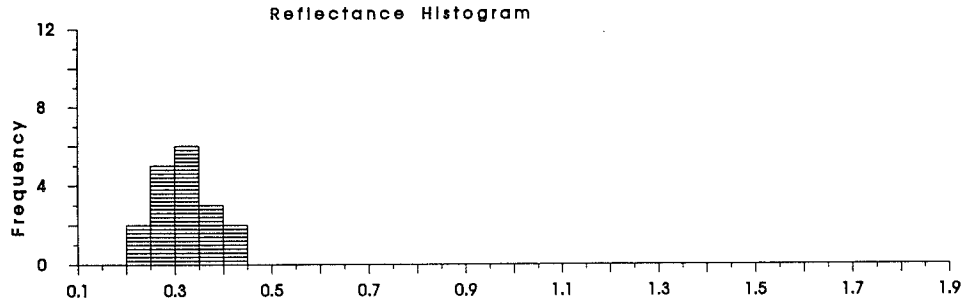
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.29	.05	12	.21	.39	3.47
(Edit)	.29	.05	12	.21	.39	3.47



K0897B, 1205-1245m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.25)	(0.32)	(0.23)	(0.25)	(0.33)	(0.30)	(0.44)	(0.33)	(0.24)	(0.25)
1	(0.33)	(0.27)	(0.40)	(0.38)	(0.27)	(0.38)	(0.30)	(0.36)		

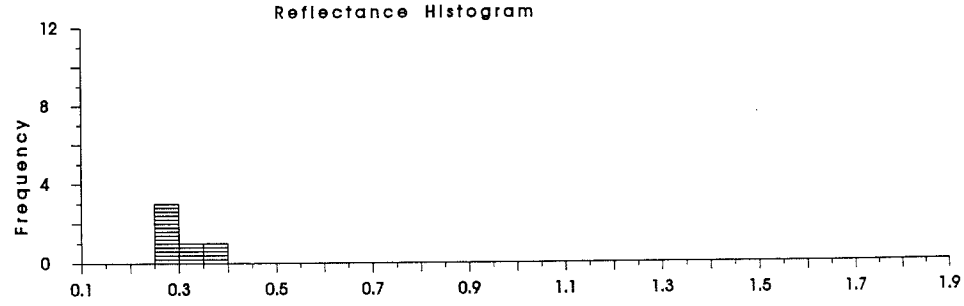
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.31	.06	18	.23	.44	5.63
(Edit)	.31	.06	18	.23	.44	5.63



K0897D, 1595-1605m

Col >	1	2	3	4	5
Row	(0.26)	(0.39)	(0.26)	(0.25)	(0.32)

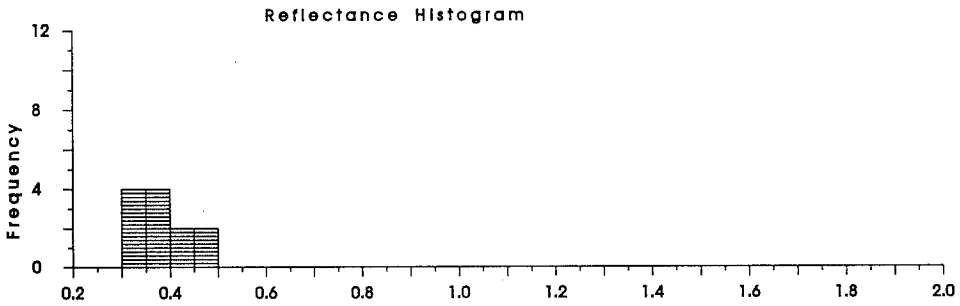
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.3	.06	5	.25	.39	1.48
(Edit)	.3	.06	5	.25	.39	1.48



K0898A, 1745-1755m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.42)	(0.31)	(0.48)	(0.36)	(0.34)	(0.34)	(0.39)	(0.33)	(0.36)	(0.41)
1	(0.39)	(0.45)								

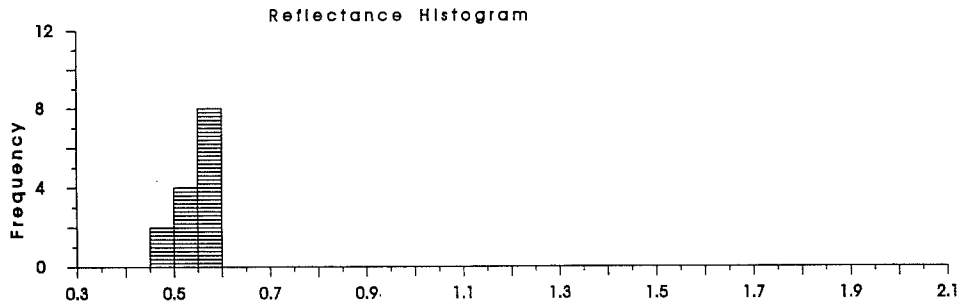
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.38	.05	12	.31	.48	4.58
(Edit)	.38	.05	12	.31	.48	4.58



K0898B, 1925-1965m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.52)	(0.47)	(0.55)	(0.57)	(0.56)	(0.55)	(0.53)	(0.51)	(0.49)	(0.57)
1	(0.57)	(0.53)	(0.59)	(0.59)						

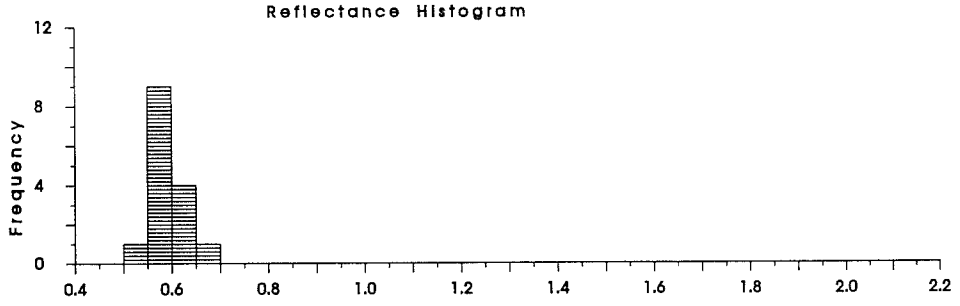
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.54	.04	14	.47	.59	7.6
(Edit)	.54	.04	14	.47	.59	7.6



K0898C, 2105-2145m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.55)	(0.57)	(0.57)	(0.55)	(0.55)	(0.53)	(0.60)	(0.62)	(0.58)	(0.69)
1	(0.62)	(0.61)	(0.58)	(0.55)	(0.58)					

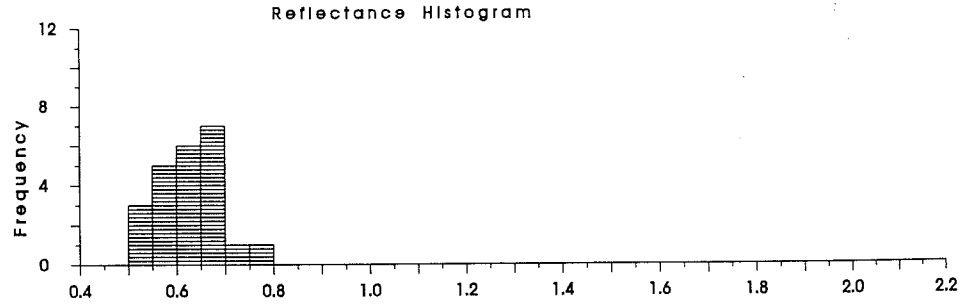
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.58	.04	15	.53	.69	8.75
(Edit)	.58	.04	15	.53	.69	8.75



K0898D, 2285-2325m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.64)	(0.55)	(0.66)	(0.55)	(0.59)	(0.76)	(0.60)	(0.53)	(0.53)	(0.60)
1	(0.73)	(0.60)	(0.68)	(0.59)	(0.67)	(0.63)	(0.69)	(0.69)	(0.55)	(0.68)
2	(0.65)	(0.53)	(0.63)							

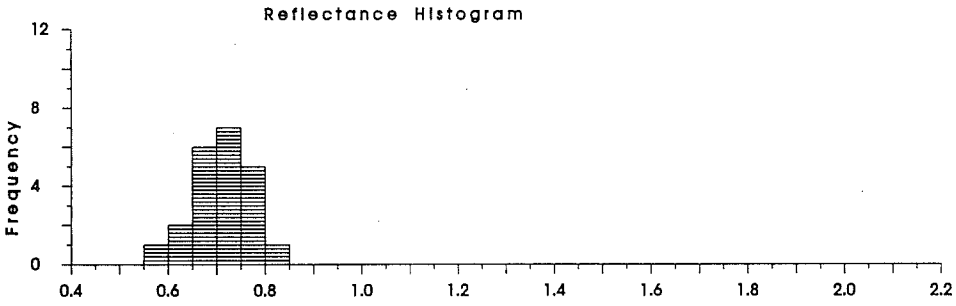
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.62	.07	23	.53	.76	14.33
(Edit)	.62	.07	23	.53	.76	14.33



K0899A, 2525-2565m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.72)	(0.71)	(0.80)	(0.73)	(0.79)	(0.76)	(0.72)	(0.61)	(0.76)	(0.68)
1	(0.79)	(0.63)	(0.67)	(0.74)	(0.67)	(0.59)	(0.73)	(0.68)	(0.67)	(0.75)
2	(0.70)	(0.69)								

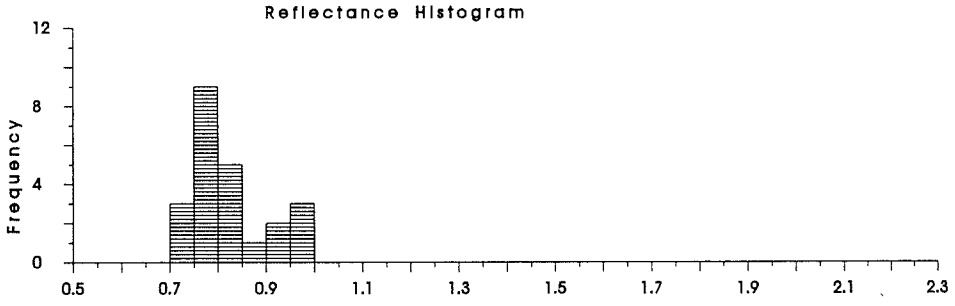
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.71	.06	22	.59	.8	15.59
(Edit)	.71	.06	22	.59	.8	15.59



K0899C, 2885-2895m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.89)	(0.76)	(0.76)	(0.77)	(0.96)	(0.78)	(0.80)	(0.76)	(0.81)	(0.75)
1	(0.78)	(0.96)	(0.84)	(0.74)	(0.74)	(0.82)	(0.97)	(0.79)	(0.76)	(0.70)
2	(0.94)	(0.84)	(0.92)							

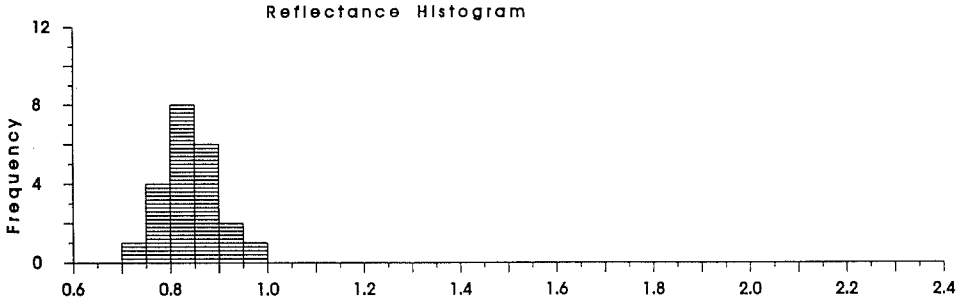
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.82	.08	23	.7	.97	18.84
(Edit)	.82	.08	23	.7	.97	18.84



K0899B, 2705-2715m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.78)	(0.86)	(0.85)	(0.84)	(0.92)	(0.85)	(0.84)	(0.82)	(0.83)	(0.85)
1	(0.83)	(0.81)	(0.92)	(0.96)	(0.74)	(0.82)	(0.76)	(0.87)	(0.76)	(0.88)
2	(0.83)	(0.79)								

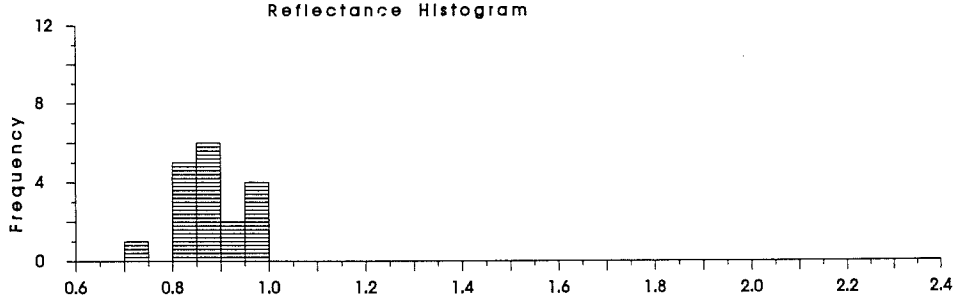
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.84	.05	22	.74	.96	18.41
(Edit)	.84	.05	22	.74	.96	18.41



K0899D, 3035-3045m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(0.81)	(0.89)	(0.85)	(0.84)	(0.83)	(0.91)	(0.90)	(0.96)	(0.71)	(0.88)
1	(0.80)	(0.99)	(0.99)	(0.84)	(0.99)	(0.89)	(0.88)	(0.87)		

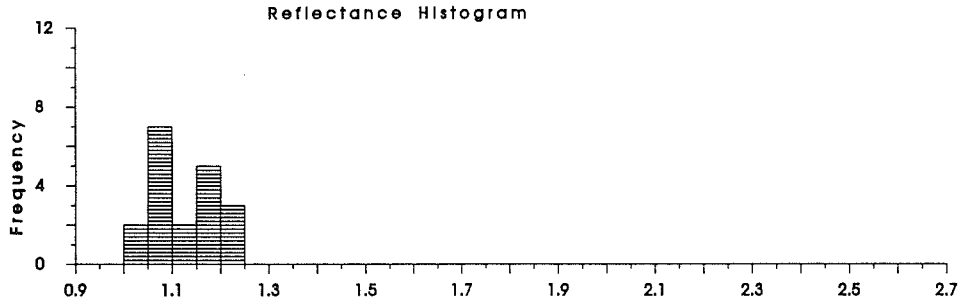
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	.88	.07	18	.71	.99	15.83
(Edit)	.88	.07	18	.71	.99	15.83



K0900A, 3215-3225m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(1.00)	(1.09)	(1.18)	(1.17)	(1.12)	(1.10)	(1.05)	(1.20)	(1.09)	(1.17)
1	(1.21)	(1.20)	(1.07)	(1.09)	(1.16)	(1.16)	(1.08)	(1.00)	(1.05)	

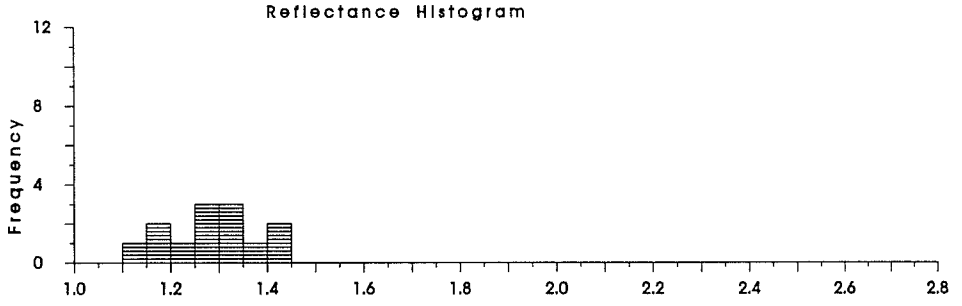
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	1.12	.07	19	1.	1.21	21.19
(Edit)	1.12	.07	19	1.	1.21	21.19



K0900C, 3605-3615m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(1.42)	(1.32)	(1.34)	(1.28)	(1.21)	(1.27)	(1.33)	(1.18)	(1.43)	(1.26)
1	(1.18)	(1.39)	(1.14)							

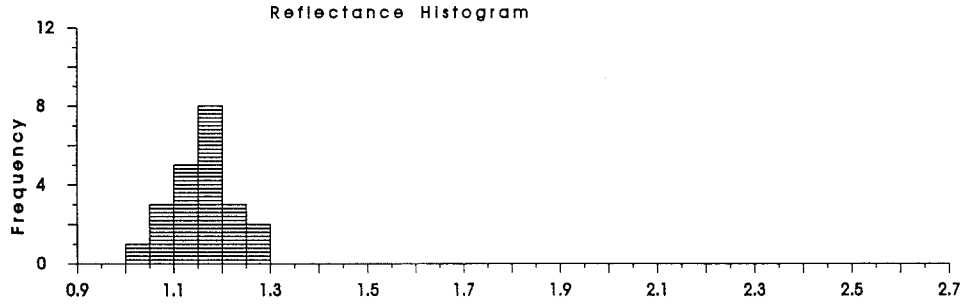
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	1.29	.09	13	1.14	1.43	16.75
(Edit)	1.29	.09	13	1.14	1.43	16.75



K0900B, 3425-3435m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(1.11)	(1.16)	(1.18)	(1.18)	(1.06)	(1.22)	(1.09)	(1.06)	(1.20)	(1.17)
1	(1.22)	(1.26)	(1.12)	(1.12)	(1.25)	(1.03)	(1.10)	(1.17)	(1.16)	(1.12)
2	(1.17)	(1.19)								

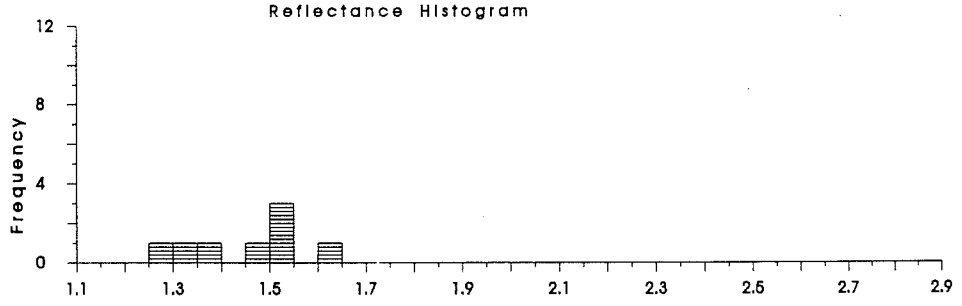
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	1.15	.06	22	1.03	1.26	25.34
(Edit)	1.15	.06	22	1.03	1.26	25.34



K0900D, 3815-3825m

Col >	1	2	3	4	5	6	7	8
Row	(1.37)	(1.47)	(1.52)	(1.51)	(1.64)	(1.28)	(1.31)	(1.52)

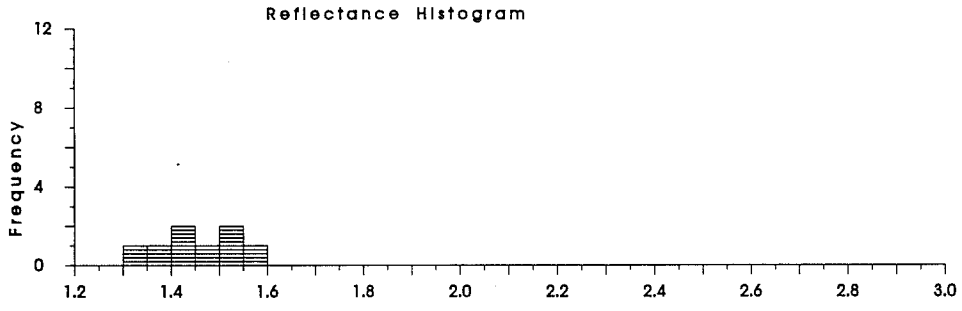
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	1.45	.12	8	1.28	1.64	11.62
(Edit)	1.45	.12	8	1.28	1.64	11.62



K0901A, 3965-3975m

Col >	1	2	3	4	5	6	7	8
Row	(1.41)	(1.57)	(1.36)	(1.32)	(1.50)	(1.40)	(1.53)	(1.47)

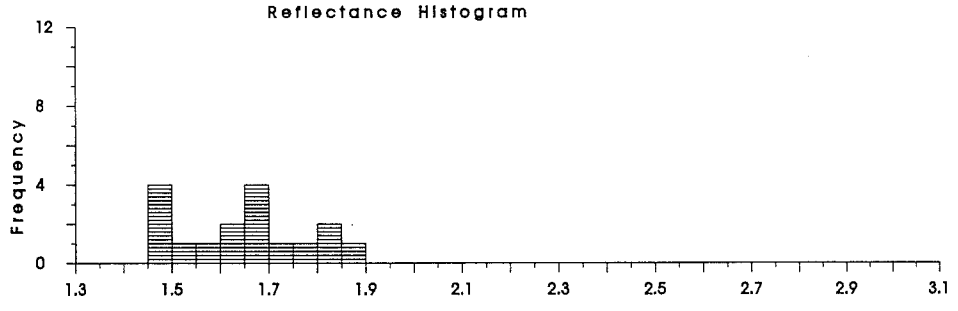
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	1.45	.09	8	1.32	1.57	11.56
(Edit)	1.45	.09	8	1.32	1.57	11.56



K0901C, 4265-4275m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(1.68)	(1.62)	(1.49)	(1.68)	(1.61)	(1.66)	(1.84)	(1.48)	(1.74)	(1.75)
1	(1.86)	(1.80)	(1.49)	(1.69)	(1.53)	(1.59)	(1.48)			

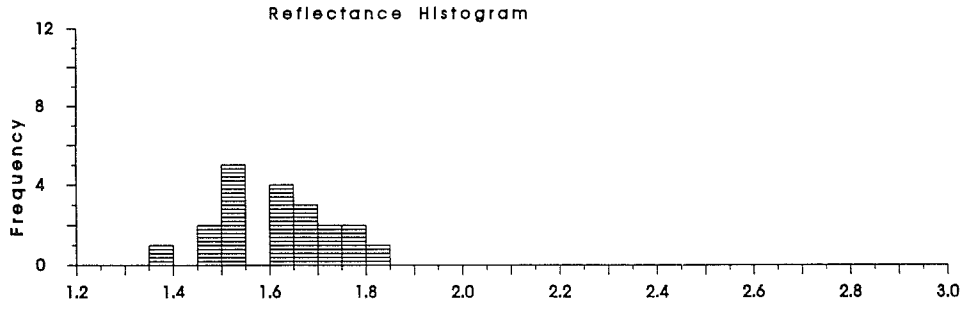
	Mean	Stand Dev	Pts	Min	Max	Sum
Total	1.65	.13	17	1.48	1.86	27.99
(Edit)	1.65	.13	17	1.48	1.86	27.99



K0901B, 4115-4125m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(1.39)	(1.64)	(1.62)	(1.51)	(1.51)	(1.60)	(1.73)	(1.81)	(1.65)	(1.46)
1	(1.75)	(1.73)	(1.65)	(1.51)	(1.54)	(1.52)	(1.47)	(1.77)	(1.63)	(1.66)

	Mean	Stand Dev	Pts	Min	Max	Sum
Total	1.61	.12	20	1.39	1.81	32.15
(Edit)	1.61	.12	20	1.39	1.81	32.15



K0901D, 4405-4450m

Col >	1	2	3	4	5	6	7	8	9	0
Row	(1.74)	(1.48)	(1.50)	(1.74)	(1.60)	(1.70)	(1.75)	(1.70)	(1.61)	(1.57)
1	(1.50)	(1.68)	(1.55)	(1.68)	(1.47)	(1.61)	(1.48)			

	Mean	Stand Dev	Pts	Min	Max	Sum
Total	1.61	.1	17	1.47	1.75	27.36
(Edit)	1.61	.1	17	1.47	1.75	27.36