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Vitrinite reflectance (Ro)
on coaly samples from the
Rawdon Hills area
Nova Scotia

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Vitrinite reflectance (Ro) of dispersed organics from coaly samples from the Rawdon Hills area, Nova Scotia

"Quotation in full or in part from this report must be with the prior approval of the Eastern Petroleum Geology Subdivision of the Atlantic Geoscience Centre, Dartmouth, Nova Scotia".

General information

At the request of Casey Ravenhurst (Dalhousie University), vitrinite reflectance analysis has been carried out on nine samples of coaly matter taken from rock samples collected in the Rawdon Hills area, Nova Scotia (Fig. 1). The samples were gathered during geological work in the area to better understand the transport mechanisms of mineralization in the Gay's River deposit, especially hot fluids which are believed to have migrated through the area. The analysis reported here and temperature data determined through apatite fission track dating will be used to interpret the temperature of these hot mineralized fluids. The study is also a part of a thesis work by Hadi Mahony of Dalhousie.

Some initial preparation of the samples was carried out at Dalhousie which reduced the overall sample preparation time. This consisted of hand-picking of the small amounts of coaly-like matter which usually occurred as very thin laminations in the rocks and crushing of the particles to -20 mesh ($\sim 850\mu\text{m}$).

Sample description

<u>Stub #</u>	<u>Catalogue #</u>	<u>Location</u>	<u>Description</u>
C0012C	HH2-1	Quarry 3mi N.W. of McPhee's Corner	Carbonaceous material in shale/siltstone
C0010B	RSB-87	Glen Brook 2mi WSW of West Gore	Plant material in sandstone at 1st sharp bend in river
C0012A	RSB-89	NSDME DDH#84-1 near W. Gore ($\sim 7\text{m}$)	Organic material and mica in thin layers in siltstone
C0010C	RSB-90	NSDME DDH#84-1 near W. Gore (66.5m)	Plant fossil
C0012B	RSB-91	NSDME DDH#84-1 near W. Gore (90.2m)	Shiny coaly material that shows layering. Some greenish layers with shiny euhedral pyrite grains
C0011A	BP6-500	Imperial Oil DDH#BP-6 near Urbania (500')	Carbonaceous layers in siltstone
C0011B	BP6-624	Imperial Oil DDH#BP-6 near Urbania (624')	Carbonaceous layers in siltstone
C0011C	BP6-797	Imperial Oil DDH#BP-6 near Urbania (797')	Carbonaceous layers in siltstone
C0010A	BP6-820	Imperial Oil DDH#BP-6 near Urbania (820')	Carbonaceous layers in siltstone

Outline of methods

The samples were mounted three per stub and polished to a low-relief scratch-free surface (Davies and Avery, 1984). They were examined at 640 x magnification with normal white incident light using a Zeiss Photometer III system.

Vitrinite reflectance results

A general comment on these data (Table 1) is that they produced more scattered histograms than a normal coal seam ply sample which would have standard deviation values in the 0.05 to 0.08 range. The standard deviations in these samples ranged from 0.08 to 0.19 with banded coals tending to the lower end of this range. The samples with high scatter or high standard deviations are difficult to use for detailed interpretations of paleotemperatures. Only two samples are above 0.13 S.D. so that most of the data are quite reasonable for time-temperature projections. Determining paleotemperatures from published time-temperature curves should be done cautiously. Burial time and especially time at maximum burial depth is to be considered and not the age of the sample.

Two samples from the Gore area analyzed previously for vitrinite reflectance yielded similar values of 0.96 and 0.84% Ro max. (Hacquebard and Donaldson, 1970).

Table I
Summary of Vitrinite reflectance

Stub #	Org. label	Ro (S.D.) (non-rotated)	Number of readings	Ro Max. (calculated)*	Comments on sample type
CO010A	BP6-820	1.25 (±.19)	56	1.33	no banding
CO010B	RSB-87	.98 (±.10)	53	1.04	no banding
CO010C	RSB-90	.91 (±.08)	86	.96	minor banding
CO011A	BP6-500	1.23 (±.13)	63	1.31	no banding
CO011B	BP6-624	1.1 (±.10)	95	1.17	very distinct banding
CO011C	BP6-797	1.21 (±.17)	79	1.28	no banding
CO012A	RSB-89	.98 (±.12)	61	1.04	distinct banding
CO012B	RSB-91	.87 (±.09)	88	.92	no banding
CO012C	HH2-1	1.06 (±.10)	40	1.12	some banding

*Ro Max. = Ro random *1.07 - 0.01 (Diessel, 1982)

Petrographic observations

The following are the brief comments made during examination of the polished samples at the microscope.

CO010A Polish good, some banding, bulk of sample comprised of inertinite, most particles fairly large, Mega-spore ≈ 500µm.

- CO010B Polish good, no banding, some mottling of vitrinite texture, some distinct high reflecting corprocollinite patches.
- CO010C Polish good, measurable vitrinite abundant, no banding.
- CO011A Polish good, similar to CO010C.
- CO011B Polish good, classic banding, typical Carboniferous texture.
- CO011C Polish good, no banding, large range of vitrinite reflectance values.
- CO012A Polish good, some very minor banding, one certain banded coal reading of 0.98 Ro.
- CO012B Polish good, classic Carboniferous banding, dark high contrast Crassisporos, pyro-fusinite very common, inertrodetrinite, carbongillite, Bogen structure in many fusinites.
- CO012C Polish good-fair, much less organics than in other samples, no real banding but the 3 main maceral types seen (Vitrinite, Ex., Inertinite).

References

- Diessel, F.K., 1982. University of New Castle Research Report. Australia.
- Hacquebard, P.A. and Donaldson, J.R., 1970. Coal metamorphism and hydrocarbon potential in the Upper Paleozoic of the Atlantic Provinces, Canada. Canadian Journal of Earth Sciences.

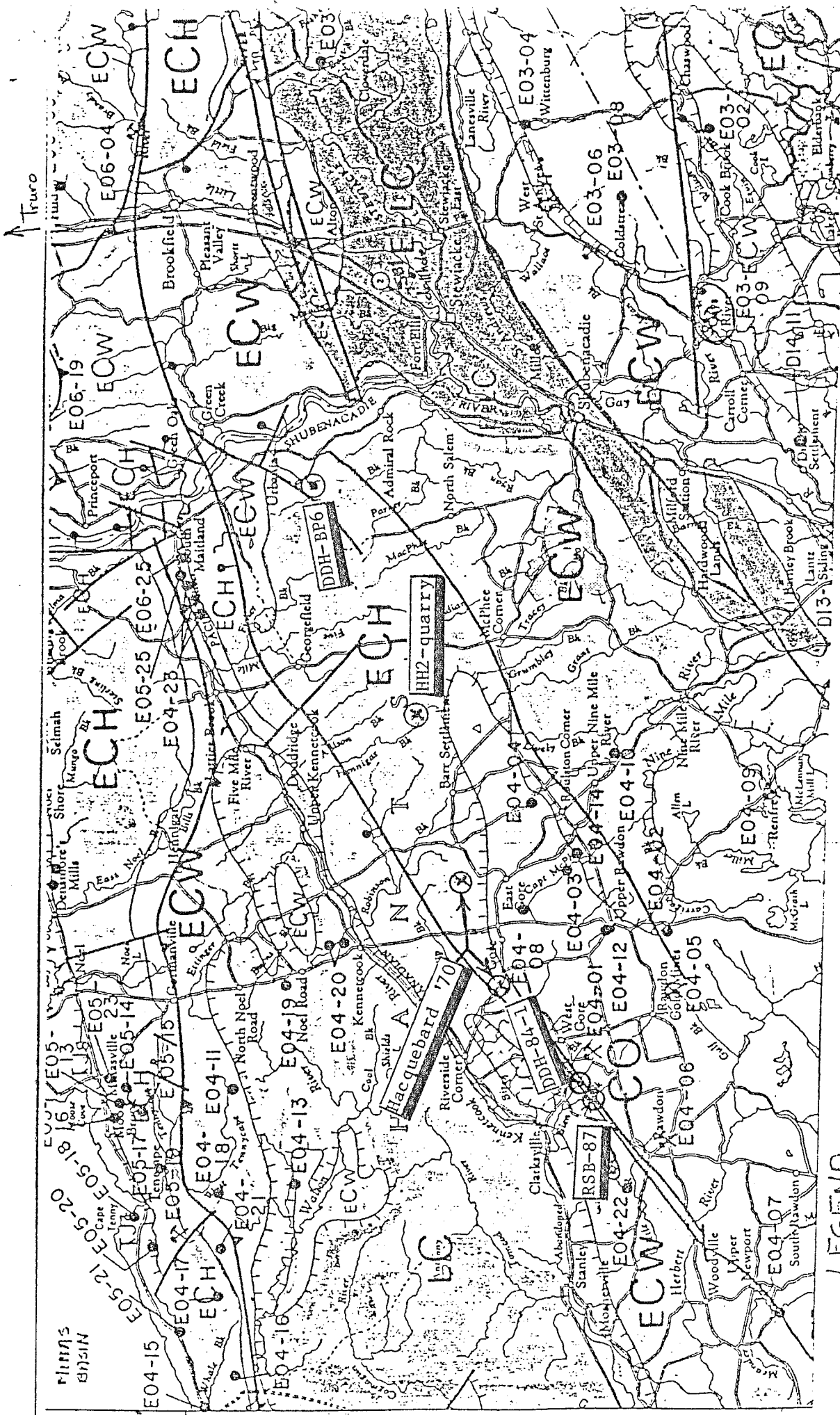
January 20, 1986



M.P. Avery
Eastern Petroleum Geology

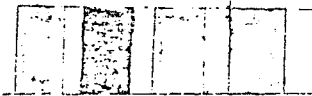
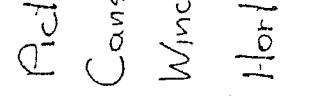
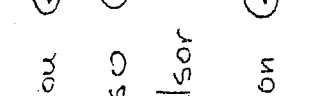
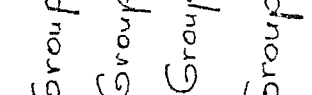
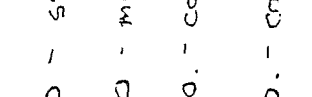
MPA/nk

- c.c. Casey Ravenhurst, Dalhousie, Halifax
Hadi Mahony, Dalhousie, Halifax
Peter Hacquebard, E.P.G.S., Dartmouth
J.S. Bell, E.P.G.S., Dartmouth
Central Technical Files, Ottawa
E.P.G.S. Files, Dartmouth
A.E. Jackson, E.P.G.S., Dartmouth



Halifax
 Scale
 1 : 250,000

LEGEND

-  Pictou Group - ss, shale, siltst.
-  Canso Group - mudst., siltst.
-  Windsor Group - carb., evap., shale, siltst.
-  Horton Group - congl., ss., sh., coal.
-  Meema Group - shale, siltst.

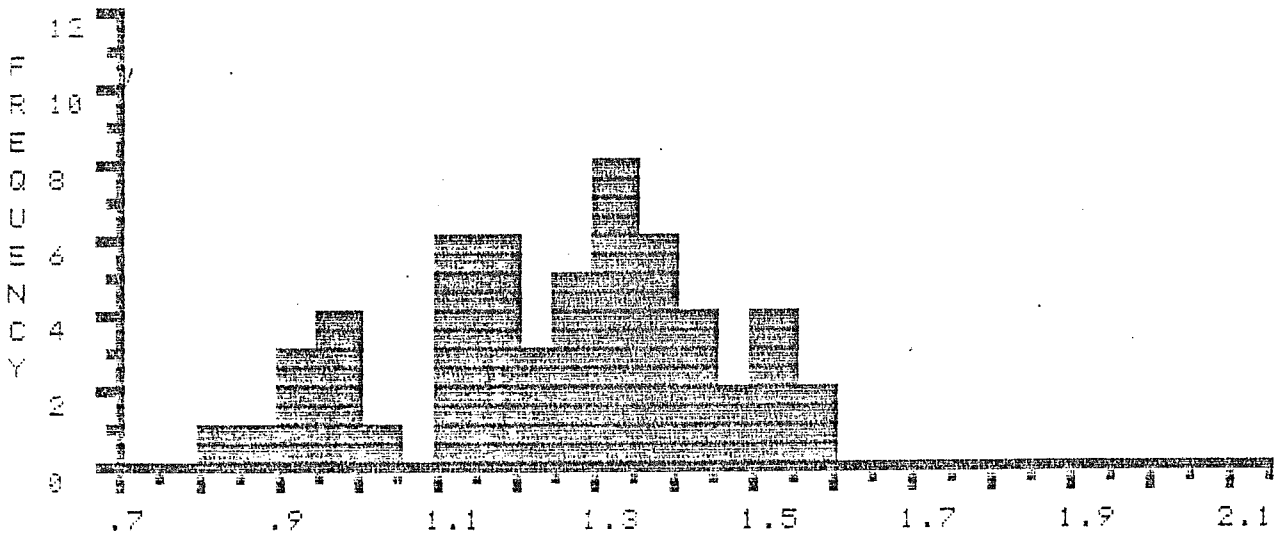
Vitrinite Reflectance Histograms

FILE >> 00010A DESCRIPTION FOLLOWS :
 DEPTH BR6-8207, RAVENHURST/85, MIKE AVERY, DEC-10-85

COL>	0	1	2	3	4	5	6	7	8	9
ROW		.84	.89	.92	.94	.94	.95	.95	.97	.99
1	1	1.1	1.12	1.13	1.13	1.14	1.14	1.15	1.17	1.17
2	1.17	1.18	1.19	1.2	1.23	1.24	1.26	1.26	1.27	1.27
3	1.28	1.3	1.3	1.31	1.31	1.31	1.32	1.33	1.34	1.37
4	1.38	1.38	1.39	1.39	1.39	1.4	1.41	1.42	1.44	1.45
5	1.45	1.51	1.51	1.52	1.54	1.56	1.57			

TOTAL >	SUM	NUMBER	MIN	MAX	MEAN	STAND. DEV.
	69.79	56	.84	1.57	1.25	.19

% R E F L E C T A N C E

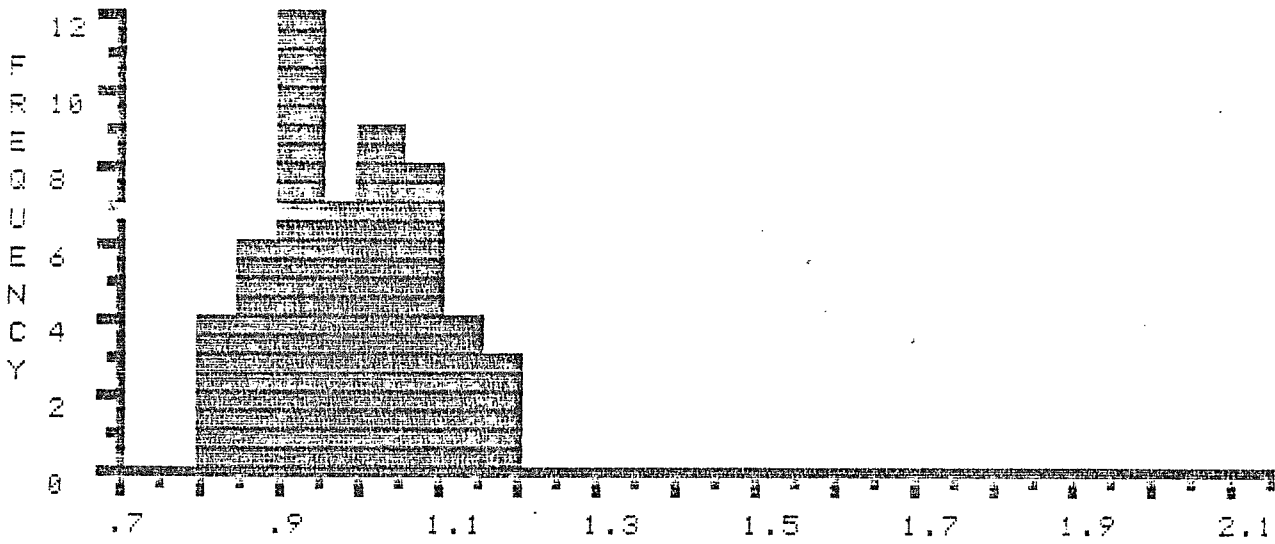


FILE >> C00106 DESCRIPTION FOLLOWS ;
 DEPTH RSB-87', RAVENHURST/85, MIKE AVERY, DEC-10-85

COL>	0	1	2	3	4	5	6	7	8	9
ROW		.8	.81	.82	.83	.84	.87	.88	.88	.89
1	.89	.9	.91	.91	.92	.93	.93	.93	.93	.93
2	.93	.94	.94	.95	.95	.98	.99	.99	.99	.99
3	1	1	1.01	1.02	1.02	1.02	1.02	1.02	1.04	1.05
4	1.05	1.05	1.05	1.06	1.07	1.08	1.09	1.1	1.13	1.13
5	1.13	1.16	1.17	1.19						

TOTAL >	SUM	NUMBER	MIN	MAX	MEAN	STAND.DEV.
	52.13	53	.8	1.19	.98	.1

% R E F L E C T A N C E

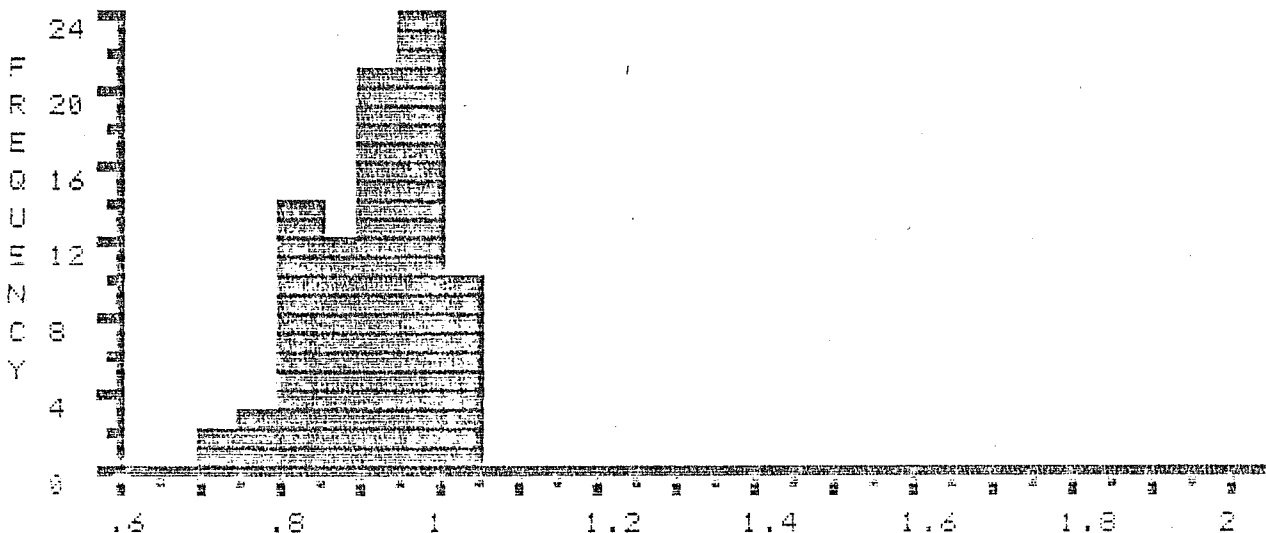


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 DEPTH R86-984, RAVENHURST/85, MIKE AMERY, DEC-10-85

COL>	0	1	2	3	4	5	6	7	8	9
ROW		.7	.74	.75	.78	.79	.8	.8	.8	.8
1	.81	.81	.81	.81	.83	.83	.84	.84	.84	.84
2	.85	.85	.85	.85	.85	.85	.86	.86	.86	.87
3	.88	.88	.9	.9	.9	.91	.91	.91	.91	.92
4	.92	.92	.93	.93	.93	.93	.93	.93	.94	.94
5	.94	.94	.94	.95	.95	.95	.95	.95	.96	.96
6	.96	.97	.97	.97	.97	.97	.98	.98	.98	.98
7	.98	.98	.99	.99	.99	.99	.99	1	1	1.01
8	1.01	1.02	1.02	1.02	1.03	1.03	1.04			

TOTAL >	SUM	NUMBER	MIN	MAX	MEAN	STAND.DEV.
	78.4	86	.7	1.04	.91	.08

% R E F L E C T A N C E

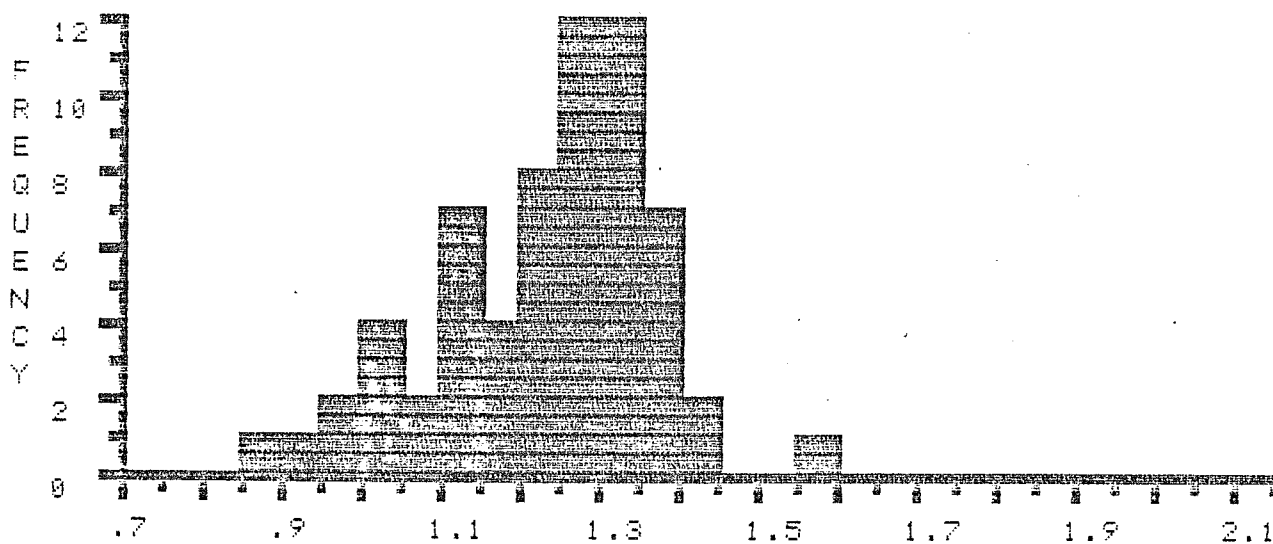


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 DEPTH EPS-500', RAVENHURST/85, MIKE AVERY, DEC-10-85

COL>	0	1	2	3	4	5	6	7	8	9
ROW		.85	.92	.97	.97	1	1.01	1.03	1.03	1.09
1	1.09	1.11	1.11	1.11	1.11	1.13	1.13	1.14	1.15	1.16
2	1.16	1.17	1.2	1.21	1.21	1.21	1.23	1.23	1.24	1.24
3	1.25	1.26	1.26	1.26	1.26	1.26	1.27	1.28	1.28	1.28
4	1.28	1.28	1.3	1.3	1.3	1.31	1.31	1.31	1.32	1.32
5	1.32	1.33	1.34	1.34	1.35	1.35	1.36	1.36	1.37	1.37
6	1.39	1.41	1.43	1.55						

TOTAL >	SUM	NUMBER	MIN	MAX	MEAN	STAND.DEV.
	77.17	63	.85	1.55	1.23	.13

% R E F L E C T A N C E

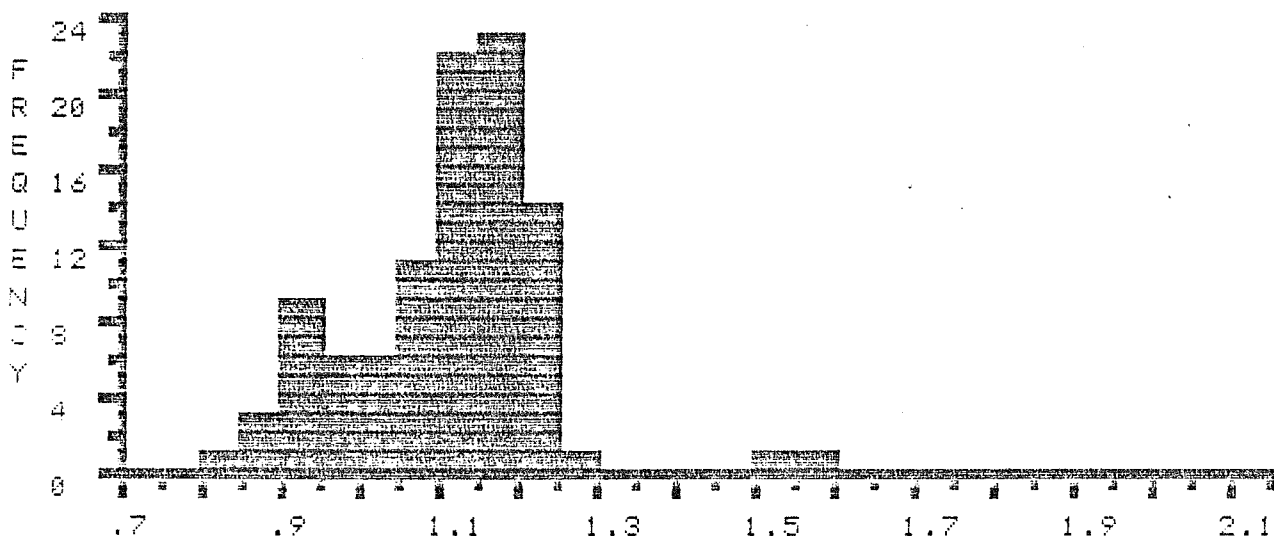


FILE # 3601E DESCRIPTION FOLLOWS :
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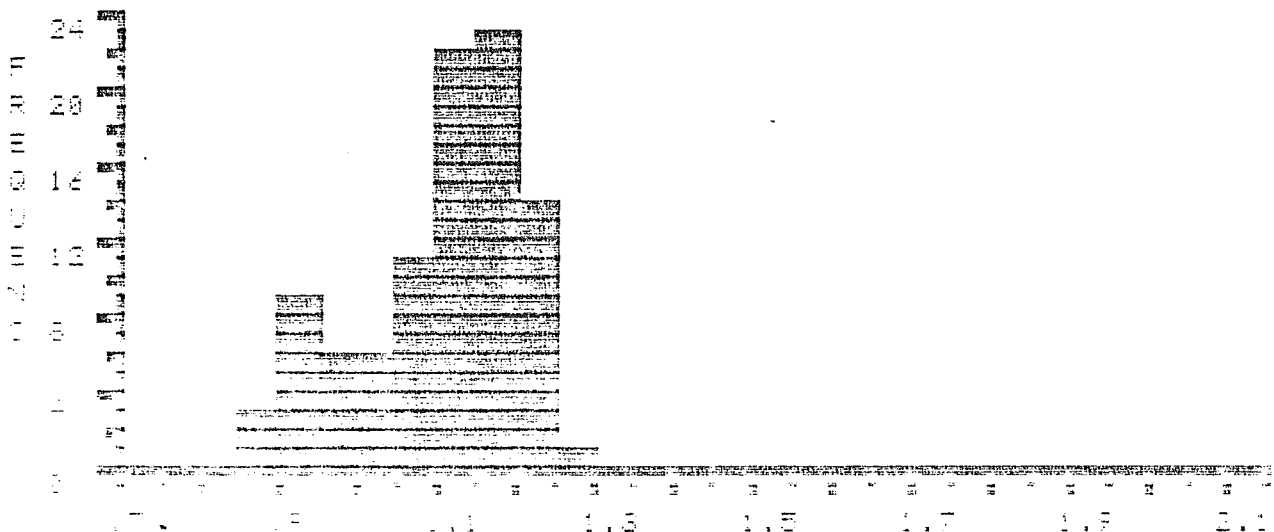
COL>	0	1	2	3	4	5	6	7	8	9
ROW		.81	*.87	*.88	*.89	*.9	*.9	*.9	*.9	*.91
1	*.91	*.98	*.98	*.94	*.96	*.97	*.97	*.97	*.98	*.98
2	*1	*1.02	*1.02	*1.03	*1.04	*1.04	*1.05	*1.05	*1.05	*1.06
3	*1.06	*1.06	*1.07	*1.07	*1.08	*1.08	*1.09	*1.1	*1.1	*1.1
4	*1.1	*1.1	*1.11	*1.11	*1.11	*1.12	*1.12	*1.12	*1.12	*1.13
5	*1.13	*1.13	*1.13	*1.14	*1.14	*1.14	*1.14	*1.14	*1.14	*1.15
6	*1.15	*1.15	*1.15	*1.15	*1.15	*1.16	*1.16	*1.16	*1.16	*1.16
7	*1.17	*1.17	*1.17	*1.17	*1.17	*1.18	*1.18	*1.18	*1.18	*1.18
8	*1.18	*1.19	*1.2	*1.2	*1.2	*1.2	*1.2	*1.2	*1.2	*1.2
9	*1.2	*1.21	*1.22	*1.22	*1.24	*1.24	*1.28	1.52	1.55	

	SUM	NUMBER	MIN	MAX	MEAN	STAND. DEV.
TOTAL >	109.14	98	.81	1.55	1.1	.12
*EDIT >	104.26	95	.87	1.28	1.1	.1

% R E F L E C T A N C E



% R E F L E C T A N C E * * E D I T E D * *

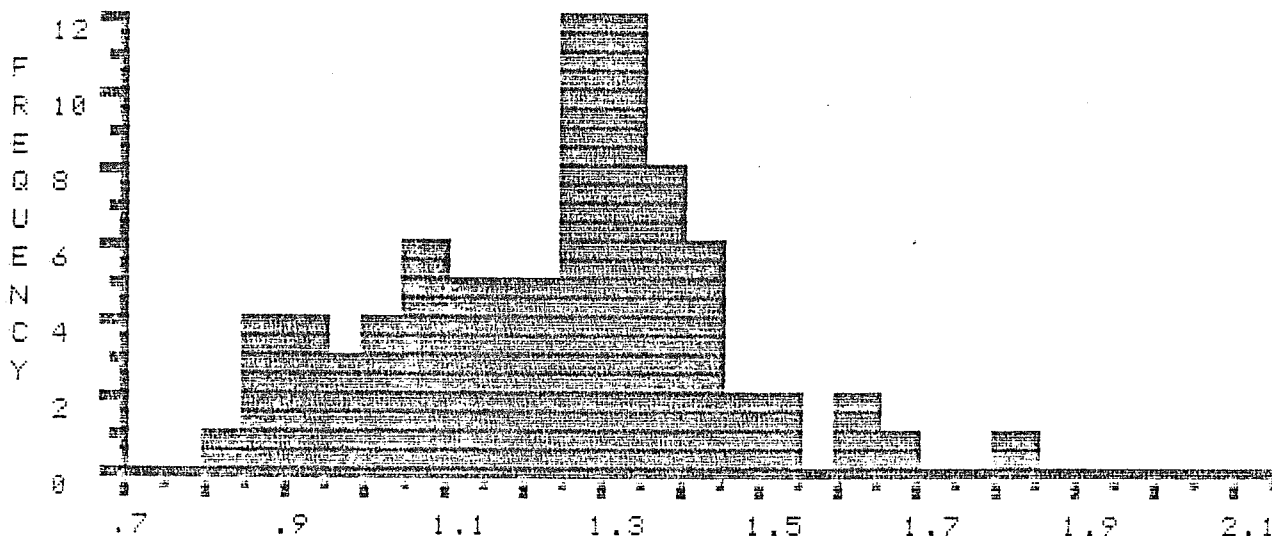


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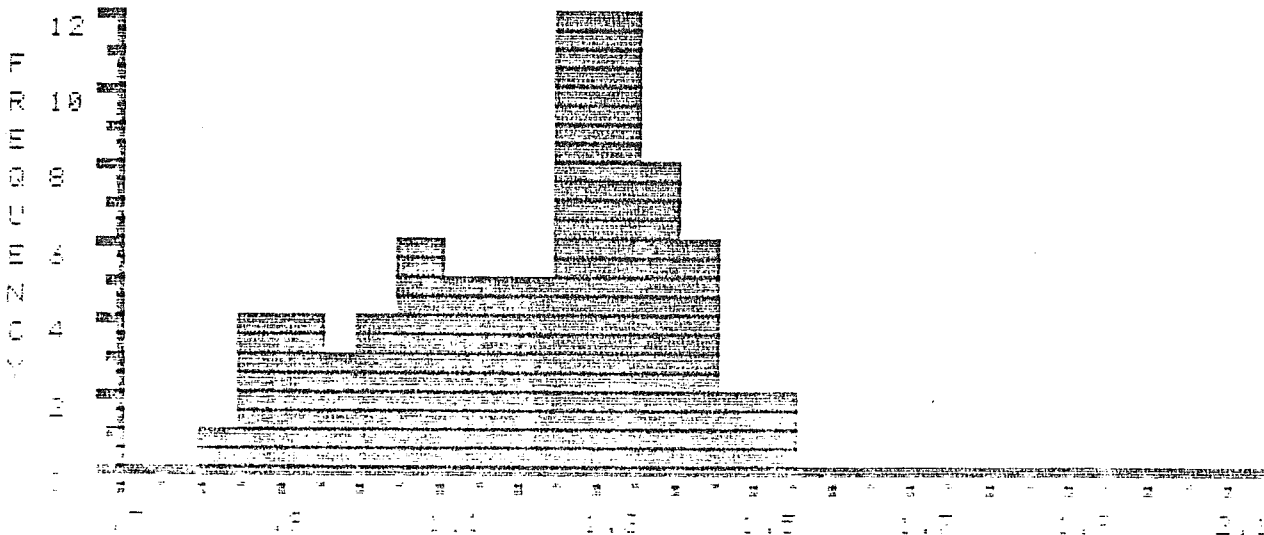
COL >	0	1	2	3	4	5	6	7	8	9
ROW		*.81	*.85	*.87	*.89	*.89	*.93	*.93	*.94	*.94
1	*.95	*.98	*.98	*1.02	*1.02	*1.03	*1.04	*1.05	*1.07	*1.08
2	*1.08	*1.08	*1.08	*1.11	*1.12	*1.13	*1.14	*1.14	*1.15	*1.16
3	*1.17	*1.17	*1.18	*1.21	*1.21	*1.21	*1.21	*1.24	*1.25	*1.25
4	*1.25	*1.27	*1.27	*1.27	*1.27	*1.27	*1.27	*1.28	*1.28	*1.29
5	*1.3	*1.3	*1.3	*1.31	*1.31	*1.31	*1.32	*1.33	*1.34	*1.34
6	*1.34	*1.34	*1.35	*1.35	*1.35	*1.36	*1.37	*1.37	*1.39	*1.39
7	*1.4	*1.41	*1.41	*1.42	*1.43	*1.44	*1.46	*1.48	*1.51	*1.54
8	1.6	1.68	1.69	1.82						

	SUM	NUMBER	MIN	MAX	MEAN	STAND. DEV.
TOTAL >	102.31	83	.81	1.82	1.23	.2
*EDIT >	95.57	79	.81	1.54	1.21	.17

% R E F L E C T A N C E



% R E F L E C T A N C E * * E D I T E D * *

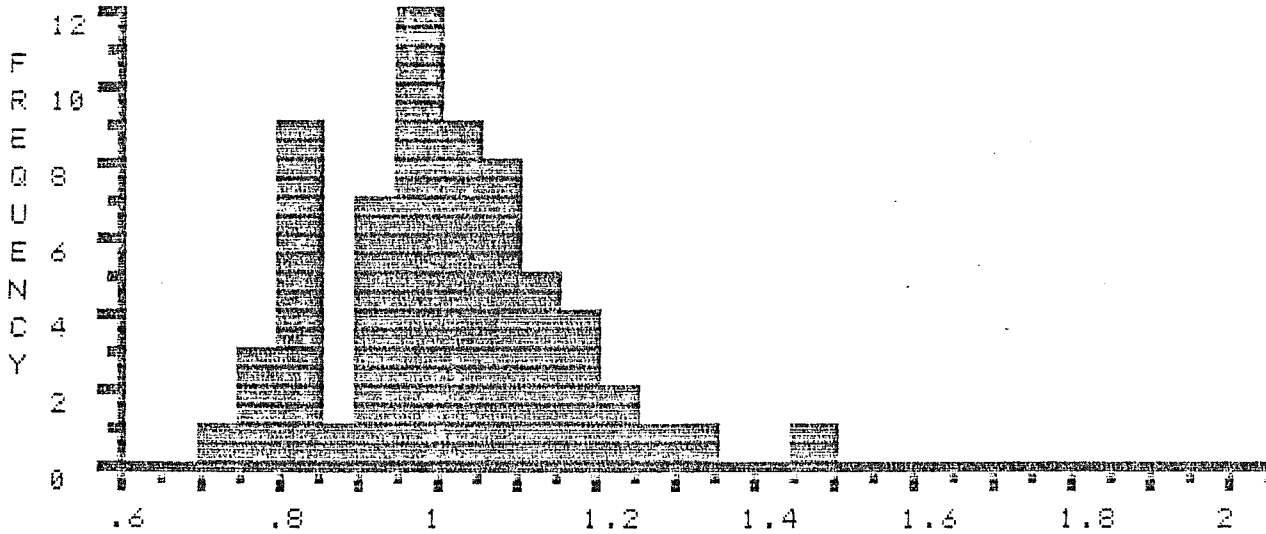


FILE 1 198104 DESCRIPTION FOLLOWS :
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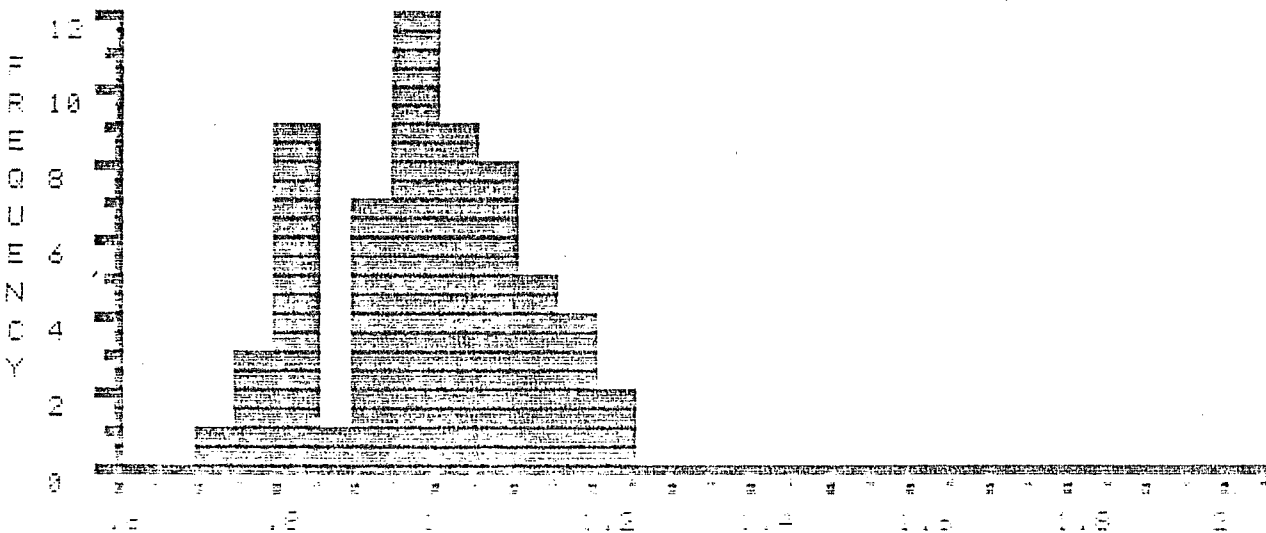
COL >	0	1	2	3	4	5	6	7	8	9
ROW		*.71	*.75	*.76	*.76	*.8	*.8	*.82	*.82	*.82
1	*.88	*.84	*.84	*.84	*.88	*.91	*.91	*.92	*.93	*.93
2	*.93	*.94	*.95	*.95	*.95	*.95	*.96	*.96	*.96	*.97
3	*.97	*.98	*.98	*.99	*1	*1.01	*1.01	*1.02	*1.03	*1.03
4	*1.03	*1.03	*1.04	*1.06	*1.06	*1.07	*1.07	*1.08	*1.08	*1.09
5	*1.09	*1.11	*1.11	*1.11	*1.13	*1.14	*1.15	*1.16	*1.18	*1.18
6	*1.2	*1.21	1.29	1.3	1.45					

	SUM	NUMBER	MIN	MAX	MEAN	STAND. DEV.
TOTAL >	68.88	64	.71	1.45	1	.14
*EDIT >	59.79	61	.71	1.21	.98	.12

% R E F L E C T A N C E



% R E F L E C T A N C E * * E D I T E D * *

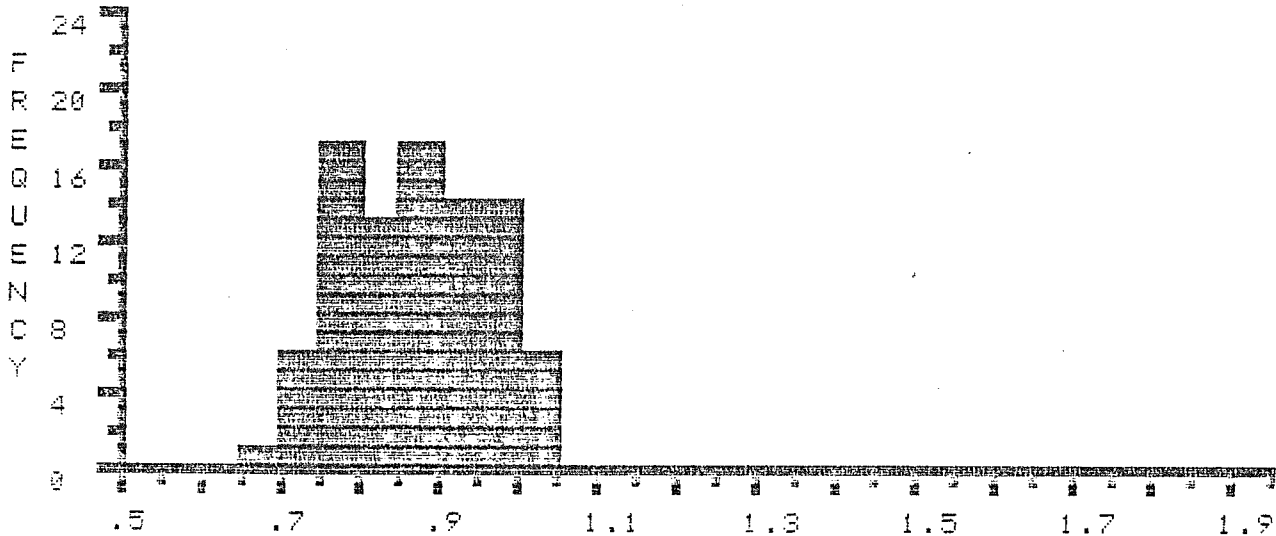


FILE >> 00012B DESCRIPTION FOLLOWS :
 DEPTH R65-211, RAVENHURST/85, MIKE AVERY, DEC-16-85

COL	0	1	2	3	4	5	6	7	8	9
ROW		.66	.7	.7	.7	.75	.74	.74	.75	.75
1	.75	.76	.77	.77	.77	.77	.78	.78	.78	.78
2	.79	.79	.79	.79	.79	.8	.8	.8	.81	.81
3	.81	.81	.81	.81	.81	.81	.81	.81	.81	.81
4	.81	.81	.81	.81	.81	.81	.81	.81	.81	.81
5	.88	.89	.89	.89	.89	.9	.9	.9	.91	.91
6	.91	.93	.93	.93	.93	.93	.93	.93	.94	.95
7	.95	.95	.95	.96	.97	.97	.97	.97	.98	.98
8	.98	.98	.99	1	1	1.01	1.01	1.01	1.03	

SUM NUMBER MIN MAX MEAN STAND.DEV.
 TOTAL > 76.14 68 .66 1.03 .87 .09

% R E F L E C T A N C E

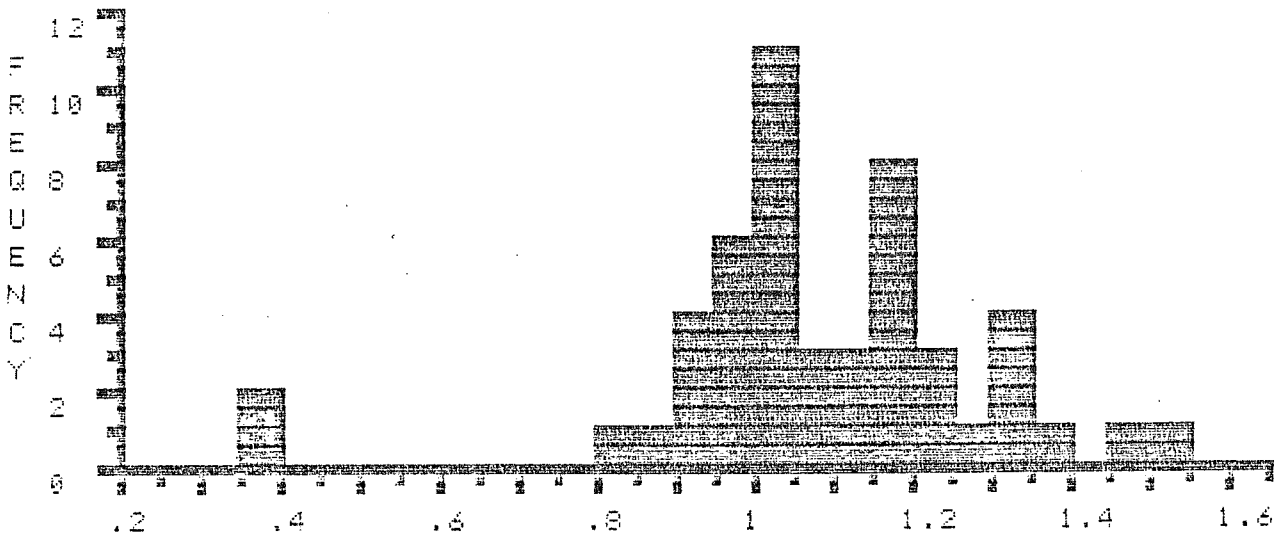


FILE >> 000120 DESCRIPTION FOLLOWS :
 DEPTH HH2-17, RAVENHURST/85, MIKE AVERY, DEC-16-85

COL>	0	1	2	3	4	5	6	7	8	9
ROW		.35	.37	.8	*.89	*.9	*.9	*.98	*.98	*.95
1	*.95	*.96	*.98	*.98	*.99	*1	*1	*1	*1	*1.01
2	*1.02	*1.02	*1.03	*1.03	*1.03	*1.04	*1.05	*1.06	*1.09	*1.10
3	*1.10	*1.14	*1.15	*1.16	*1.16	*1.16	*1.16	*1.17	*1.19	*1.19
4	*1.21	*1.21	*1.22	*1.25	1.3	1.31	1.32	1.33	1.39	1.45
5	1.51									

	SUM	NUMBER	MIN	MAX	MEAN	STAND.DEV.
TOTAL >	58.56	50	.35	1.51	1.07	.21
*EDIT >	42.48	40	.89	1.25	1.06	.1

% REFLECTANCE



% REFLECTANCE ** EDITED **

