

SPICER HOUSE

x2

January 2002

25/3/02 RECEIVED FROM RANDAL HUNTER LITTLE
REPORT PREPARED BY HEPWORTH

COPIES:—

JOHN D. MARSHALL
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TERRY E. ELMIS
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SPICER HOUSE

EVALUATION OF MINERAL RESERVES

1. LOCATION

The site is situated at Annat Royd approximately 1 mile to the South West of Ingbirchworth.

The site is bounded to the North by Spicer house lane, to the South by a Wind Farm under the ownership of Yorkshire Water Ltd. and to the West by Greenley Carr quarry under the ownership of Hepworth Building products Ltd.

2. PROPERTY

The Spicer House Farm site and associated land, buildings and woodland extends to 144 acres, 58.3 hectares, or thereabouts.

A watercourse known as Spicer House Brook which discharges into the Ingbirchworth reservoir crosses the site.

The brook effectively divides the site into two area designated A and B on the location plan included in appendix A.

The land is currently under agricultural use.

3. GEOLOGY

The strata underlying the Spicer Farm area is the sequence of sandstones and shales associated with the Grenoside sandstone and Greenmoor rock of the Lower Coal Measures, the general dip of the strata being 1 in 15 to the North East.

The Grenoside sandstone sequence is visible in an exposed face at Annat Royd quarry adjacent to the northern boundary of the property; reference the location plan included in appendix A.

This sequence of strata is currently being worked at the Appleton quarry Shepley, where sandstone suitable for block stone and crushed products is being extracted by Marshalls Mono Ltd., with the associated shale, suitable for vitrified clay products, being extracted by Hepworth Building Products Ltd.

Hepworth Building Products Ltd are currently extracting shale from Grenoside/Greenmoor sandstone sequence at the Greenley Carr quarry site.

Reference: Geological Survey of England and Wales Yorkshire (West Riding) Sheet CCLXXIII S.W. edition of 1923.

4. MINERAL ASSESSMENT

In order to confirm the thickness and extent of the mineral underlying the property a series of four cored boreholes was drilled during June 1993.

A further borehole, reference borehole 5, was drilled during February 2002.

Samples of the cores obtained from the drilling were subject to laboratory analysis to determine the physical, chemical and firing properties of the shales found.

The location of the boreholes is indicated on the location plan in appendix A, sections of the boreholes are included in appendix B and the laboratory assessment of the shale is included in appendix C.

From the available geological and borehole information and from examination of the exposed sequence of the Grenoside Rock at Annat Royd quarry, it is concluded that the sequence of strata within the Grenoside Rock and Greenmoor rock sequence, extends under the Spicer House property.

The boreholes drilled during 1993 and 2002, were essentially to prove the presence and quality of the Grenoside sandstone and associated shale and did not therefore extend to the depth required to prove the extent and thickness of the lower Greenmoor Rock sequence of sandstone and shales. However based on the available geological and borehole information it is extrapolated that the sequence of sandstone and shale found at the Appleton quarry site, extending from the Grenoside sandstone horizon to the Greenmoor rock sequence, will be present beneath the Spicer House area.

This report, therefore, does not include any assessment of the extent of any of the potential mineral reserves below the base of the strata proved by the 1993 boreholes.

5. MINERAL RIGHTS

All mineral rights, with the exception of coal, are reserved to the Lord of the Manor of Ingbirchworth

6. MINERAL RESERVE

GRENOSIDE ROCK SEQUENCE

Based on the available borehole and geological information the Grenoside sandstone sequence within the Spicer Hill area extends over: -

Area A	area in the order of 5 hectares
Area B	area in the order of 25 hectares

The areas are indicated on the location plan included in appendix A.

The boreholes have indicated the presence of a band of sandstone with an average thickness of 8 metres and a band of shale with an average thickness of 4 metres separated by approximately 16 metres of black shale.
The borehole sections are included in appendix B.

A report of the physical, chemical and firing properties of the shale is included in appendix C.

The total reserve of the minerals present within the Grenoside rock sequence in the Spicer House area is therefore calculated as: -

Spicer House Area A

Grenoside sandstone
 $50,000 \text{ m}^2 @ 4.0 \text{ metres in thickness giving in the order of } 200,000 \text{ m}^3$.

Shale
 $50,000 \text{ m}^2 @ 4.0 \text{ metres in thickness giving in the order of } 200,000 \text{ m}^3$

Spicer Hill Area B

Grenoside Sandstone
 $250,000 \text{ m}^2 @ 8.0 \text{ metres in thickness giving in the order of } 2,000,000 \text{ m}^3$.

Shale
 $250,000 \text{ m}^2 @ 4.0 \text{ metres in thickness giving in the order of } 1,000,000 \text{ m}^3$

TOTAL RESERVES

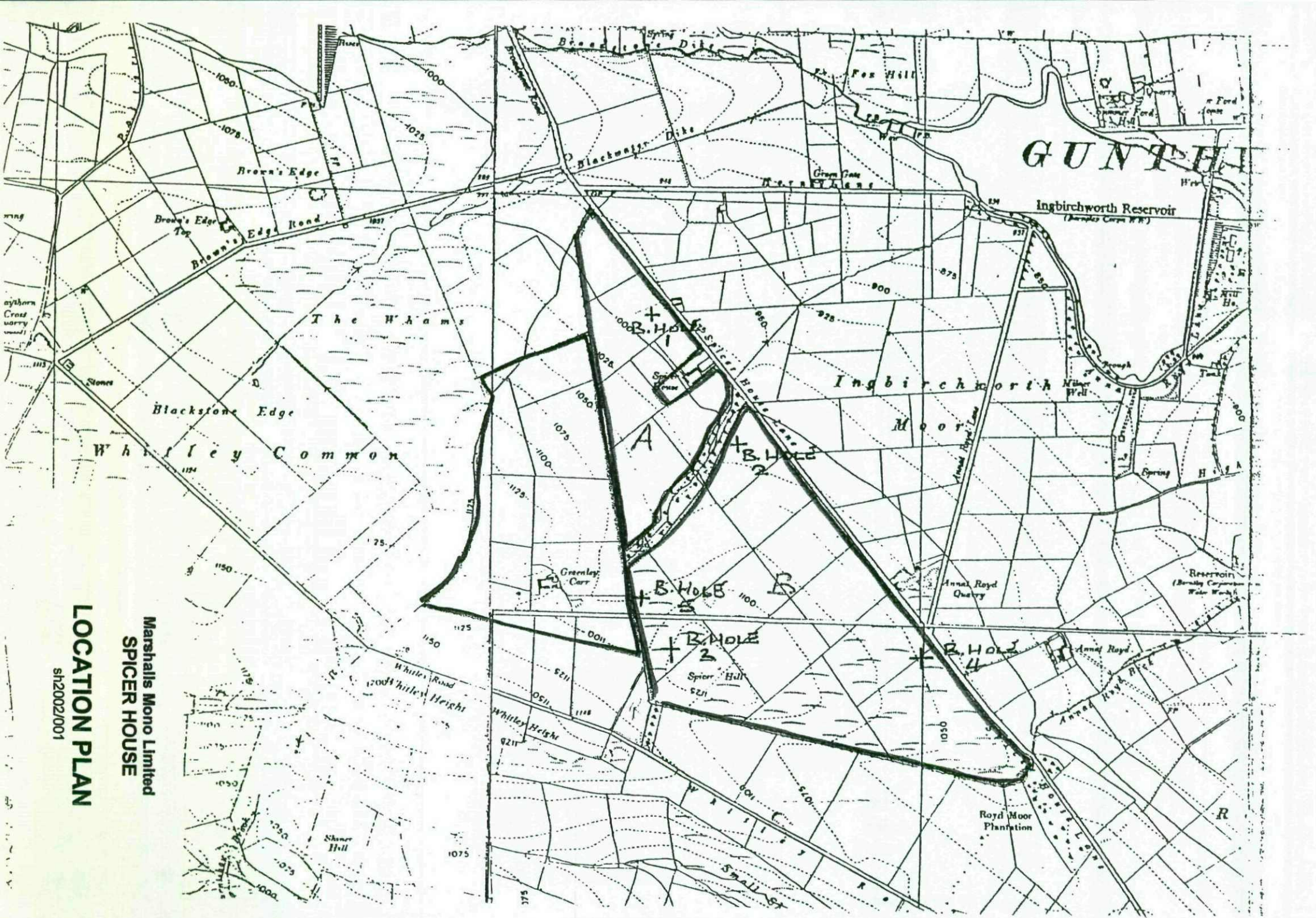
Total reserve of mineral within the Spicer House property is estimated as: -

Grenoside sandstone	in the order of	$2,200,000 \text{ m}^3$
Shale	in the order of	$1,200,000 \text{ m}^3$

APPENDICES

- A. Location Plan
- B. Borehole Sections
- C. Laboratory Evaluation of core samples

APPENDIX A



GUNTHWAITE

Ingbirchworth Reservoir
(Barnsley Corp. W.W.)

Ingbirchworth Moor

The Wharfe

Blackstone Edge

Whitley Common

Reservoir
(Barnsley Corporation Water Works)

Annal Royd Quarry

Royd Moor Plantation

Marshall's Mono Limited
SPICER HOUSE
LOCATION PLAN

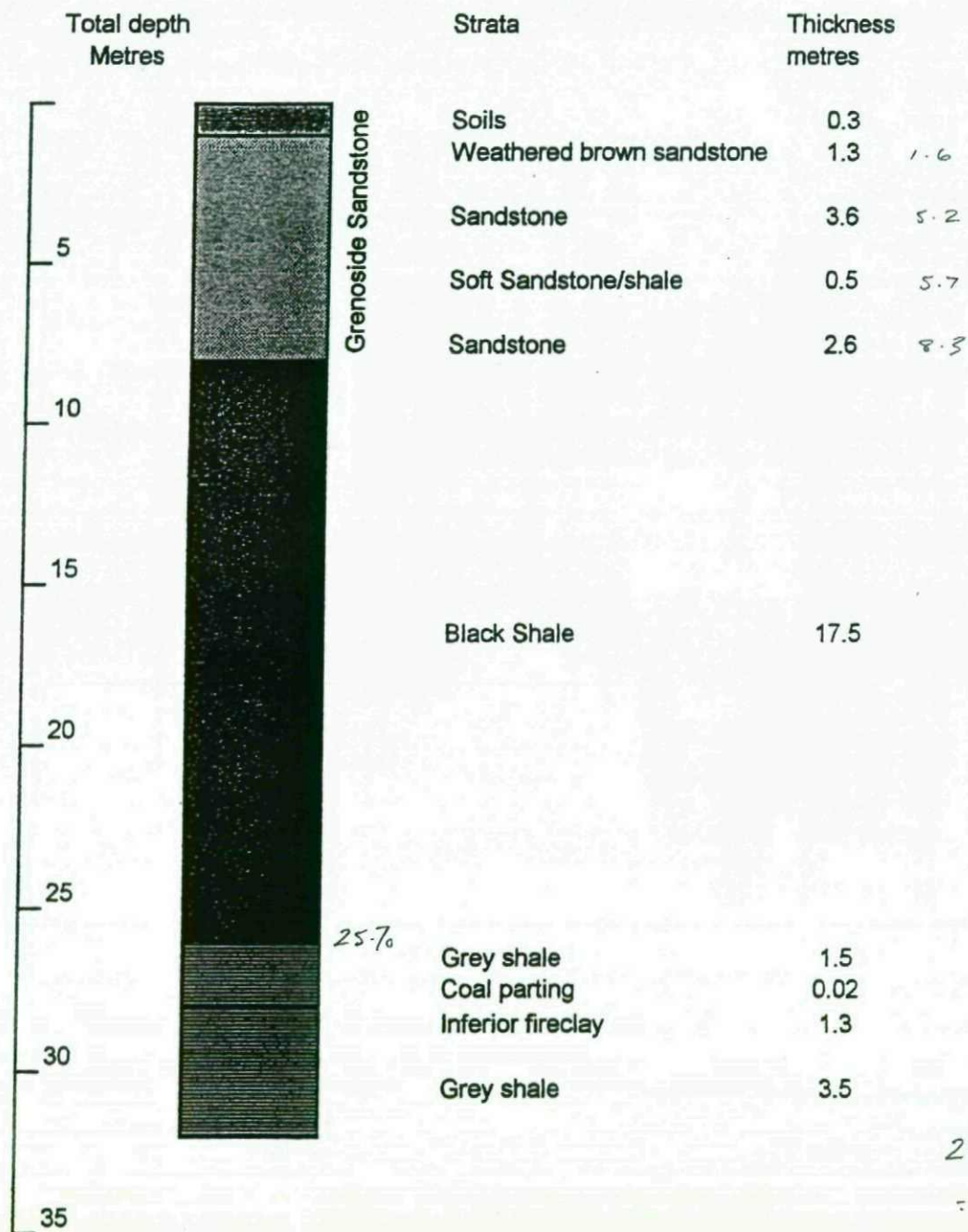
SH2002/001

APPENDIX B

SPICER HOUSE

BOREHOLE No.1

Surface Level 299 m AOD

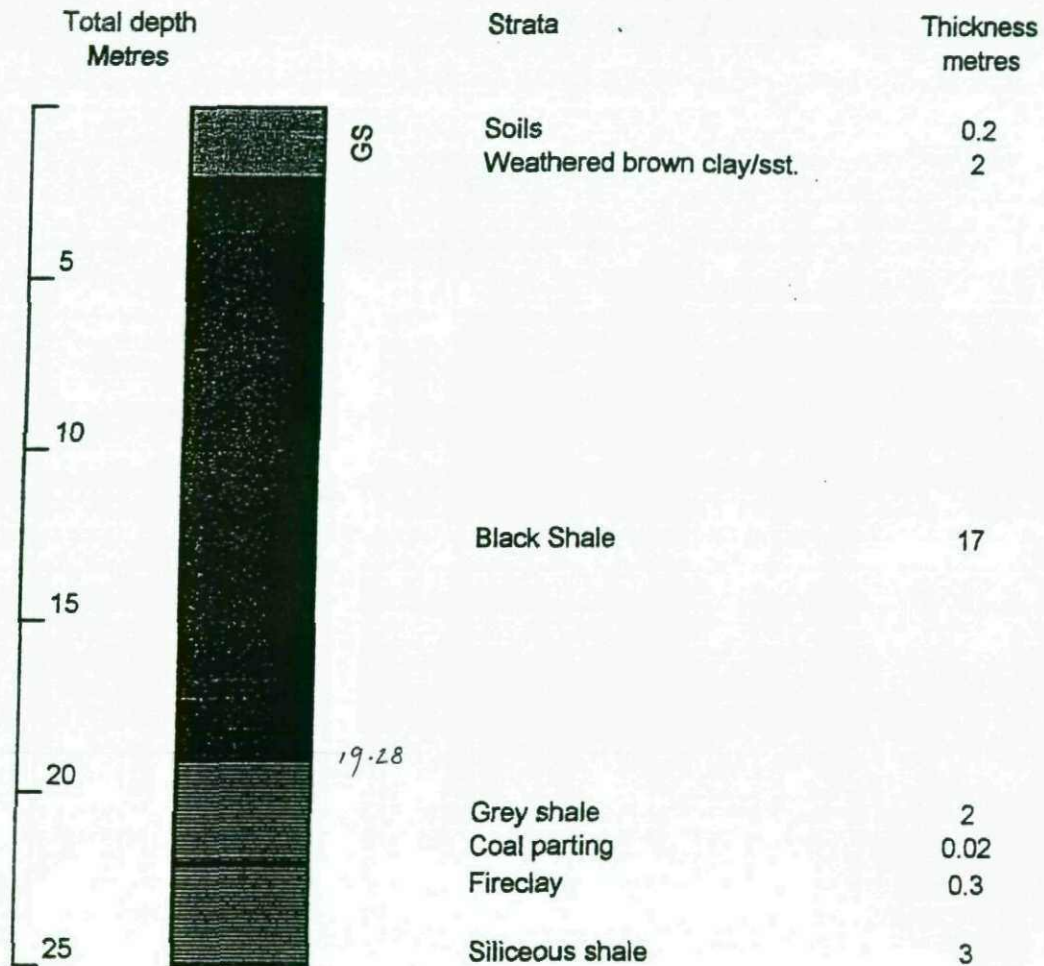


25.70 + 7.00
= 32.70
Top of G.M.

SPICER HOUSE

BOREHOLE No.2

Surface Level 309 m AOD



$$17.28 + 7$$

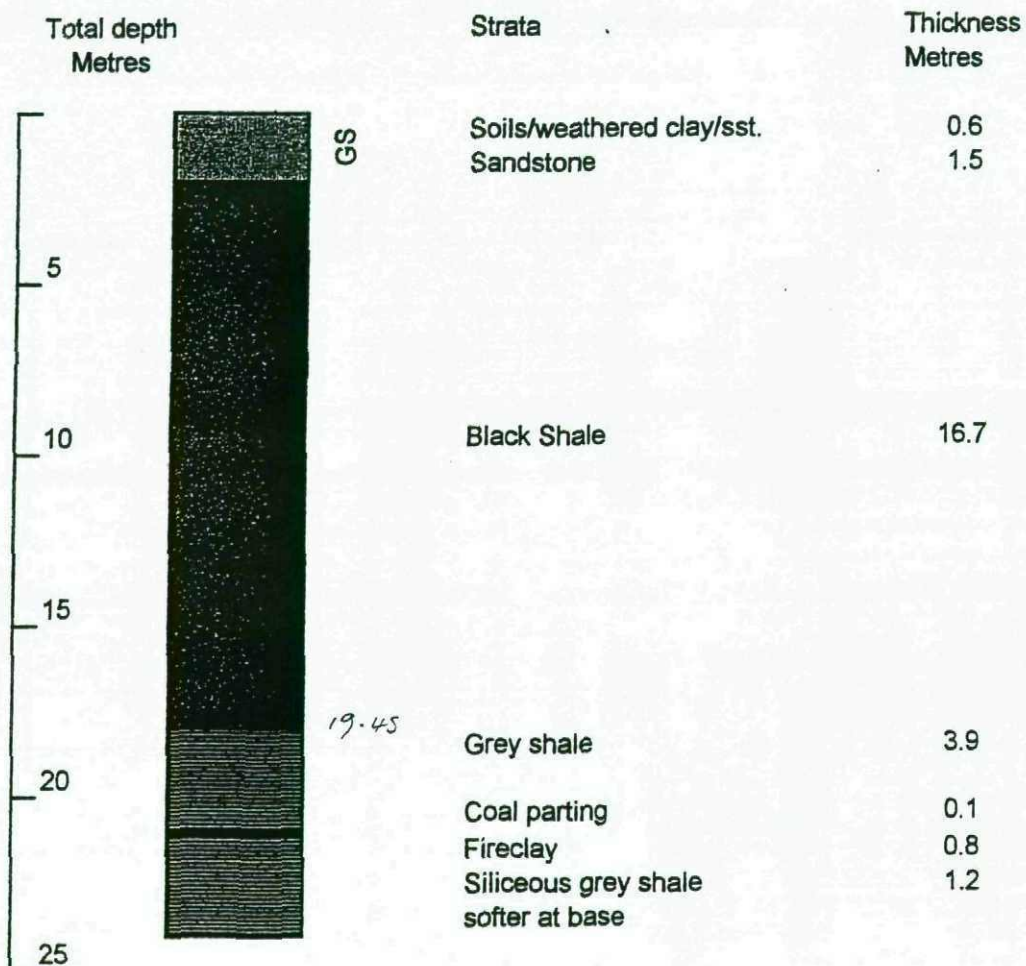
$$= 26.28$$

Top of Gm

SPICER HOUSE

BOREHOLE No.3

Surface Level 341 m AOD



19.45 + 7

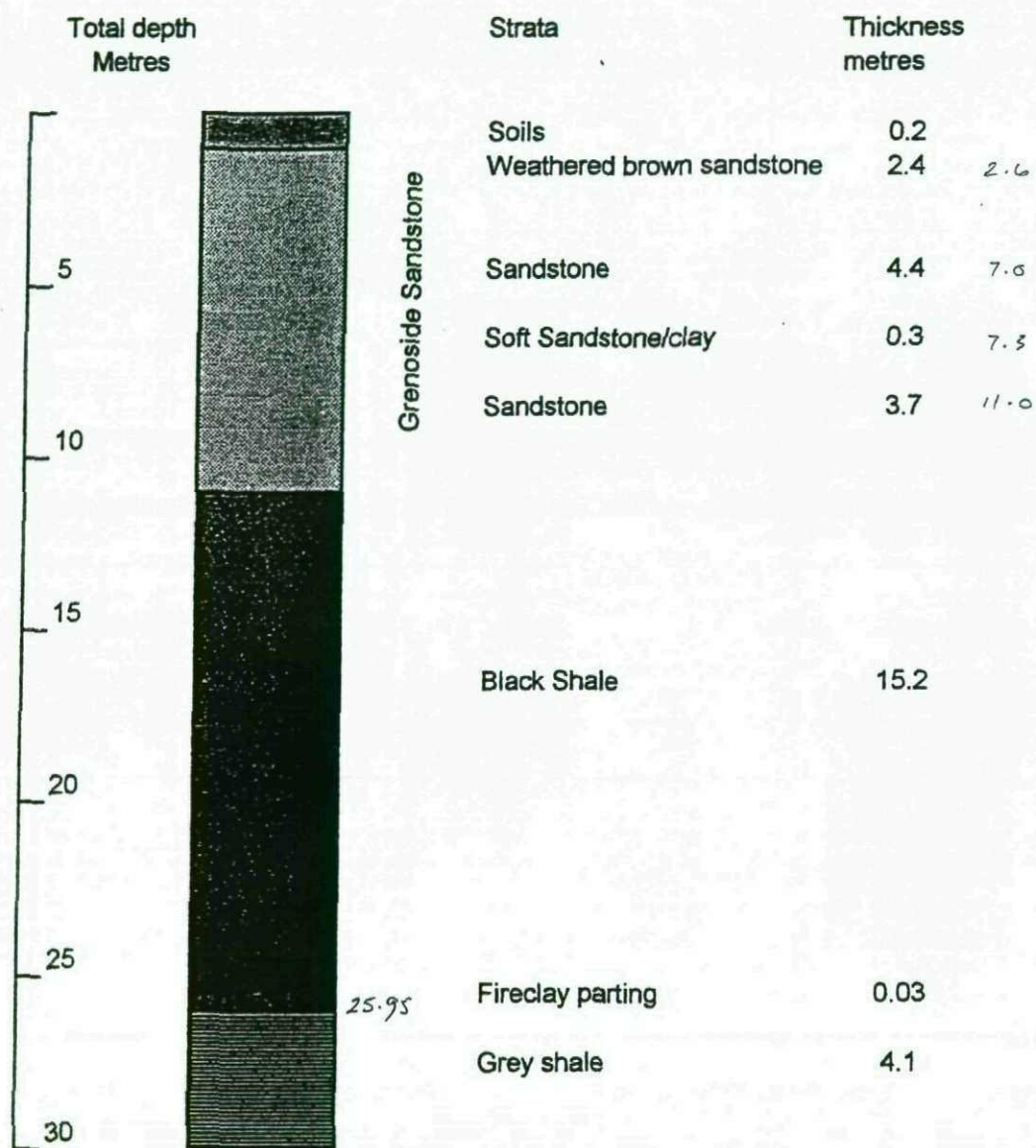
= 26.45

Top of Gm

SPICER HOUSE

BOREHOLE No.4

Surface level 319 m AOD ✓



25.95 + 7

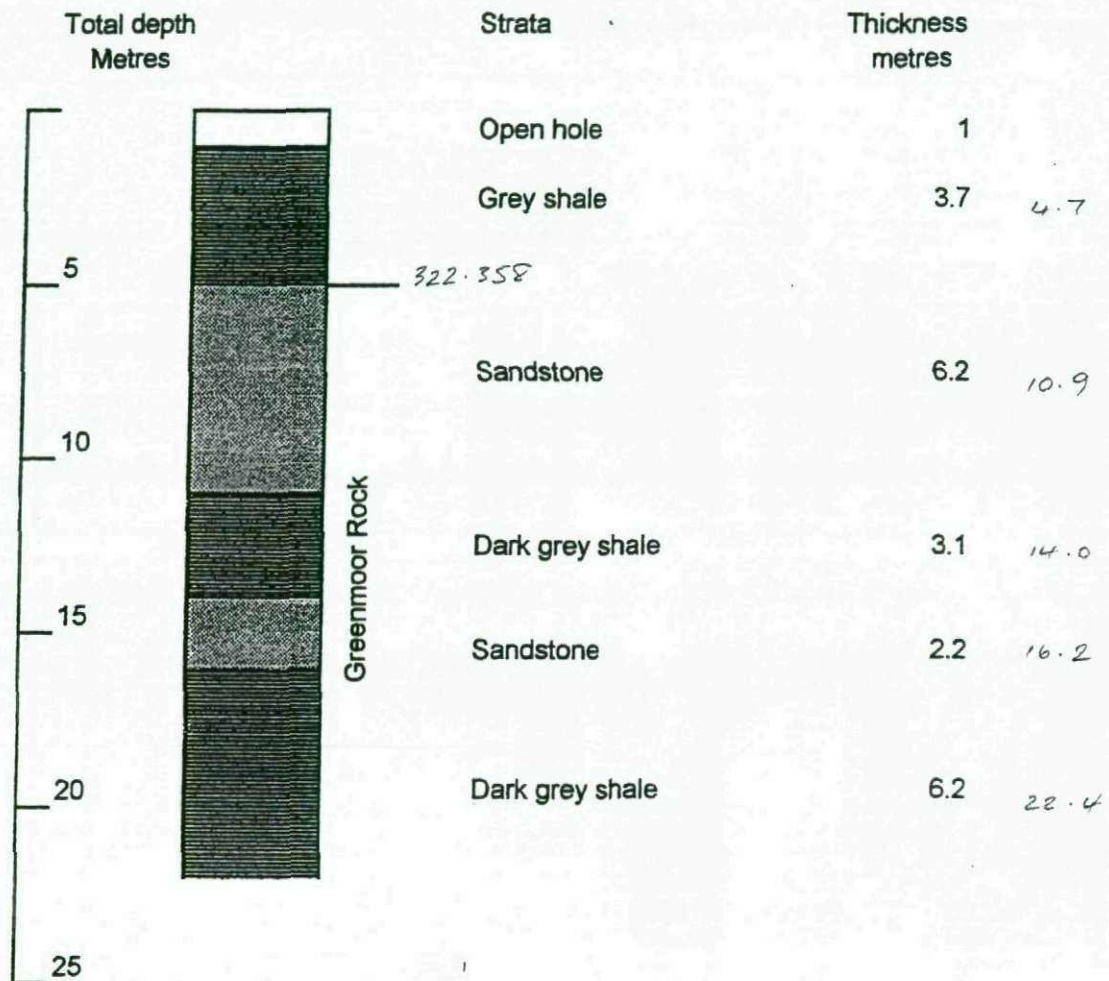
= 32.95

Top of Gm

SPICER HOUSE

BOREHOLE No.5

Surface level 327 m AOD



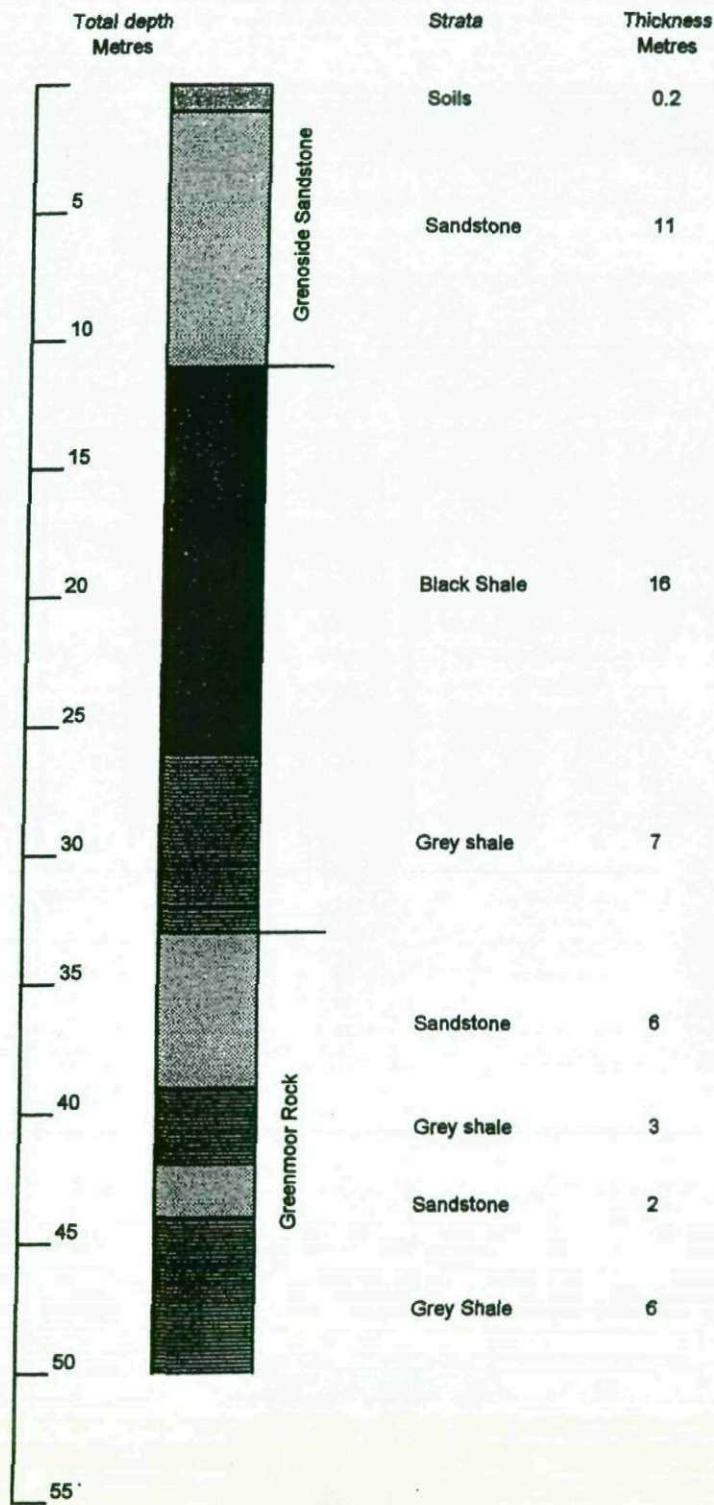
Assume Avg thickness of :-

Grey shale = 7m
Black shale = 16.6m

= 322.358 = 329.358 BShale
= 345.958 Base of Grenoside

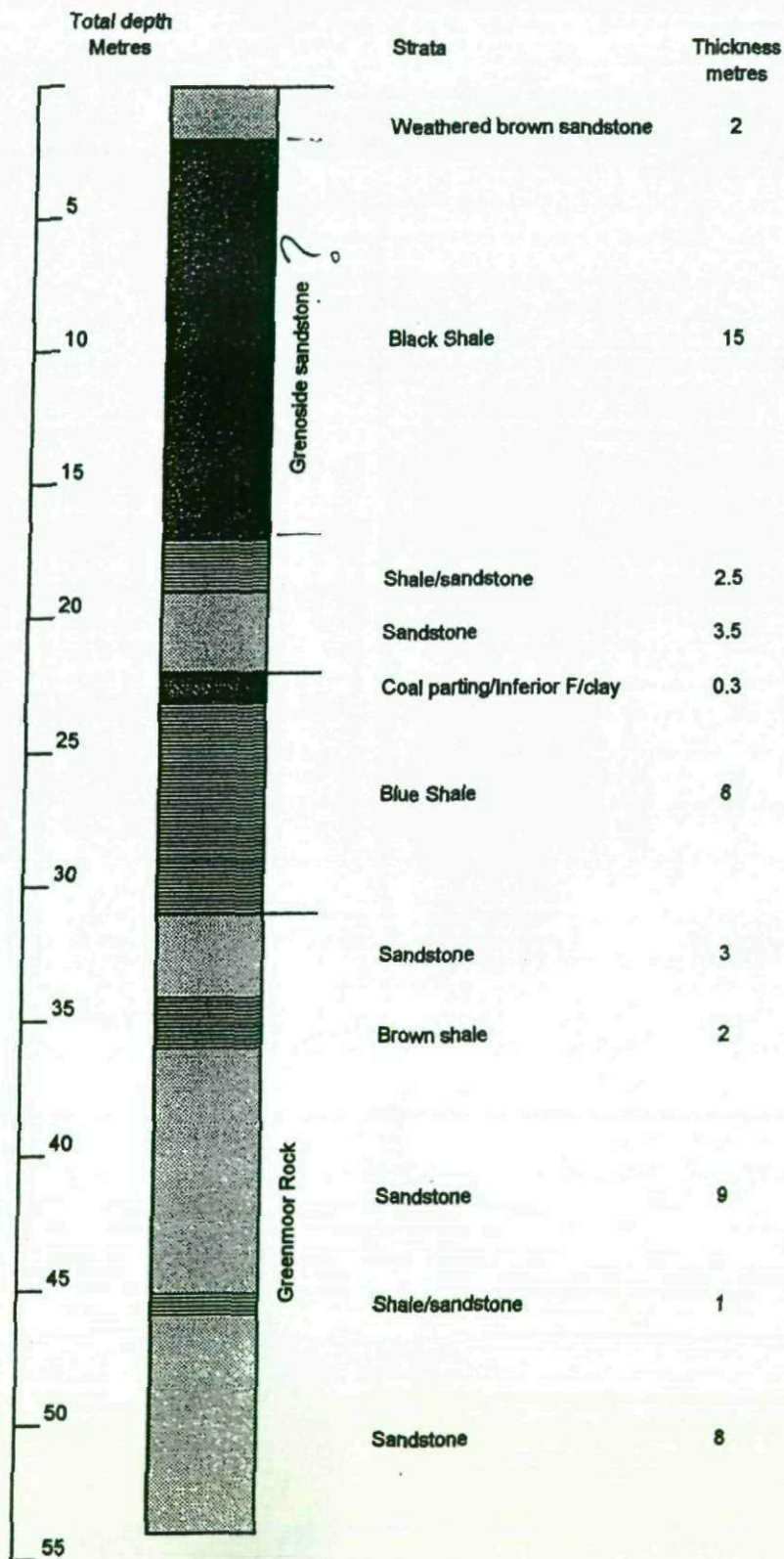
SPICER HOUSE

Spicer Hill Average Section



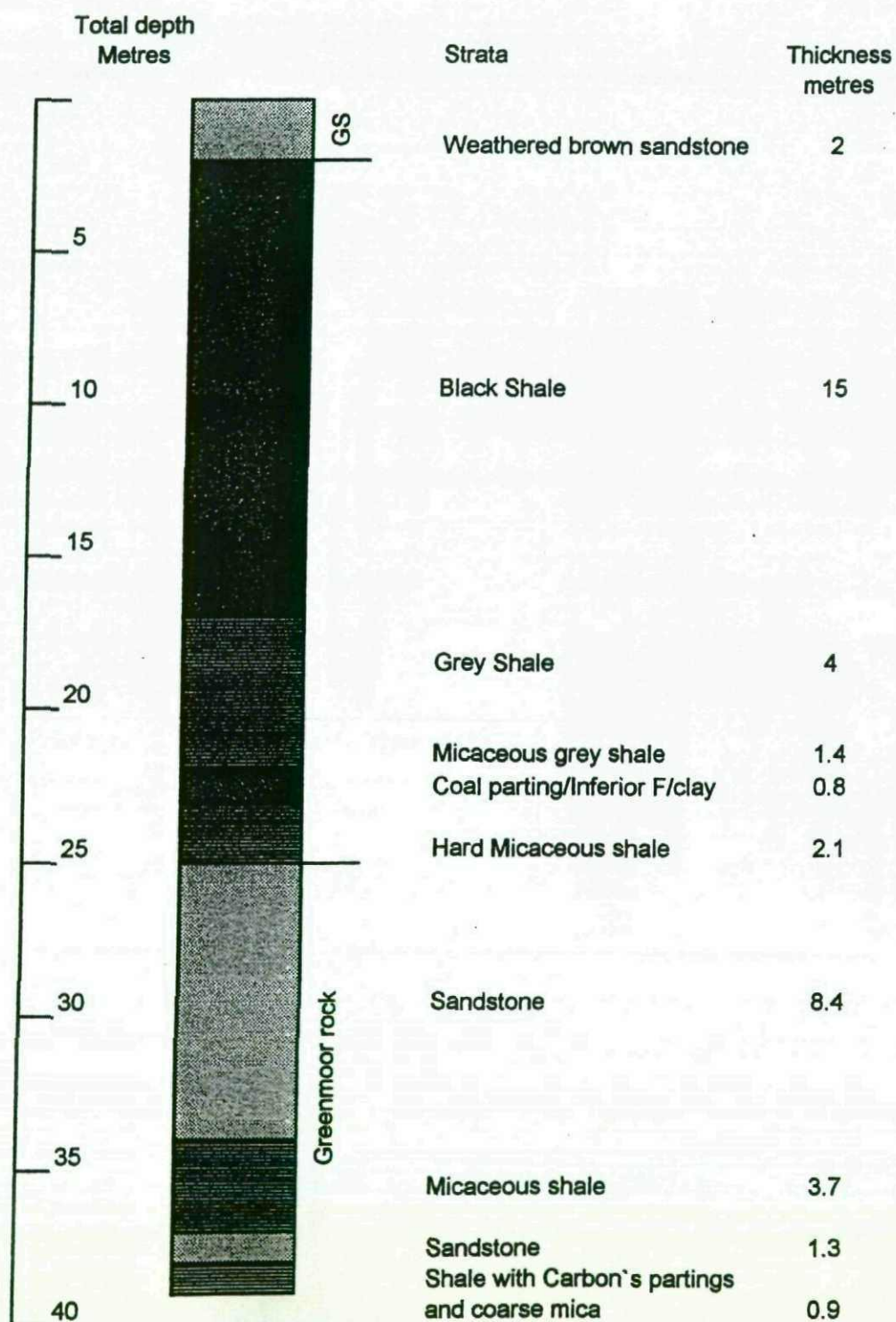
Appleton

Appleton average section



Greenley carr

Greenley Carr Average section



APPENDIX C

SPICER HOUSE

BOREHOLE

EVALUATION

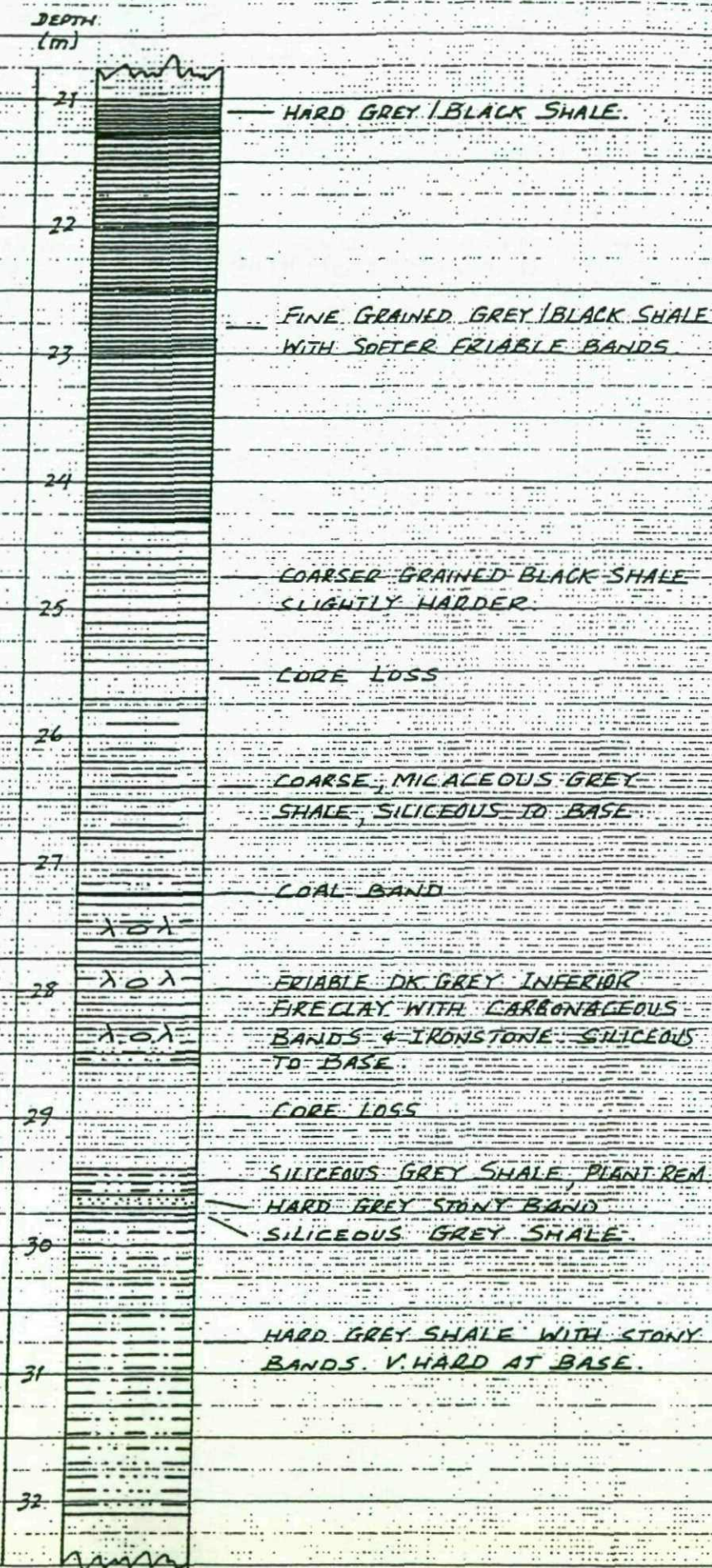
CORED FROM 21.00m - 32.10m.

TOTAL DEPTH (m)	THICKNESS (m)	DESCRIPTION	TOTAL C (%)	SO3 (%)	I
21.00-21.30	.30	Hard grey /black shale.	2.92	nd	12
21.30-24.30	3.00	Fine grained grey/black shale with softer friable bands.	2.59	nd	10
24.30-25.40	1.10	Coarser grained black shale, slightly harder.	3.74	1.09	10
25.40-25.70	.30	Loss.			
25.70-27.24	1.54	Coarse micaceous grey shale, siliceous to base.	.87	.18	5
27.24-27.26	.02	Coal band.			
27.26-28.57	1.31	Friable dark grey inferior fireclay with carbonaceous bands & ironstones. Siliceous towards base.	1.60	.33	7
28.57-29.40	.83	Loss.			
29.40-29.60	.20	Siliceous grey shale with plant remains.	.59	.18	6
29.60-29.70	.10	Hard grey stony band.	1.50	.20	6
29.70-29.80	.10	Siliceous grey shale.	1.22	.22	5
29.80-32.10		Hard grey shale with stony bands. Very hard at base.	.54	nd	4

The following samples were selected for full evaluation:-

M4734	25.70	- 26.47m.	(0.77m.)	- Grey shale.
M4735	26.47	- 27.24m.	(0.77m.)	- Grey shale.
M4736	27.35	- 27.96m.	(0.61m.)	- Inferior fireclay.
M4737	27.96	- 28.57m.	(0.61m.)	- Inferior fireclay.
M4738	29.40	- 30.30m.	(0.90m.)	- Siliceous grey shale.
M4739	30.30	- 31.20m.	(0.90m.)	- Siliceous grey shale.

SPICER HOUSE - BOREHOLE 1 - JUNE 1993



CORED FROM 17.00m - 24.78m.

TOTAL DEPTH (m)	THICKNESS (m)	DESCRIPTION	TOTAL C (%)	SO3 (%)	L (%)
17.00-19.28	2.28	Fairly hard, fine grained, grey/black shale. 1.20m. core loss.	9.11	1.40	22.
19.28-21.88	2.60	Coarser grained grey shale, micaceous with hard ironstone bands. More siliceous to base.	4.57	.16	15.
21.88-21.90	.02	Coal band.	1.12	.15	6.
21.90-22.28	.38	Inferior fireclay, lean with carbonaceous partings.	1.79	.36	7.
22.28-23.28	1.00	Dark grey shale with inferior fireclay partings.	1.36	.28	7.
23.28-24.78	1.40	Very hard coarse grained grey shale, micaceous.	.64	.19	4.

The following samples were selected for full evaluation:-

M4742	19.43	- 19.93m.	(0.50m.)	- Grey shale.
M4743	19.93	- 20.43m.	(0.50m.)	- Grey shale.
M4744	20.43	- 20.93m.	(0.50m.)	- Grey shale.
M4745	20.93	- 21.43m.	(0.50m.)	- Grey shale.
M4746	21.43	- 21.88m.	(0.45m.)	- Grey shale.
M4747	22.00	- 22.28m.	(0.28m.)	- Inferior fireclay..
M4748	22.28	- 22.78m.	(0.50m.)	- Dark grey shale, with inferior fireclay.
M4749	22.78	- 23.28m.	(0.50m.)	- Dark grey shale, with inferior fireclay.
M4750	23.28	- 23.85m.	(0.57m.)	- Siliceous grey shale.
M4751	23.85	- 24.32m.	(0.47m.)	- Siliceous grey shale.
M4752	24.32	- 24.78m.	(0.46m.)	- Siliceous grey shale.

SPICER HOUSE - BOREHOLE 2 - JUNE 1993

DEPTH
(m)



FAIRLY HARD, FINE GRAINED,
GREY / BLACK SHALE
1.20m CORE LOSS

COARSE MICACEOUS GREY
SHALE WITH HARD IRONSTONE
BANDS, SILICEOUS TO BASE

COAL BAND

INFERIOR FIRECLAY, LEAN,
WITH CARBONACEOUS BANDS

DK GREY SHALE WITH
INFERIOR FIRECLAY PARTINGS

✓ HARD, COARSE GRAINED
GREY SHALE, MICACEOUS

CORED FROM 17.00m - 23.57m.

TOTAL DEPTH (m)	THICKNESS (m)	DESCRIPTION	TOTAL C (%)	SO3 (%)	LI (%)
17.00-17.55	.55	Fine grained black shale.			
17.55-17.67	.12	Soft, friable carbonaceous clay.			
17.67-17.96	.29	Harder dark grey shale.	.65	.16	5.6
17.96-18.10	.14	Soft, friable grey/black clay.	.60	.14	5.6
18.10-18.60	.50	Fairly soft dark grey shale. Hard ironstone nodules.	.83	.18	5.4
18.60-18.75	.15	Soft friable grey/black clay.	.97	.21	5.8
18.75-19.45	.70	Dark grey micaceous shale. Hard ironstone band 18.85-18.90m.	.78	.15	5.4
19.45-19.56	.11	Soft friable grey/black clay.	.79	.15	5.3
19.56-19.90	.34	Dark grey shale with coarse mica.	.84	.15	5.1
19.90-21.54	1.64	Grey, micaceous shale with occasional ironstone nodules.	.64	.11	5.2
21.54-21.62	.08	Soft, friable, carbonaceous clay band. (Coal horizon?)			
21.62-22.37	.75	Soft fireclay with plant remains.	1.09	.22	7.7
22.37-22.67	.30	V.Hard siliceous grey shale with f. coarse mica.	.46	.15	3.7
22.67-23.10	.43	Less hard siliceous grey shale with ironstone nodules.	.44	.21	5.0
23.10-23.57	.47	Softer micaceous grey shale, fine mica.	.72	.11	5.2

The following samples were selected for full evaluation:-

M4755	17.67	- 18.67m.	(1.00m.)	- Grey shale.
M4756	18.67	- 19.67m.	(1.00m.)	- Grey shale.
M4757	19.67	- 20.67m.	(1.00m.)	- Grey shale.
M4758	20.67	- 21.54m.	(0.87m.)	- Grey shale.
M4759	21.62	- 22.37m.	(0.75m.)	- Fireclay.
M4760	22.37	- 22.67m.	(0.30m.)	- Hard siliceous shale.
M4761	22.67	- 23.10m.	(0.43m.)	- Less hard siliceous shale.
M4762	23.10	- 23.57m.	(0.47m.)	- Softer micaceous grey shale.

SPICER HOUSE - BOREHOLE 3 - JUNE 1993

DEPTH
(m)



FINE GRAINED BLACK SHALE

SOFT FRIABLE CARB. CLAY

HARDER DARK GREY SHALE

SOFT FRIABLE GREY CLAY

SOFTISH DARK GREY SHALE

WITH IRONSTONE NODULES

SOFT FRIABLE GREY CLAY

DK GREY MICACEOUS SHALE

IRONSTONE BAND 18-85m

SOFT FRIABLE GREY CLAY

COARSE MICACEOUS DK GREY

SHALE

GREY MICACEOUS SHALE WITH

ALL IRONSTONE NODULES

SOFT FRIABLE CARBONACEOUS

BAND - COAL HORIZON?

SOFT FIRECLAY PLANT REMAINS

HARD SILICEOUS GREY SHALE,

COARSE MICA

LESS HARD SILICEOUS GREY

SHALE - IRONSTONE NODULES

SOFTER MICACEOUS GREY

SHALE

CORED FROM 23.00m - 30.29m.

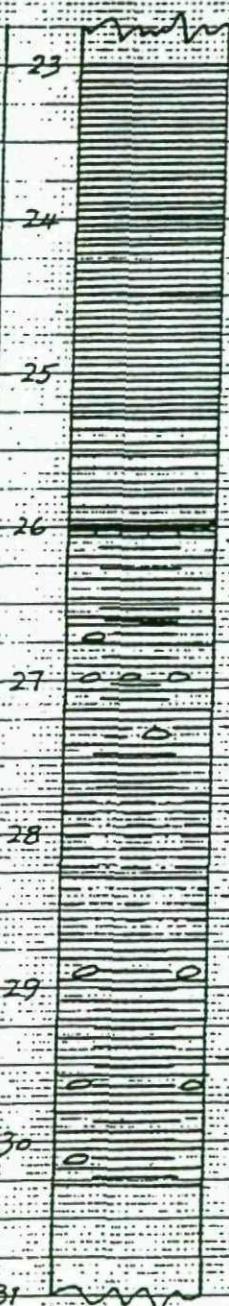
TOTAL DEPTH (m)	THICKNESS (m)	DESCRIPTION	TOTAL C (%)	SO3 (%)	I
23.00-25.29	2.29	Grey/black, well compacted, fine grained shale with fine mica.			
25.29-25.95	.66	Black, well compacted, coarser shale with plant remains.	2.05	.45	8.
25.95-26.03	.08	Fragmented grey/black shale with plant remains.			
26.03-26.06	.03	Soft, friable, inferior fireclay parting.	.94	.70	6.
26.06-26.58	.52	Well compacted grey shale. at 26.08m.	2.17	.14	10
		at 26.57m.	.68	.14	5.
26.58-26.64	.06	Fragmented grey shale.			
26.64-27.74	1.10	Harder grey shale with ironstone bands and nodules; some mica.	.75	.15	5.
27.74-28.29	.55	Hard, siliceous, dark grey shale with coarser mica	.97	.16	5.
28.29-28.69	.40	V. hard, siliceous dark grey shale, coarse mica.	.58	.16	3.
28.69-30.29	1.60	Less hard, dark grey shale with finer mica, some harder ironstone bands and nodules.	.77	.14	5.

The following samples were selected for full evaluation:-

M4765 26.20 - 26.64m. (0.44m.) - Grey shale.
M4766 26.64 - 27.14m. (0.50m.) - Harder grey shale.
M4767 27.14 - 27.74m. (0.60m.) - Harder grey shale.
M4768 27.74 - 28.24m. (0.50m.) - Siliceous dark grey shale.
M4769 28.24 - 28.74m. (0.50m.) - Siliceous dark grey shale.
M4770 28.74 - 29.24m. (0.50m.) - Dark grey shale.
M4771 29.24 - 29.74m. (0.50m.) - Dark grey shale.
M4772 29.74 - 30.29m. (0.55m.) - Dark grey shale.

SPICER HOUSE - BOREHOLE 4 - JUNE 1993

DEPTH
(m)



FINE GRAINED WELL COMPACTED
GREY/BLACK SHALE FINE MICA

WELL COMPACTED BLACK SHALE,
COARSER WITH PLANT REMAINS
FRAGMENTED GREY/BLACK SHALE
UNDERLAIN BY INFERRIOR FIRECLAY
PARTING

WELL COMPACTED GREY SHALE
UNDERLAIN BY FRAGMENTED BAND

HARDER GREY SHALE WITH
IRONSTONE SOME MICA

HARD SILICEOUS DARK GREY
SHALE WITH COARSER MICA

V. HARD, SILICEOUS, DARK GREY
SHALE COARSE MICA

LESS HARD, DARK GREY SHALE
WITH FINER MICA, SOME HARDER
IRONSTONE BANDS & NODULES

SPICER HOUSE BOREHOLES

JUNE 1993

TEST RESULTS

1. IMPURITY ANALYSES

SAMPLE	BH. No.	C. TOT %	C. INORG. %	SO3 %	LOI %	QUARTZ %
M4734	1	.98	.32	.21	5.90	30
M4735	1	.91	.44	.15	6.01	35
M4736	1	2.25	.06	.25	8.21	22
M4737	1	2.27	1.48	.29	10.19	25
M4738	1	.78	.33	.39	4.54	44
M4739	1	.78	.43	.13	4.95	34
M4742	2	1.17	.48	.13	6.52	27
M4743	2	.92	.45	.17	6.12	30
M4744	2	1.02	.49	.13	5.72	35
M4745	2	.94	.45	.19	5.61	33
M4746	2	1.14	.64	.12	6.52	30
M4747	2	2.66	.24	.41	9.12	-
M4748	2	1.38	.09	.21	7.15	21
M4749	2	1.32	.73	.17	7.73	21
M4750	2	.87	.34	.12	4.65	38
M4751	2	.78	.25	.16	4.32	40
M4752	2	.63	.17	.19	3.99	39
M4755	3	1.17	.51	.15	6.45	30
M4756	3	1.12	.54	.14	6.16	32
M4757	3	.81	.31	.13	5.42	32
M4758	3	.94	.48	.12	5.83	35
M4759	3	1.23	.19	.10	7.29	20
M4760	3	.42	.32	.11	3.22	50
M4761	3	.47	.11	.31	3.92	39
M4762	3	1.04	.45	.11	5.79	30
M4765	4	1.15	.54	.12	6.67	31
M4766	4	.93	.30	.16	5.53	33
M4767	4	.93	.45	.15	5.61	30
M4768	4	.99	.53	.14	5.20	40
M4769	4	.78	.37	.13	4.40	47
M4770	4	1.01	.43	.15	5.94	34
M4771	4	.98	.49	.13	5.90	35
M4772	4	1.04	.58	.16	6.27	30

2. CHEMICAL ANALYSES

SAMPLES SH1 - 50% M4734/50% M4735
 SH2 - 50% M4736/50% M4737
 SH3 - 50% M4738/50% M4739
 SH4 - 25% M4755/25% M4756/ 25% M4757/ 25% M4758
 SH5 - 100% M4759
 SH6 - 33.3% M4770/33.3% M4771/33.3% M4772

SAMPLE	SiO2 %	Al2O3 %	TiO2 %	Fe2O3 %	CaO %	MgO %	K2O %	Na2O %	LOI %
SH1	61.24	17.42	1.03	7.01	.46	1.86	3.24	.91	5.96
SH2	50.54	21.34	.75	9.65	.64	2.11	4.74	.33	9.20
SH3	65.83	15.31	.90	6.21	.42	1.60	2.88	1.07	4.75
SH4	60.88	17.40	1.02	7.32	.35	1.94	3.22	.97	5.97
SH5	52.64	24.14	.83	6.69	.19	2.23	5.01	.31	7.29
SH6	60.28	17.71	.98	7.38	.39	1.95	1.95	.98	6.04

3. UNFIRED PROPERTIES

SAMPLE	BH. No.	<2um %	2-20um %	>20um %	EXT. MOIST. %	PLASTICITY INDEX	DRY SHR. %	DRY MOR MPa
M4734	1	30	58	12	14.2	.75	2.64	3.2
M4735	1	27	54	19	13.7	.73	2.09	2.8
M4736	1	48	41	11	15.1	1.02	2.93	3.2
M4737	1	41	43	16	14.3	1.15	2.74	3.5
M4738	1	22	36	42	13.3	N/A	2.19	2.5
M4739	1	26	47	27	13.3	N/A	2.18	2.7
M4742	2	26	59	15	16.0	.70	3.02	2.7
M4743	2	27	60	13	15.4	.78	2.77	2.4
M4744	2	24	53	23	14.3	.76	2.22	2.5
M4745	2	23	56	21	11.6	.72	2.35	2.2
M4746	2	24	59	17	14.6	.84	2.45	2.3
M4747	2	NOT EXTRUDED						
M4748	2	52	40	8	15.9	1.09	3.45	3.4
M4749	2	40	50	10	14.7	1.00	2.91	3.2
M4750	2	22	37	41	13.2	.69	2.15	2.4
M4751	2	21	35	44	13.3	N/A	1.87	2.0
M4752	2	26	38	36	12.9	N/A	2.01	2.1
M4755	3	30	61	9	15.3	.71	2.98	2.9
M4756	3	26	56	18	14.7	.74	2.79	2.9
M4757	3	21	67	12	14.2	.80	2.62	2.9
M4758	3	30	57	13	13.9	.83	2.40	2.8
M4759	3	59	37	4	16.0	1.10	3.37	3.9
M4760	3	NOT EXTRUDED						
M4761	3	22	50	28	14.2	.62	2.16	3.2
M4762	3	31	58	11	13.7	.78	2.59	2.4
M4765	4	35	58	7	13.7	.79	2.28	3.5
M4766	4	33	58	9	13.3	.79	2.30	3.2
M4767	4	31	56	13	13.3	.79	2.25	3.0
M4768	4	19	52	29	13.5	N/A	2.26	2.5
M4769	4	20	35	45	13.6	N/A	2.06	2.6
M4770	4	33	55	12	13.8	.72	2.45	3.5
M4771	4	30	54	16	13.5	.75	2.34	3.2
M4772	4	36	33	11	13.1	.88	2.34	3.2

4. FIRED PROPERTIES

AT 4.0% WATER ABSORPTION

SAMPLE	BE. No.	FIRING TEMP. oC	FIRING SHR. %	MoR MPa	REMARKS
M4734	1	1062	5.14	32.7	Slight lime blowing.
M4735	1	1089	5.10	33.3	Coal blowing.
M4736	1	1028	5.45	32.7	3 hour oxidation at 7500c, coal blowing
M4737	1	1053	6.17	23.5	
M4738	1	1156	5.22	27.5	
M4739	1	1118	5.44	30.6	
M4742	2	1075	6.08	36.6	
M4743	2	1081	6.21	39.5	
M4744	2	1105	5.97	31.5	V.slight coal blowing.
M4745	2	1106	6.01	34.1	
M4746	2	1090	6.07	33.3	
M4747	2	NOT EXTRUDED			
M4748	2	1024	4.68	26.7	Severe coal blowing.
M4749	2	1023	5.25	29.2	Slight coal blowing.
M4750	2	1155	5.05	31.4	
M4751	2	1168	5.28	30.7	
M4752	2	1167	5.26	31.1	
M4755	3	1071	5.68	38.9	
M4756	3	1091	6.00	37.1	
M4757	3	1093	5.80	36.1	
M4758	3	1090	5.75	35.0	
M4759	3	1031	4.77	31.3	
M4760	3	NOT EXTRUDED			
M4761	3	1149	5.11	35.3	
M4762	3	1081	5.37	36.7	
M4765	4	1045	5.08	35.4	
M4766	4	1064	4.84	36.6	
M4767	4	1071	5.17	35.4	
M4768	4	1141	5.51	34.6	
M4769	4	1162	5.06	30.3	
M4770	4	1069	5.11	37.6	
M4771	4	1070	5.25	38.5	
M4772	4	1062	5.09	34.0	

AVERAGE PROPERTIES OF USABLE MINERAL

BOREHOLE 1

1.54m, GREY SHALE (25.70m/27.24m.)	
1.22m. INFERIOR FIRECLAY (27.35m./28.57m.)	<u>TOTAL 2.76m.</u>
AVE. FIRING TEMPERATURE (4% W.ABS.)	1061oC
AVE. TOTAL CARBON	1.53%
AVE. ORGANIC CARBON	0.98%
AVE. SO3	0.22%

BOREHOLE 2

2.45m, GREY SHALE (19.43m/21.88m.)	
1.00m. GREY SHALE WITH INFERIOR FIRECLAY (22.28m./23.28m.)	<u>TOTAL 3.45m.</u>
AVE. FIRING TEMPERATURE (4% W.ABS.)	1072oC
AVE. TOTAL CARBON	1.13%
AVE. ORGANIC CARBON	0.66%
AVE. SO3	0.20%

BOREHOLE 3

3.87m, GREY SHALE (17.67m/21.54m.)	
0.75m. FIRECLAY (21.62m./22.37m.)	<u>TOTAL 4.62m.</u>
AVE. FIRING TEMPERATURE (4% W.ABS.)	1077oC
AVE. TOTAL CARBON	1.05%
AVE. ORGANIC CARBON	0.63%
AVE. SO3	0.13%

A further 0.43m. of refractory mineral at 1149oC firing temperature and at least 0.47m. of micaceous grey shale at 1081oC is also available if it is considered economical to remove the hard siliceous shale at 22.67m./23.10m.

BOREHOLE 4

1.54m, GREY SHALE (26.20m/27.74m.)	
1.00m. HARD SILICEOUS SHALE (27.74m./28.74m.)	<u>TOTAL 4.09m.</u>
1.55m. DARK GREY SHALE (28.74m./30.29m)	
AVE. FIRING TEMPERATURE (4% W.ABS.)	1086oC
AVE. TOTAL CARBON	0.97%
AVE. ORGANIC CARBON	0.52%
AVE. SO3	0.14%

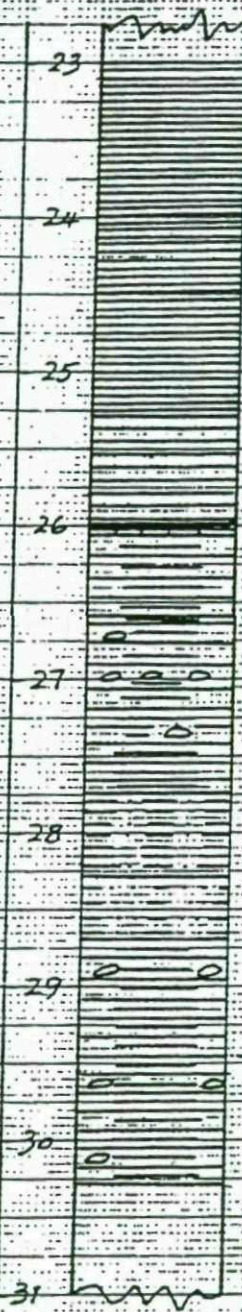
If the hard siliceous shale was removed and discarded 3.09m. of mineral would be available at the following averages:

AVE. FIRING TEMPERATURE (4% W.ABS.)	1065°C
AVE. TOTAL CARBON	1.00%
AVE. ORGANIC CARBON	0.54%
AVE. SO ₃	0.15%

It should be noted that more than 1.55m. of dark grey shale at the base of the borehole is likely to be available.

SPICER HOUSE - BOREHOLE 4 - JUNE 1993

DEPTH
(m)



FINE GRAINED WELL COMPACTED
GREY/BLACK SHALE FINE MICA

WELL COMPACTED BLACK SHALE,
COARSER WITH PLANT REMAINS
FRAGMENTED GREY/BLACK SHALE
UNDERLAIN BY INFERIOR FIRECLAY
PARTING

WELL COMPACTED GREY SHALE
UNDERLAIN BY FRAGMENTED SAND

HARDER GREY SHALE WITH
IRONSTONE, SOME MICA

HARD SILICEOUS DARK GREY
SHALE WITH COARSER MICA

V. HARD, SILICEOUS, DARK GREY
SHALE COARSE MICA

LESS HARD, DARK GREY SHALE
WITH FINER MICA, SOME HARDER
IRONSTONE BANDS & NODULES

SPICER HOUSE BOREHOLES

JUNE 1993

TEST RESULTS

1. IMPURITY ANALYSES

SAMPLE	BH. No.	C. TOT %	C. INORG. %	SO3 %	LOI %	QUARTZ %
M4734	1	.98	.32	.21	5.90	30
M4735	1	.91	.44	.15	6.01	35
M4736	1	2.25	.06	.25	8.21	22
M4737	1	2.27	1.48	.29	10.19	25
M4738	1	.78	.33	.39	4.54	44
M4739	1	.78	.43	.13	4.95	34
M4742	2	1.17	.48	.13	6.52	27
M4743	2	.92	.45	.17	6.12	30
M4744	2	1.02	.49	.13	5.72	35
M4745	2	.94	.45	.19	5.61	33
M4746	2	1.14	.64	.12	6.52	30
M4747	2	2.66	.24	.41	9.12	-
M4748	2	1.38	.09	.21	7.15	21
M4749	2	1.32	.73	.17	7.73	21
M4750	2	.87	.34	.12	4.65	38
M4751	2	.78	.25	.16	4.32	40
M4752	2	.63	.17	.19	3.99	39
M4755	3	1.17	.51	.15	6.45	30
M4756	3	1.12	.54	.14	6.16	32
M4757	3	.81	.31	.13	5.42	32
M4758	3	.94	.48	.12	5.83	35
M4759	3	1.23	.19	.10	7.29	20
M4760	3	.42	.32	.11	3.22	50
M4761	3	.47	.11	.31	3.92	39
M4762	3	1.04	.45	.11	5.79	30
M4765	4	1.15	.54	.12	6.67	31
M4766	4	.93	.30	.16	5.53	33
M4767	4	.93	.45	.15	5.61	30
M4768	4	.99	.53	.14	5.20	40
M4769	4	.78	.37	.13	4.40	47
M4770	4	1.01	.43	.15	5.94	34
M4771	4	.98	.49	.13	5.90	35
M4772	4	1.04	.58	.16	6.27	30

2. CHEMICAL ANALYSES

SAMPLES SH1 - 50% M4734/50% M4735
SH2 - 50% M4736/50% M4737
SH3 - 50% M4738/50% M4739
SH4 - 25% M4755/25% M4756/ 25% M4757/ 25% M4758
SH5 - 100% M4759
SH6 - 33.3% M4770/33.3% M4771/33.3% M4772

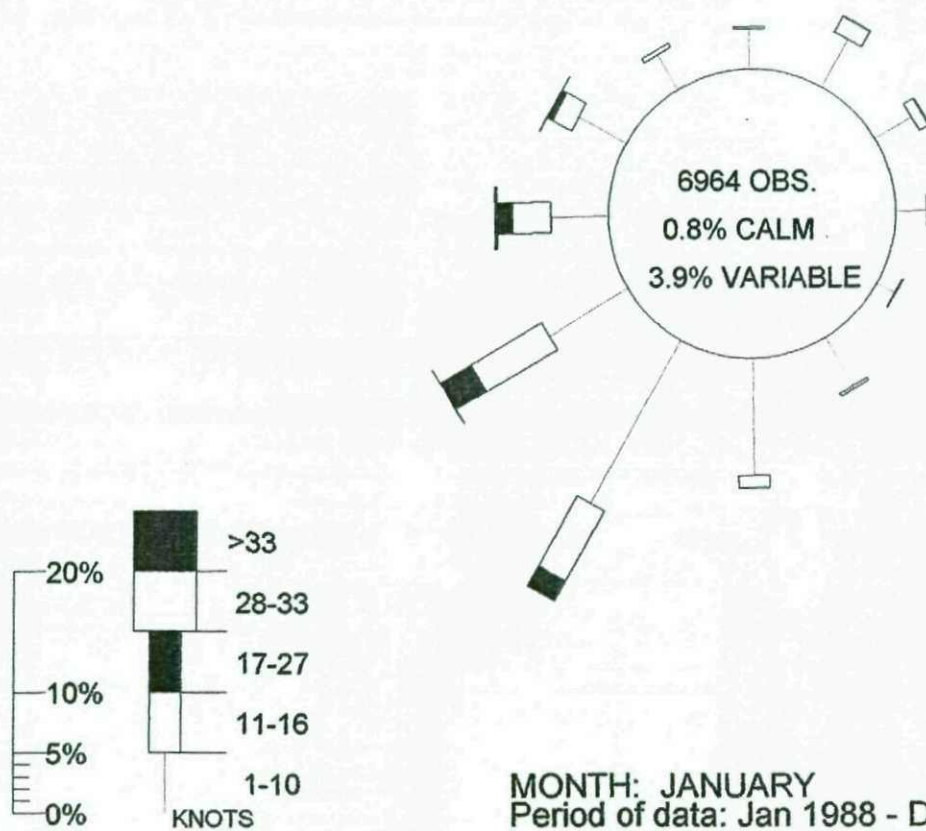
SAMPLE	SiO2 %	Al2O3 %	TiO2 %	Fe2O3 %	CaO %	MgO %	K2O %	Na2O %	LOI %
SH1	61.24	17.42	1.03	7.01	.46	1.86	3.24	.91	5.96
SH2	50.54	21.34	.75	9.65	.64	2.11	4.74	.33	9.20
SH3	65.83	15.31	.90	6.21	.42	1.60	2.88	1.07	4.75
SH4	60.88	17.40	1.02	7.32	.35	1.94	3.22	.97	5.97
SH5	52.64	24.14	.83	6.69	.19	2.23	5.01	.31	7.29
SH6	60.28	17.71	.98	7.38	.39	1.95	1.95	.98	6.04

3. UNFIRED PROPERTIES

SAMPLE	BH. No.	<2um %	2-20um %	>20um %	EXT. MOIST. %	PLASTICITY INDEX	DRY SHR. %	DRY MoR MPa
M4734	1	30	58	12	14.2	.75	2.64	3.2
M4735	1	27	54	19	13.7	.73	2.09	2.8
M4736	1	48	41	11	15.1	1.02	2.93	3.2
M4737	1	41	43	16	14.3	1.15	2.74	3.5
M4738	1	22	36	42	13.3	N/A	2.19	2.5
M4739	1	26	47	27	13.3	N/A	2.18	2.7
M4742	2	26	59	15	16.0	.70	3.02	2.7
M4743	2	27	60	13	15.4	.78	2.77	2.4
M4744	2	24	53	23	14.3	.76	2.22	2.5
M4745	2	23	56	21	11.6	.72	2.35	2.2
M4746	2	24	59	17	14.6	.84	2.45	2.3
M4747	2	NOT EXTRUDED						
M4748	2	52	40	8	15.9	1.09	3.45	3.4
M4749	2	40	50	10	14.7	1.00	2.91	3.2
M4750	2	22	37	41	13.2	.69	2.15	2.4
M4751	2	21	35	44	13.3	N/A	1.87	2.0
M4752	2	26	38	36	12.9	N/A	2.01	2.1
M4755	3	30	61	9	15.3	.71	2.98	2.9
M4756	3	26	56	18	14.7	.74	2.79	2.9
M4757	3	21	67	12	14.2	.80	2.62	2.9
M4758	3	30	57	13	13.9	.83	2.40	2.8
M4759	3	59	37	4	16.0	1.10	3.37	3.9
M4760	3	NOT EXTRUDED						
M4761	3	22	50	28	14.2	.62	2.16	3.2
M4762	3	31	58	11	13.7	.78	2.59	2.4
M4765	4	35	58	7	13.7	.79	2.28	3.5
M4766	4	33	58	9	13.3	.79	2.30	3.2
M4767	4	31	56	13	13.3	.79	2.25	3.0
M4768	4	19	52	29	13.5	N/A	2.26	2.5
M4769	4	20	35	45	13.6	N/A	2.06	2.6
M4770	4	33	55	12	13.8	.72	2.45	3.5
M4771	4	30	54	16	13.5	.75	2.34	3.2
M4772	4	36	33	11	13.1	.88	2.34	3.2

WIND ROSE FOR SHEFFIELD
N.G.R: 4339E 3873N

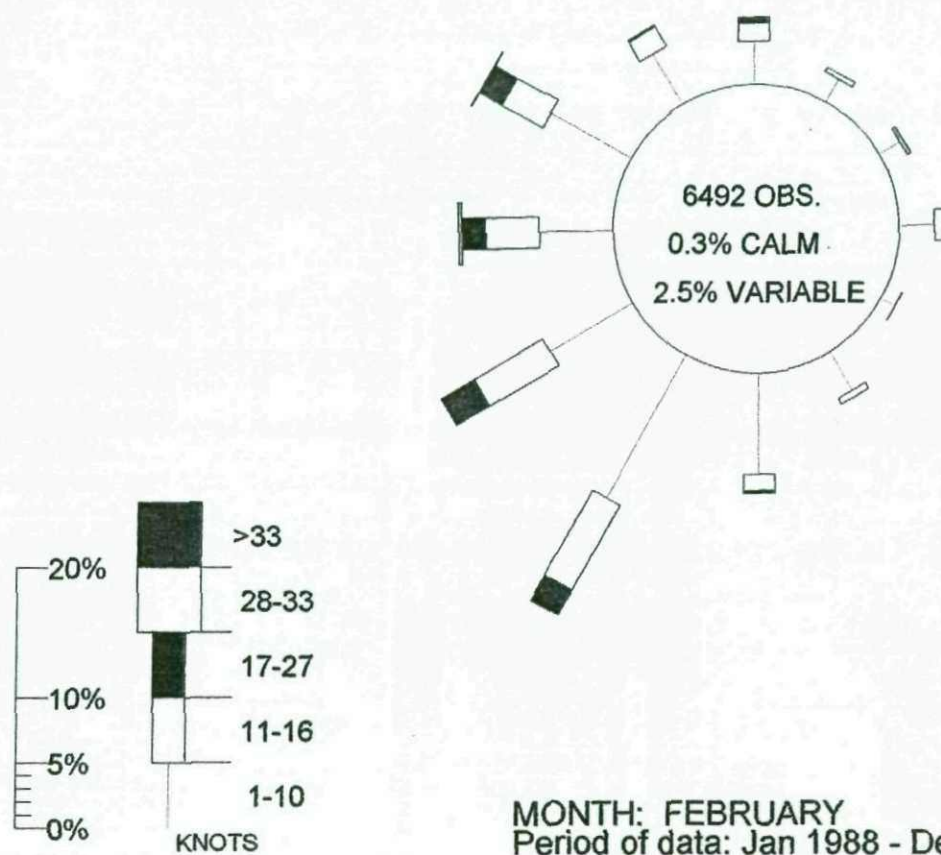
ALTITUDE: 131 metres a.m.s.l.



MONTH: JANUARY
Period of data: Jan 1988 - Dec 1997

WIND ROSE FOR SHEFFIELD
N.G.R: 4339E 3873N

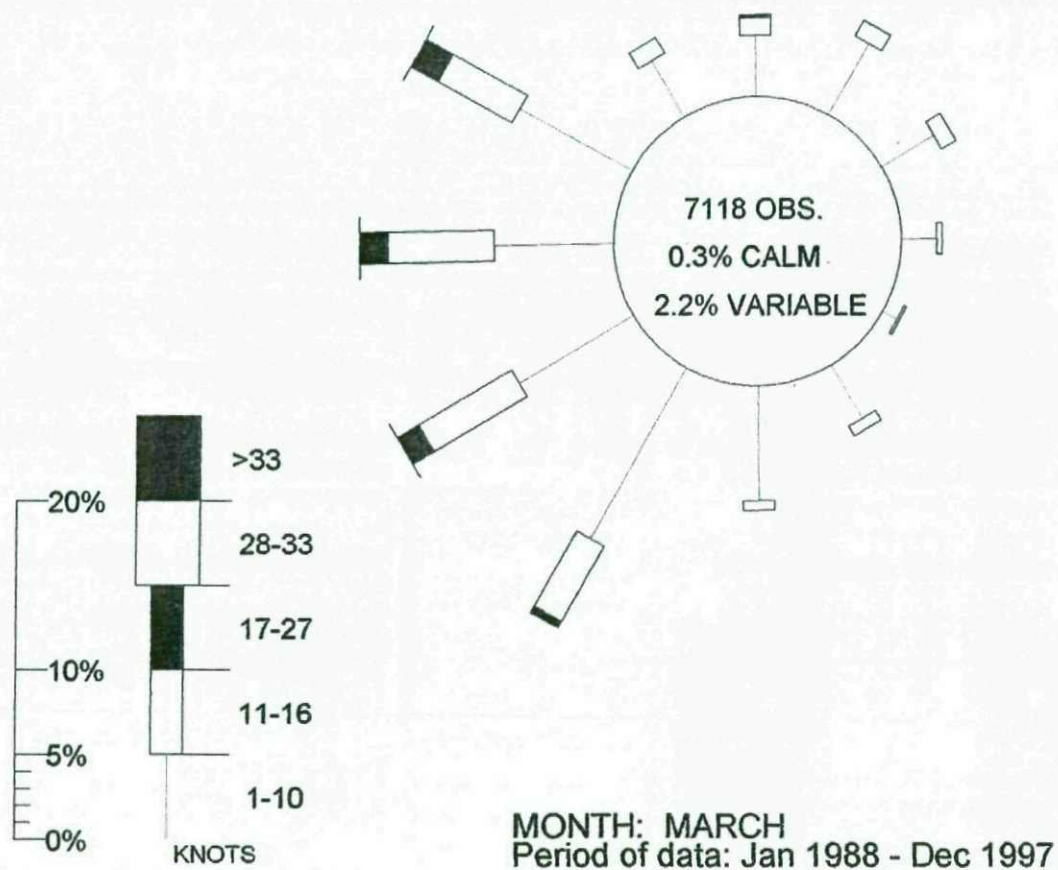
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MONTH: FEBRUARY
Period of data: Jan 1988 - Dec 1997

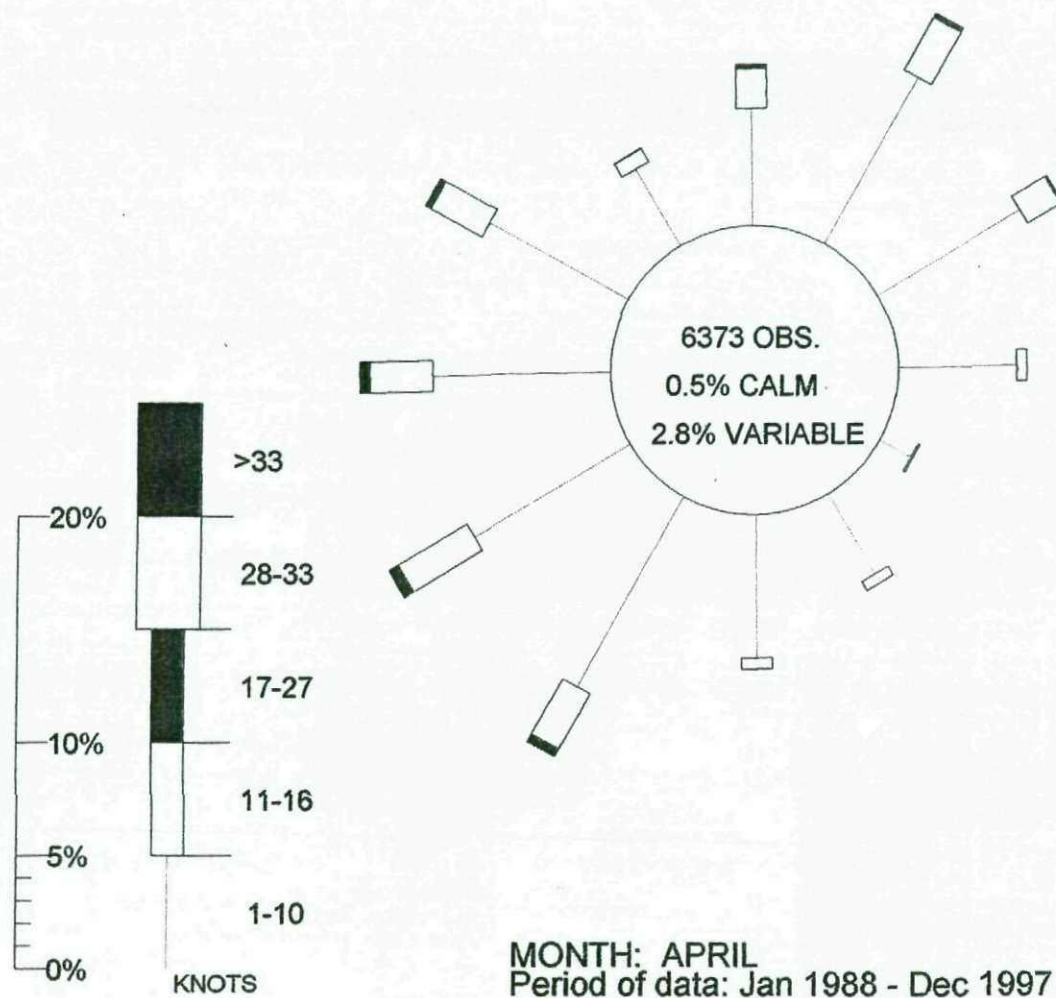
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ALTITUDE: 131 metres a.m.s.l.



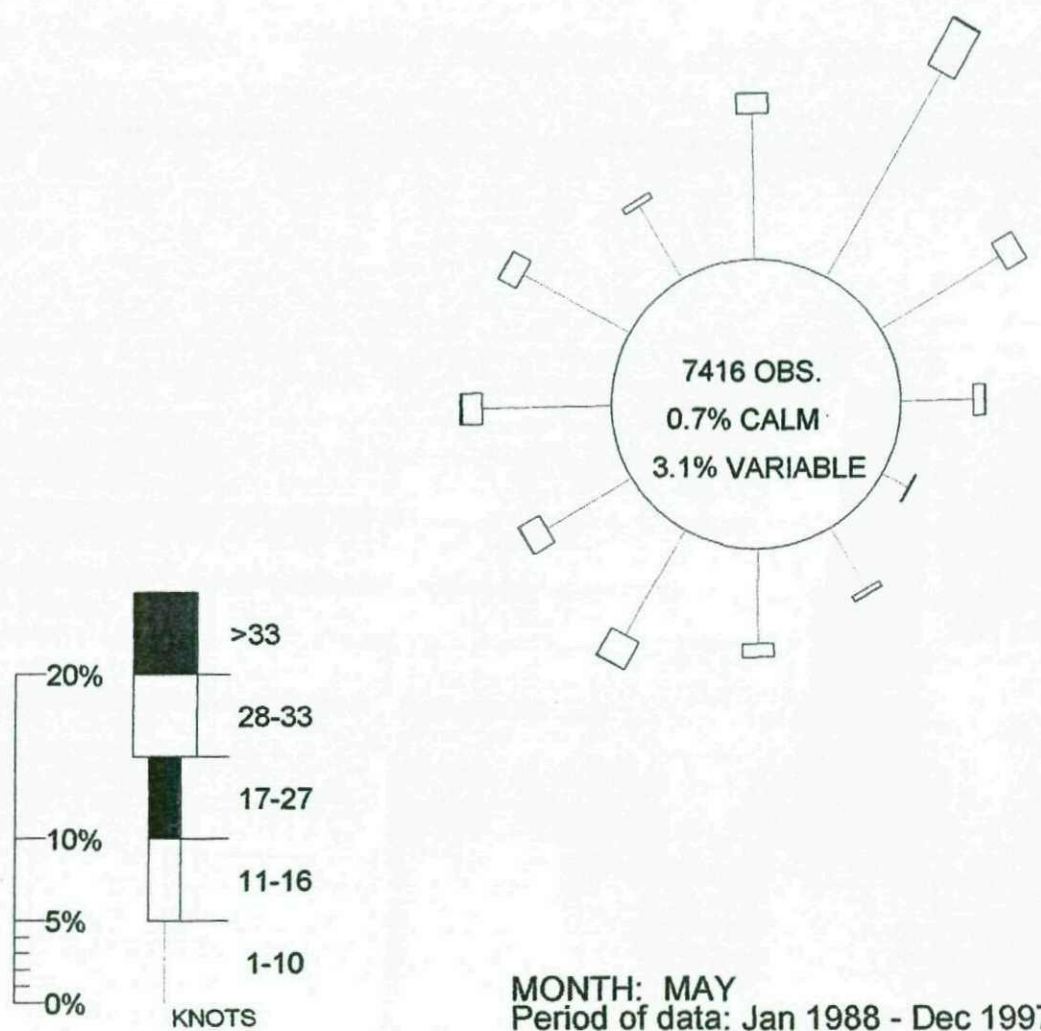
WIND ROSE FOR SHEFFIELD
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ALTITUDE: 131 metres a.m.s.l.



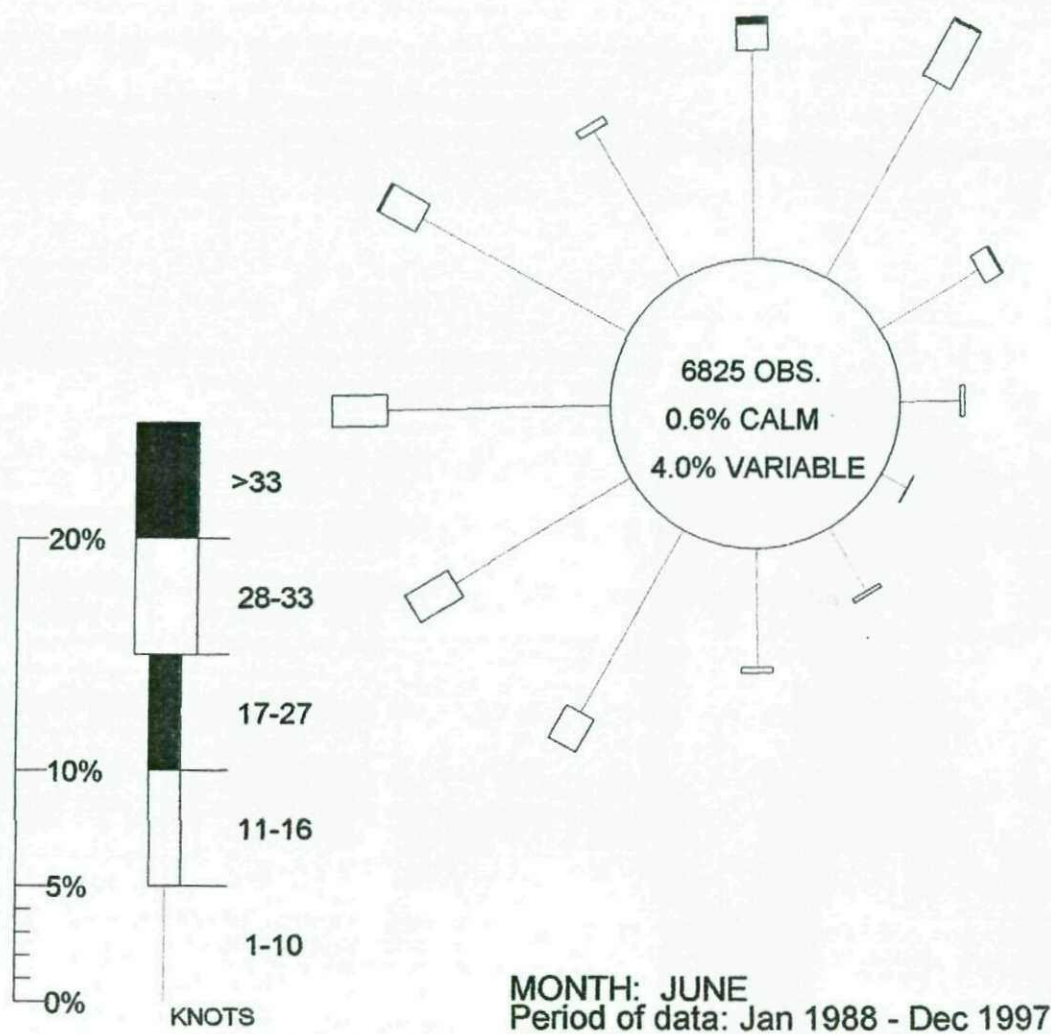
WIND ROSE FOR SHEFFIELD
N.G.R: 4339E 3873N

ALTITUDE: 131 metres a.m.s.l.



WIND ROSE FOR SHEFFIELD
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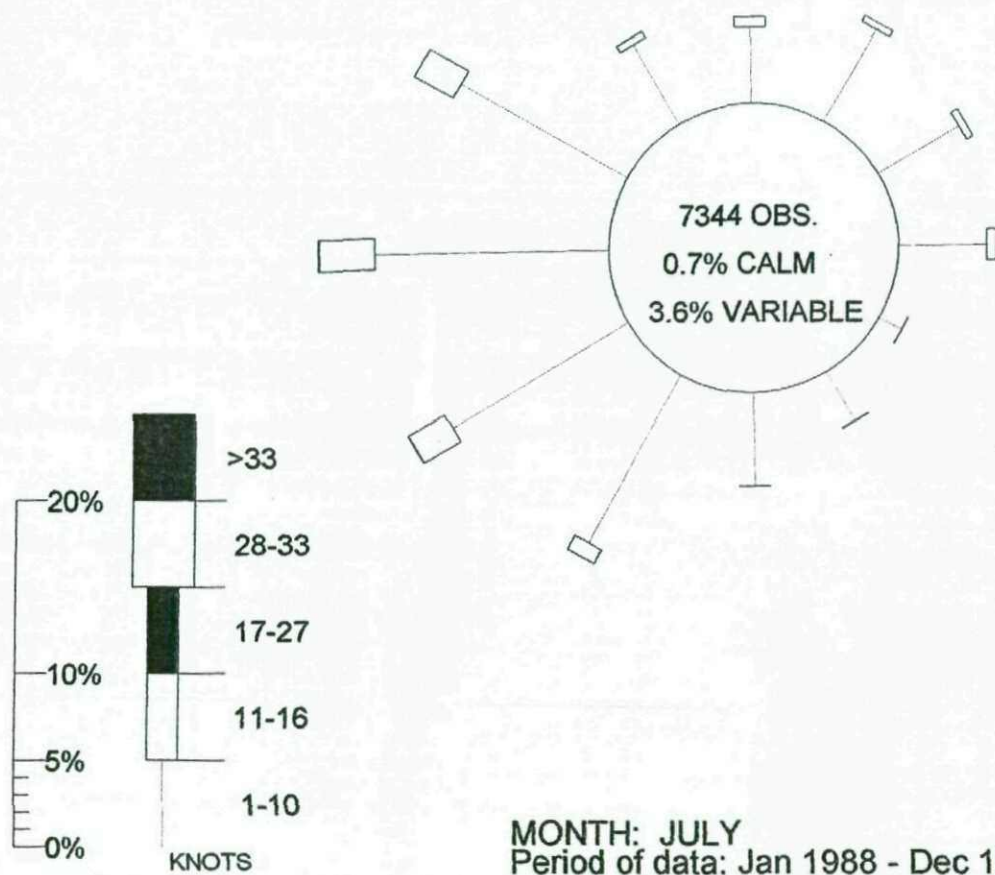
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WIND ROSE FOR SHEFFIELD

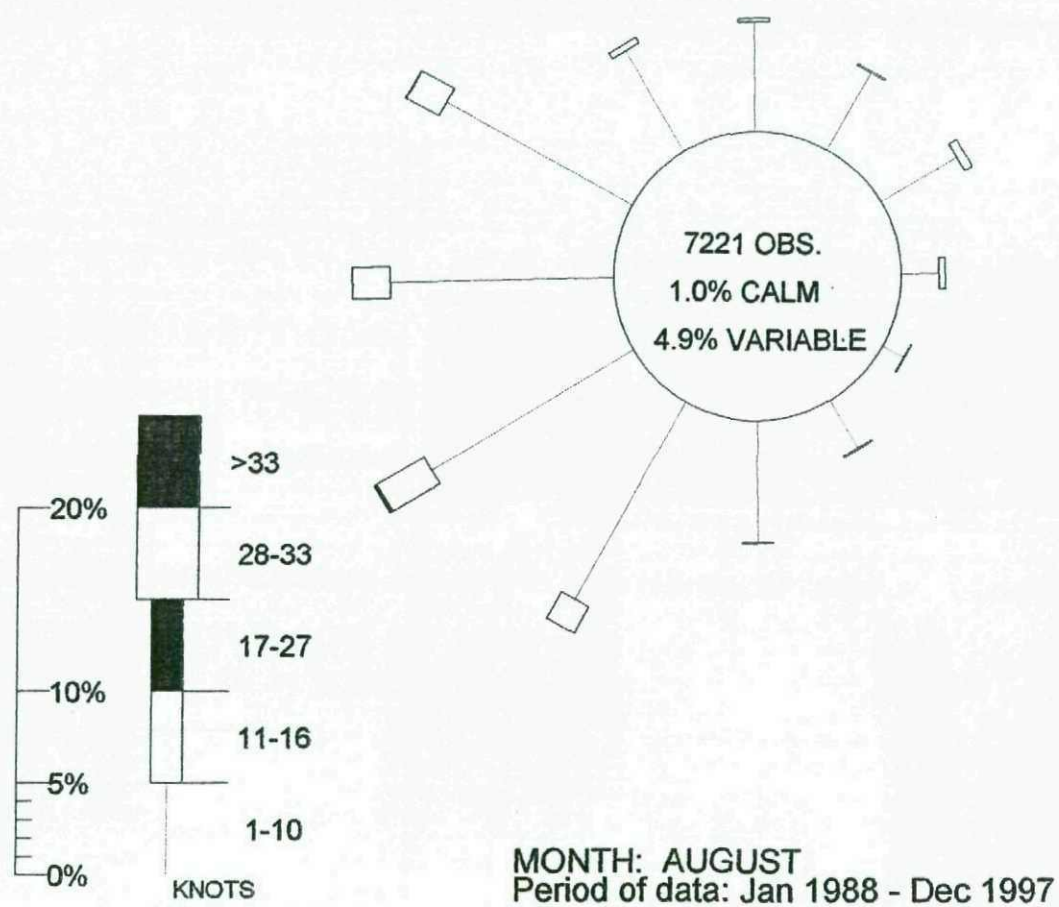
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ALTITUDE: 131 metres a.m.s.l.



WIND ROSE FOR SHEFFIELD
N.G.R: 4339E 3873N

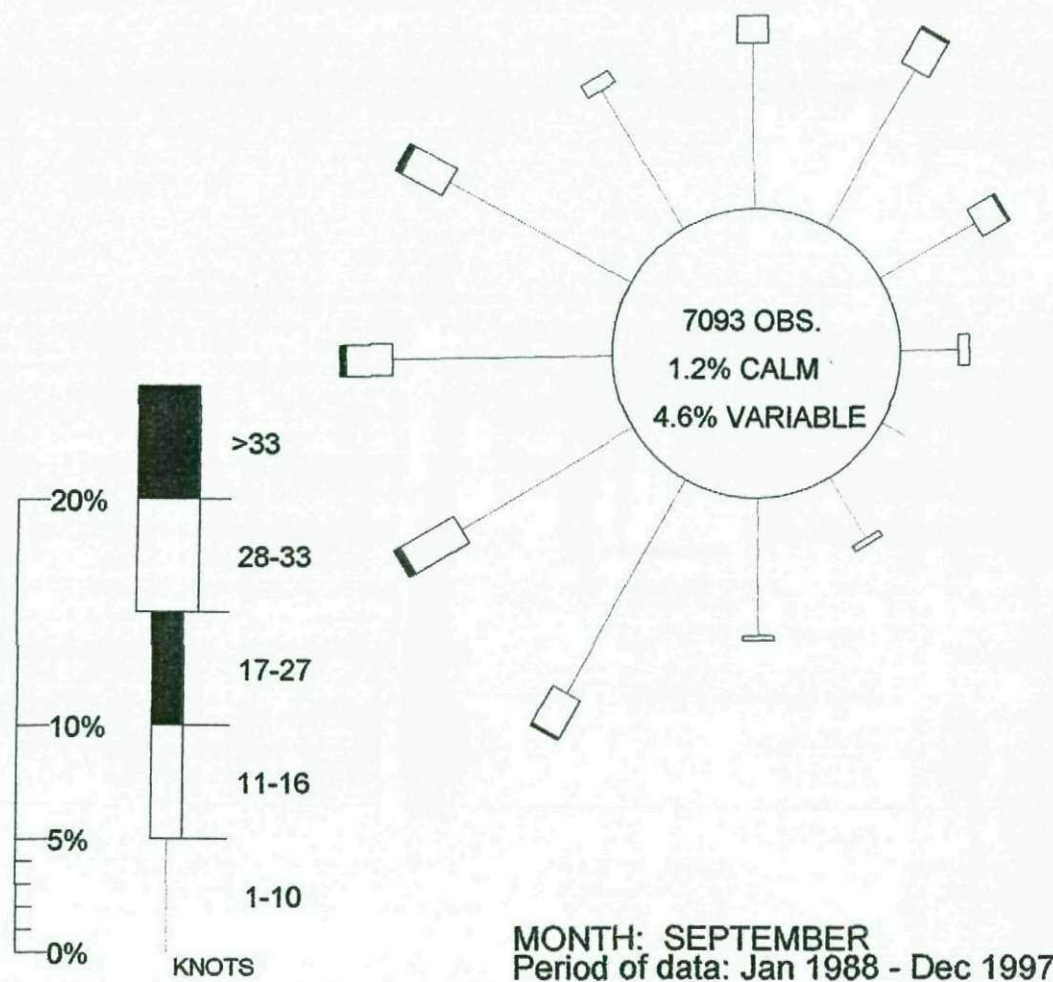
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WIND ROSE FOR SHEFFIELD

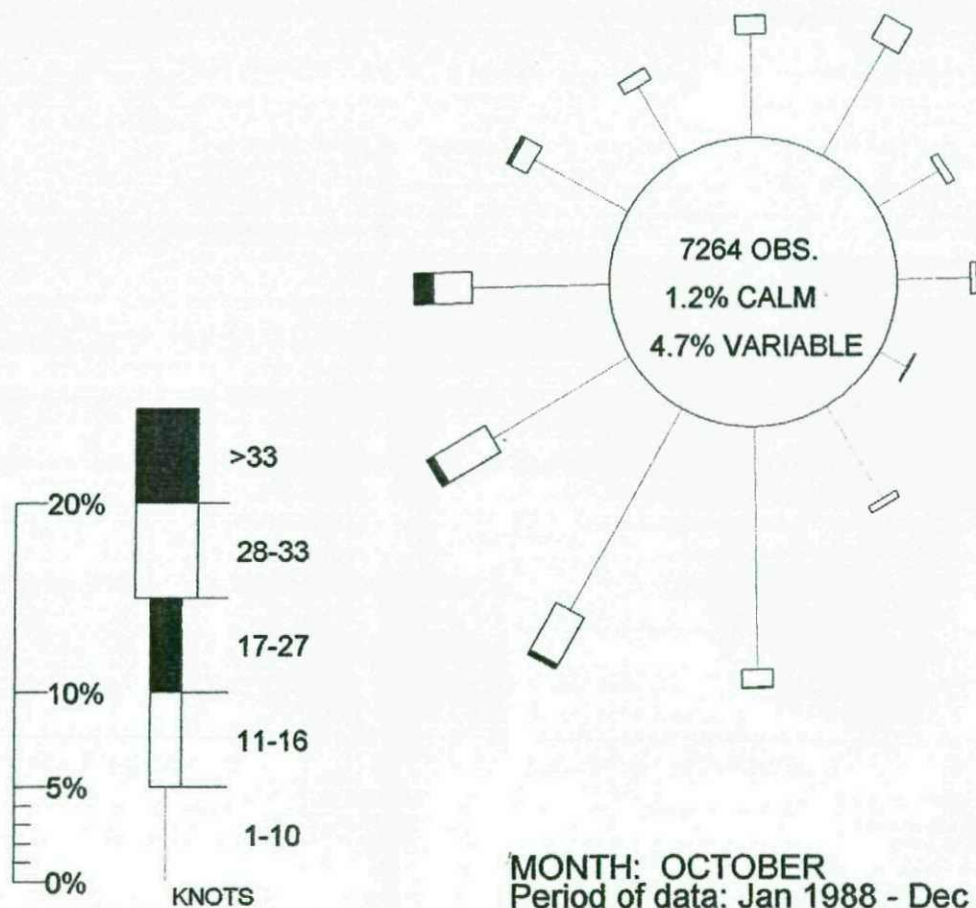
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ALTITUDE: 131 metres a.m.s.l.



WIND ROSE FOR SHEFFIELD
N.G.R: 4339E 3873N

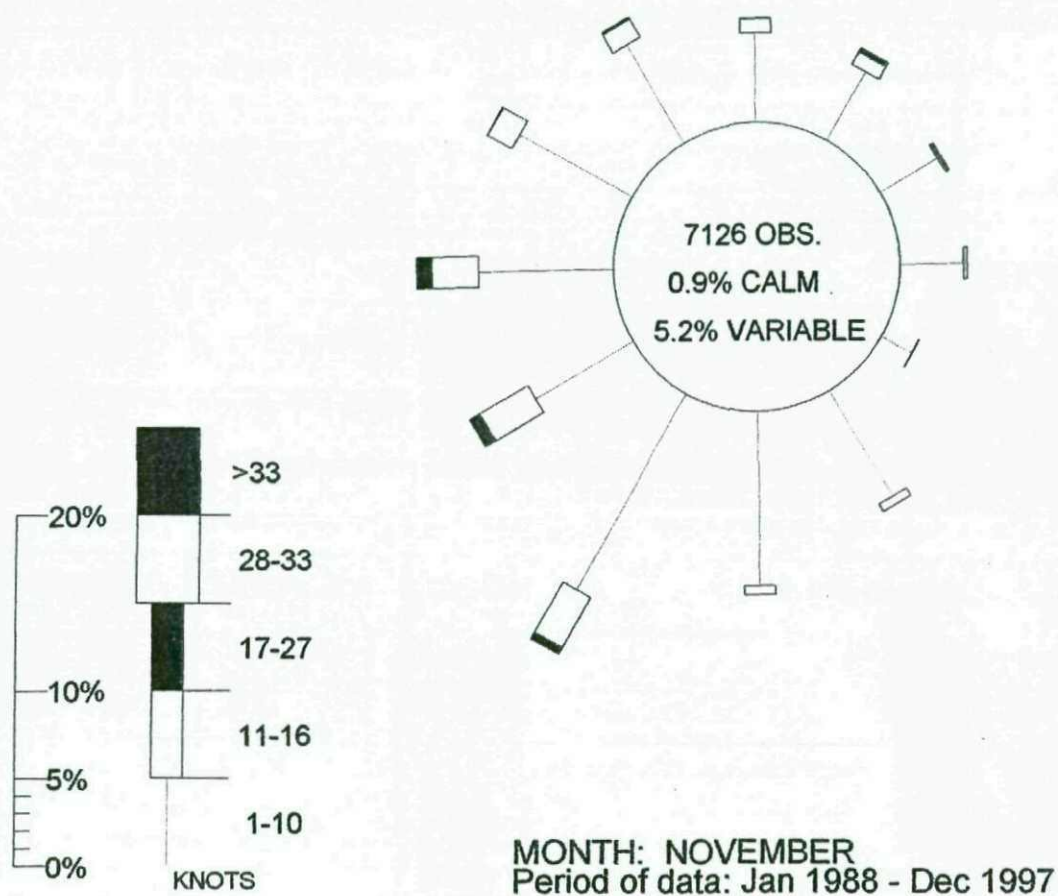
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MONTH: OCTOBER
Period of data: Jan 1988 - Dec 1997

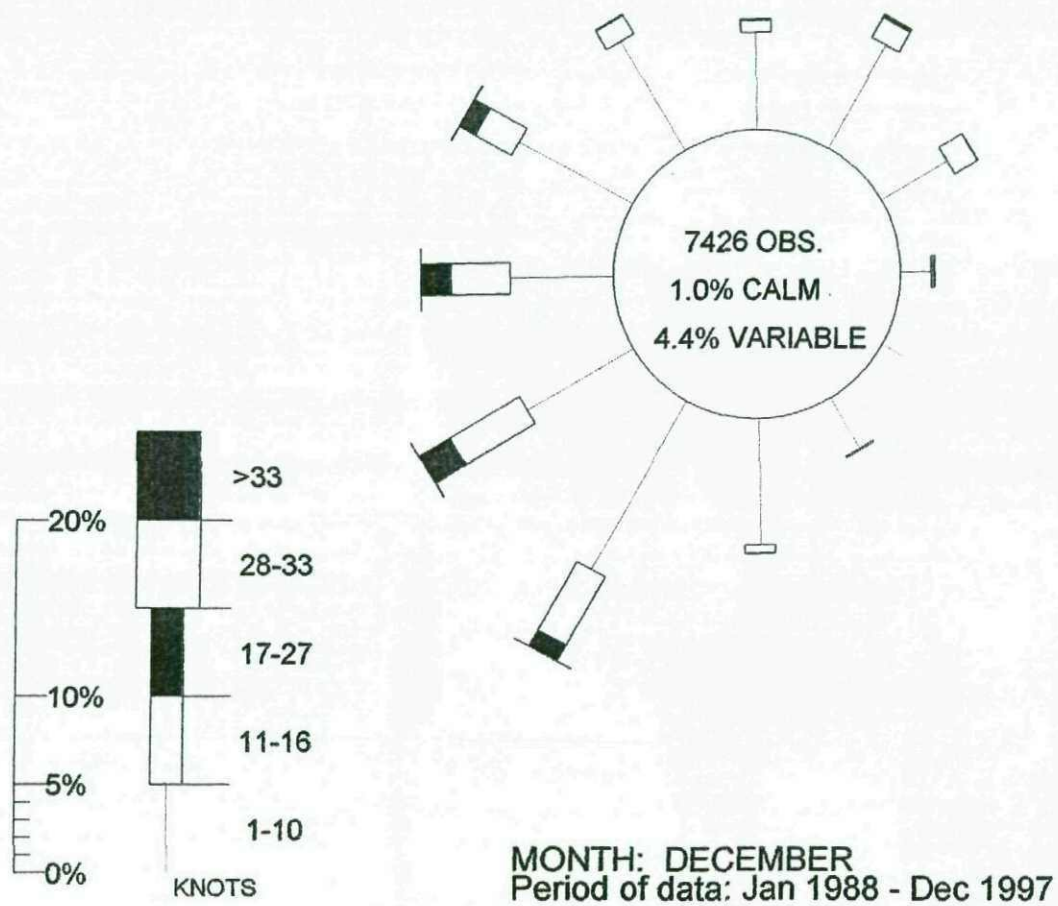
WIND ROSE FOR SHEFFIELD
N.G.R: 4339E 3873N

ALTITUDE: 131 metres a.m.s.l.



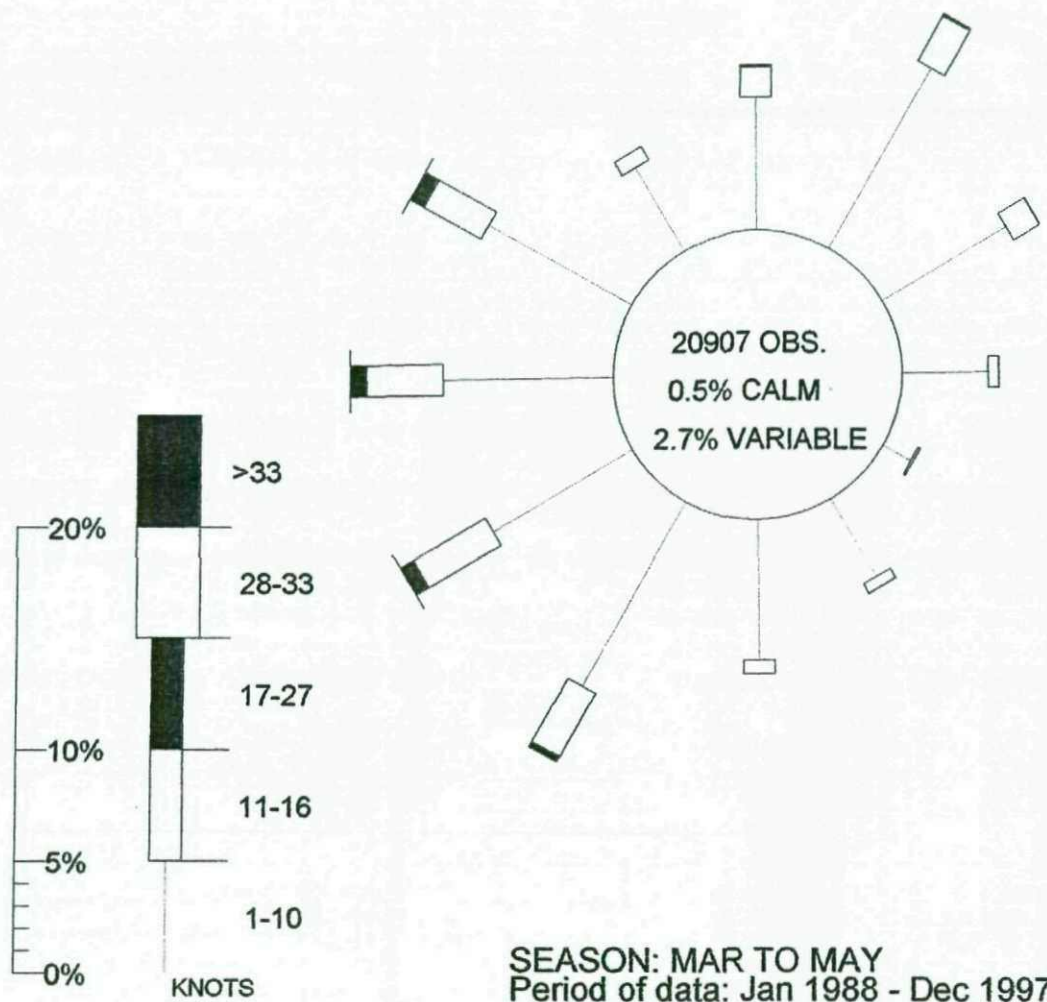
WIND ROSE FOR SHEFFIELD
N.G.R: 4339E 3873N

ALTITUDE: 131 metres a.m.s.l.



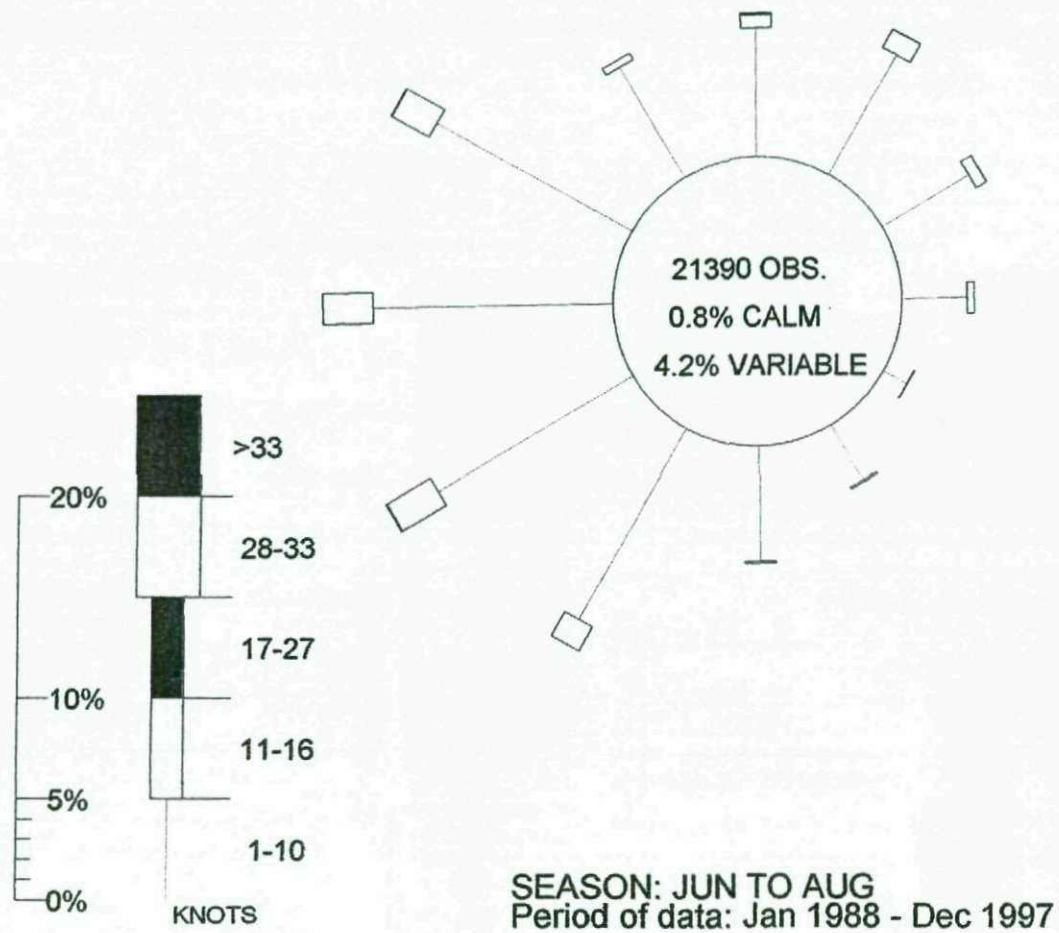
WIND ROSE FOR SHEFFIELD
N.G.R: 4339E 3873N

ALTITUDE: 131 metres a.m.s.l.



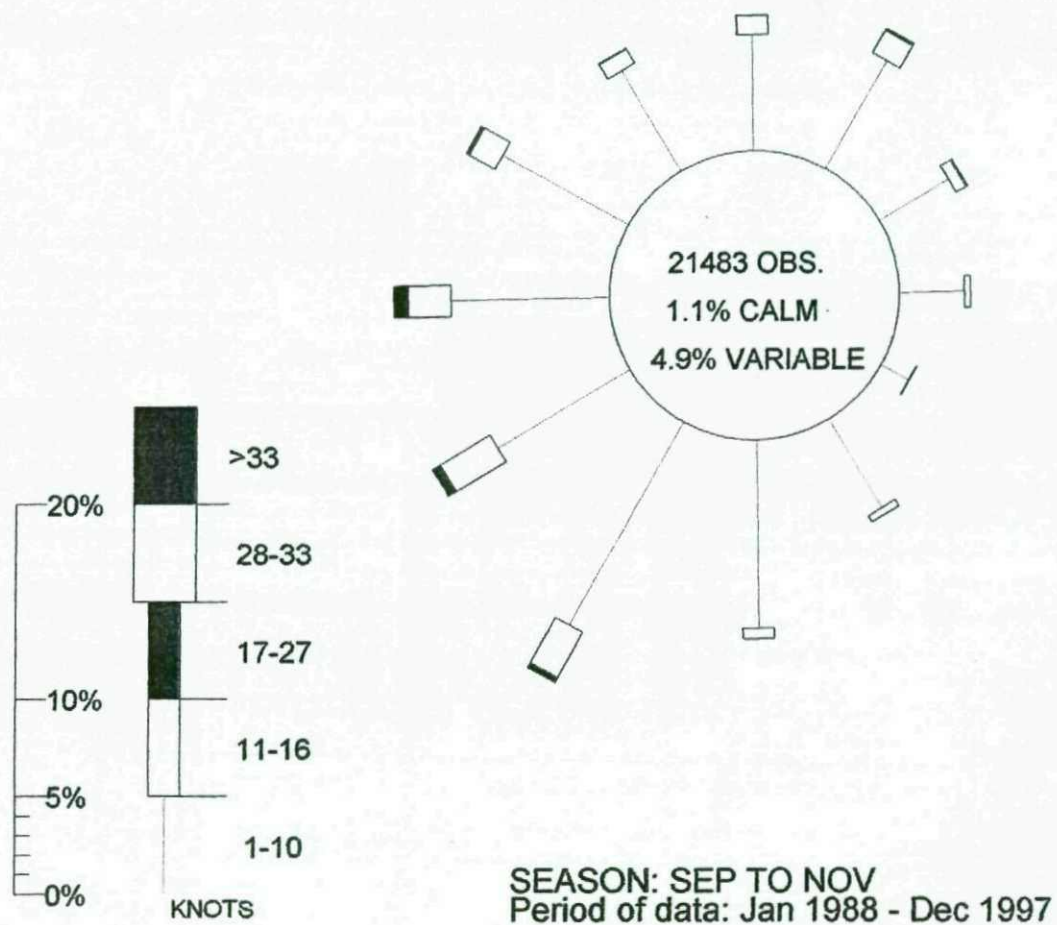
WIND ROSE FOR SHEFFIELD
N.G.R: 4339E 3873N

ALTITUDE: 131 metres a.m.s.l.



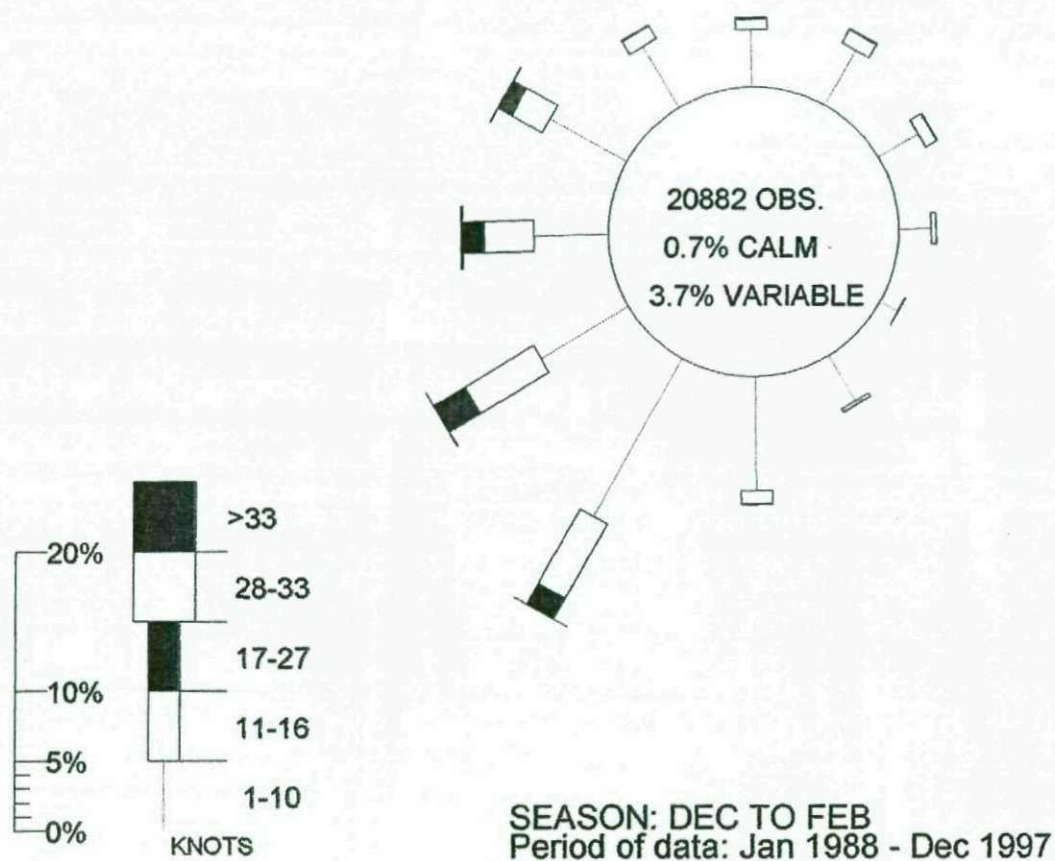
WIND ROSE FOR SHEFFIELD
N.G.R: 4339E 3873N

ALTITUDE: 131 metres a.m.s.l.



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N.G.R: 4339E 3873N

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N.G.R: 4339E 3873N

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