

UR1986_35

1986/35. Analysis of coal from the Fenhope colliery, near Avoca

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Abstract:

A 300 mm x 200 mm channel sample was collected from the Fenhope colliery approximately 150 m from the mine portal. Petrographic and proximate analyses were made on the seam plies by CCI, Newcastle in December 1985. The analyses, along with graphic and descriptive sections of the seam are given below.

The seam is 3.50 m thick with a number of mudstone and claystone bands. The coal is of Late Triassic age and similar in quality to other coals of similar age mined elsewhere in the State.

INTRODUCTION

Location: in main heading 150 m from portal.

AMG grid co-ordinates: EP805549.

Elevation: ~460 m a.s.l.

Roof: lithic sandstone.

Floor: mudstone.

The colliery, opened in 1980 and is owned and operated by Mr D. Fenton. An impressive wooden storage bin and wooden gantry have been built close to the mine portal.

COAL GEOLOGY

The seam at the Fenhope colliery is part of the Late Triassic lithic sandstone coal-bearing sequence at the top of the Upper Parmeener Super-Group. The areal extent of the seam is limited by faulting which has broken the lithic sandstone sequence into blocks. The Fenhope colliery is in the same area as the previously worked Stanhope (Excelsior), New Stanhope and Mt Christie collieries.

The seam at the Fenhope colliery is banded, and on weathering the coal has a bluish tinge which has been found to be filmy deposits of the rare clay mineral halloysite. This same bluish tinge is found on coal from the Blue Seam, Mt Nicholas and this too is due to coatings of halloysite. A graphic log of the seam is given in Figure 1 and a written seam description in Table 1.

Proximate analyses of the coal plies are given in Table 2. The ash content of the Fenhope seam appears to decrease from the base to the top of the seam throughout the seam plies. Additional information such as ultimate analyses and ash fusion temperatures are given in Table 3.

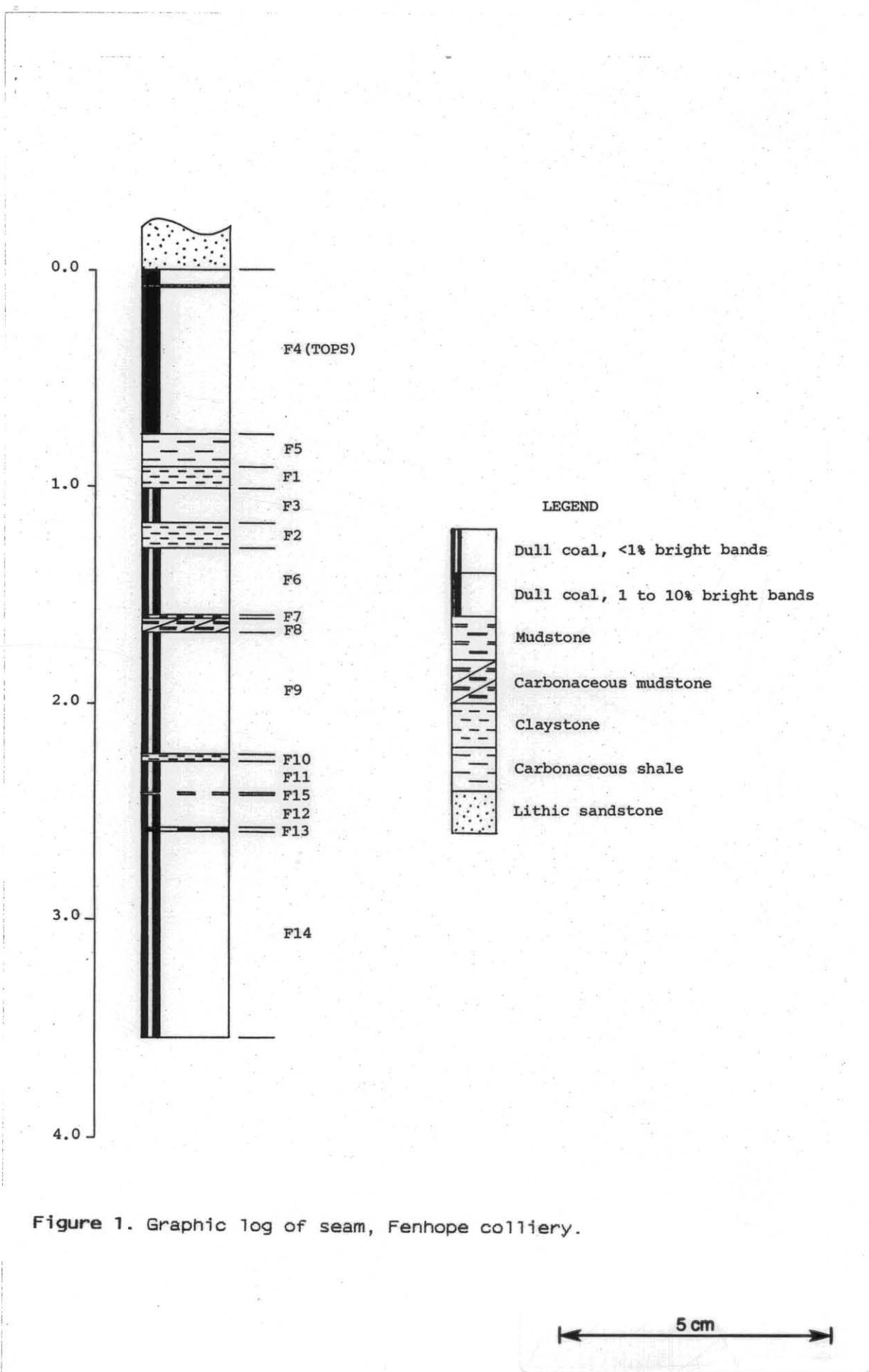


Figure 1. Graphic log of seam, Fenhope colliery.

PETROGRAPHIC ANALYSIS

The petrographic composition of the plies of the Fenhope seam are shown in Table 4 and Figure 2. All plies are rich in inertinite, as are all other Tasmanian Late Triassic coals.

The dominant inertinite maceral is semifusinite. The exinite is mostly resinite, with spononite being the second most common exinite maceral and cutinite comprising only a small fraction of this group. This is curious because in all the other Late Triassic coals in Tasmania the dominant exinite maceral is cutinite. The inertinite and exinite compositions are plotted in Figures 3 and 4.

ENVIRONMENT OF COAL FORMATION

Following the method outlined by Diessel (1986), Gelification and Tissue Preservation Indices were derived from maceral analyses of the coal plies, (table 5). The Gelification index (GI) is defined as:

$$\frac{\text{vitrinite} + \text{macrinite}}{\text{fusinite} + \text{semifusinite} + \text{inertodetrinite}}$$

This gives a measure of how wet the conditions of peat formation were.

The Tissue Preservation index (TPI) is defined as:

$$\frac{\text{telinite} + \text{telocollinite} + \text{fusinite} + \text{semifusinite}}{\text{desmocollinite} + \text{macrinite} + \text{inertodetrinite}}$$

Table 1
FENHOPE SEAM DESCRIPTION

Sample No.	Description	Thickness (m)	Cumulative thickness (m)
	Roof: medium-grained lithic sandstone		
F4	Dull coal, 10% bright bands ;	0.07	0.07
	MLSS, sand stringer from roof } (TOPS)	0.01	0.08
	Dull coal, 10% bright bands ;	0.68	0.76
F5	Carbonaceous shale	0.15	0.91
F1	Claystone, white, ash band	0.10	1.01
F3	Dull coal	0.16	1.17
F2	Claystone, white, ash band	0.12	1.29
F6	Dull coal (FOOT SECTION)	0.30	1.59
F7	Claystone brown	0.02	1.61
F8	Carbonaceous mudstone	0.06	1.67
F9	Dull coal (TWO FOOT SECTION)	0.56	2.23
F10	Claystone, white	0.03	2.26
F11	Dull coal (TOP BAND COAL)	0.15	2.41
F15	Mudstone, brown	0.01	2.42
F12	Dull coal (BOTTOM BAND COAL)	0.15	2.57
F13	Mudstone, brown	0.02	2.59
F14	Dull coal (BOTTOM COAL)	0.95	3.54

Table 2
PROXIMATE ANALYSIS OF THE FENHOPE SEAM PLIES

Sample	Ply thickness (m)	Description	Relative density	Air-dried moisture (%)	Proximate analysis (dry basis)			Specific energy (mJ/kg)		
					Ash (%)	Volatile carbonaceous matter (%)	Fixed carbon (%)	Total sulphur (%)	Dry basis	Dry ash-free
F4	0.76	Coal (TOP)	1.36	2.5	12.6	31.7	53.2	0.65	29.62	34.46
F5	0.15	Shale	1.99		63.1					
F1	0.10	Claystone	2.41		83.8					
F3	0.16	Coal	1.61	2.3	34.3	20.9	42.5	0.39	21.60	34.06
F2	0.12	Claystone	2.34		84.4					
F6	0.30	Coal (FOOT)	1.45	2.3	18.0	28.2	51.5	0.47	21.14	34.06
F7	0.02	Claystone	2.19		74.9					
F8	0.06	Mudstone	1.75		45.6					
F9	0.56	Coal (TWO FOOT)	1.45	2.7	17.9	27.9	51.5	0.46	26.84	33.80
F10	0.03	Claystone	2.12		72.0					
F11	0.15	Coal (TOP BAND)	1.46	3.2	19.5	26.6	50.7	0.49	26.18	33.86
F15	0.01	Mudstone	2.45		83.1					
F12	0.15	Coal (BOTTOM BAND)	1.48	3.1	20.2	25.5	51.2	0.44	26.30	34.28
F13	0.02	Mudstone	2.47		83.7					
F14	0.95	Coal (BOTTOM)	1.49	2.4	21.3	26.9	49.4	0.50	26.04	34.12
F1-F15	(raw)			3.1	29.4	24.7	42.8	0.40	22.60	33.48
F1-F15	(F 1.7)	Yield 71.1%		3.8	15.2	28.6	52.4	0.39	27.38	33.80

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This index compares wood derived macerals with detrital macerals and so gives an indication of the proportion of material in the coal which is derived from wood.

Together these two indices can be used to define coal facies, and give an indication of the environment of coal formation. The coal facies are plotted in Figure 5. The indices show that all plies of the Fenhope seam have a high proportion (>50%) of macerals which have been derived from woody material. The environment of peat formation was relatively dry as shown by the low GI. These conditions are similar to those in which the Duncan, Merrywood and Blue seams formed, which was a dry terrestrial forest moor in which the peat was derived largely from woody tissue which oxidized to form inertinite at the expense of telinite and telocollinite. Frequent flooding of the moor with mud-laden water produced numerous dirt bands throughout the seam.

The Fenhope seam has less wood derived macerals than the Duncan seam; containing about the same wood content as the Blue seam. The most characteristic feature of the seam is the composition of the exinite fraction, which is mostly sporinite and resinite instead of the more usual cutinite.

Table 3
ULTIMATE ANALYSIS AND ASH FUSION TEMPERATURES, FENHOPE SEAM

<i>ULTIMATE ANALYSES</i>	<i>F1-F15 (raw)</i> <i>3.54 m</i>	<i>F1-F15 (F 1.70)</i> <i>Yield 71.1%</i>
<i>Dry basis</i>		
Carbon	54.78	67.22
Hydrogen	3.56	4.17
Nitrogen	1.03	1.23
Carbon dioxide	0.53	0.27
<i>Dry-ash free basis</i>		
Volatile matter	36.6	35.3
Carbon	81.16	82.99
Hydrogen	5.27	5.15
Nitrogen	1.53	1.52
<i>ASH FUSION TEMPERATURES</i>		
Reducing atmosphere	(°C)	(°C)
Deformation	1200	1310
Spherical	1490	1470
Hemisphere	>1500	1500
Flow	>1500	>1500

Table 4
MACERAL COMPOSITION OF THE FENHOPE SEAM PLIES

	F4	F3	F6	F9	F11	F12	F14	Whole seam (raw)	Whole seam (F 1.70)
VITRINITE	(45)	(29)	(31)	(16)	(33)	(19)	(26)	(27)	(30)
Vitrinite A	24.8	8.4	18.2	6.8	12.2	6.8	8.4	10.0	14.0
Vitrinite B	20.6	20.4	12.6	9.0	20.6	12.6	17.4	16.6	16.3
EXINITE	(6)	(4)	(4)	(7)	(4)	(5)	(6)	(7)	(8)
Sporinite	2.8	1.8	1.6	2.2	2.2	1.0	1.2	1.6	3.0
Cutinite	1.8	0.8	1.4	4.0	1.4	3.6	4.4	1.3	1.6
Resinite	1.4	1.0	1.0	1.0	0.8	0.4	0.2	4.0	4.0
INERTINITE	(44)	(49)	(57)	(67)	(55)	(67)	(53)	(61)	(59)
Micrinite	2.0	3.2	1.8	3.2	2.6	2.0	1.8	2.0	2.3
Macrinite	4.0	6.4	3.4	6.8	2.6	3.2	3.0	4.6	6.6
Semifusinite	23.8	28.0	34.2	35.4	37.8	46.0	32.0	37.6	37.3
Fusinite	2.8	2.0	3.6	3.4	3.0	2.6	3.8	2.3	1.6
Inertodetrinite	11.6	9.6	13.6	18.4	8.4	12.8	12.8	14.3	11.6
MINERALS	5.0	18.4	8.6	9.8	8.4	9.0	15.0	5.7	1.7

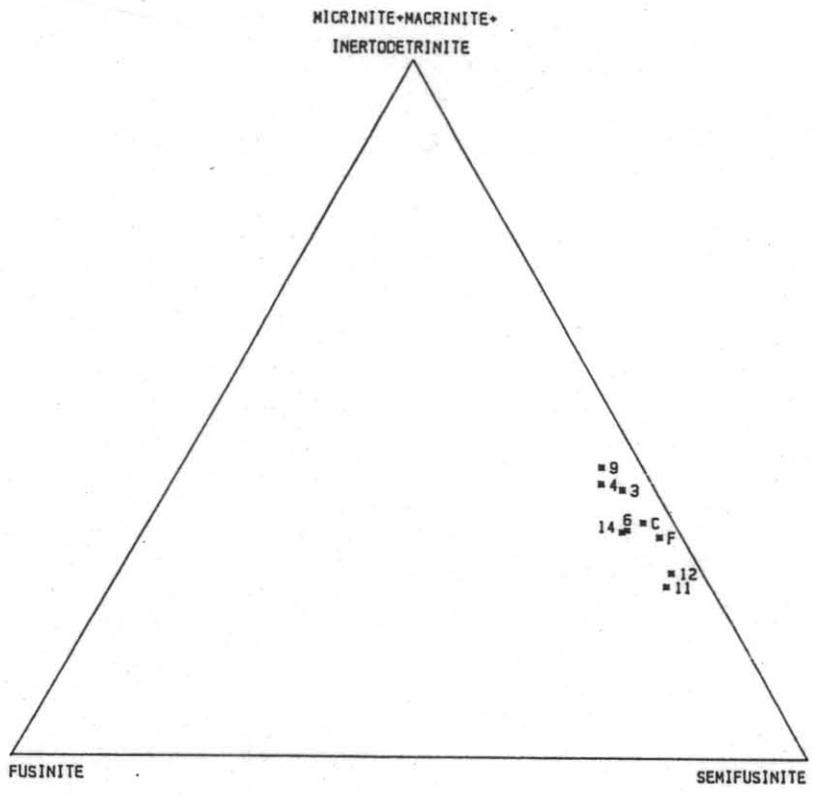


Figure 2. Petrographic composition of the Fenhope seam plies.

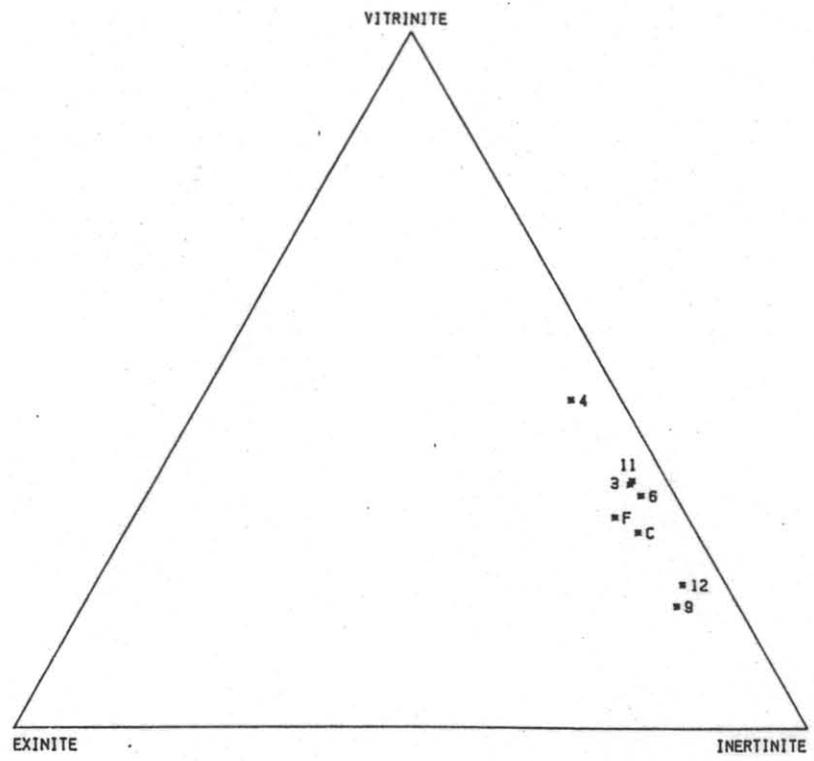
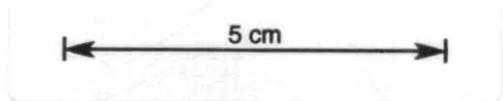


Figure 3. Inertinite composition of the Fenhope seam plies (C = seam composite; F = F 1.70)



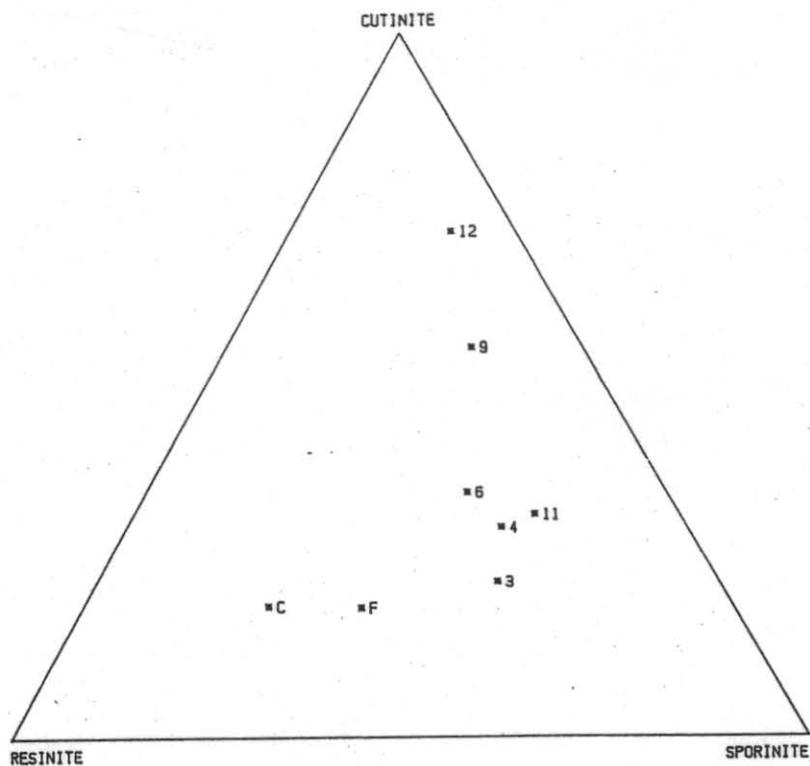


Figure 4. Exinite composition of the Fenhope seam plies (C = seam composite; F = F 1.70)

The seam was formed in a dry forest more habitat which was frequently flooded and in which the peat dried out from time to time. The habitat was none the less wetter than that in which the Duncan seam formed. Conditions of peat deposition of the Fenhope seam closely resemble those in which the Blue seam formed.

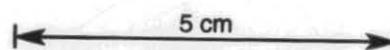
Table 5
GELIFICATION AND TISSUE PRESERVATION INDICES, FENHOPE SEAM

Ply	Gelification Index	Tissue Preservation Index
F4	1.3	1.4
F3	0.9	1.1
F6	0.7	1.9
F9	0.4	1.3
F11	0.7	1.7
F12	0.4	1.9
F14	0.6	1.3
Whole seam (raw)	0.6	1.4

REFERENCES

DIESSEL, C. F. K. 1986. On the relationships between coal facies and depositional environments. *Proc. 20th Symp. Study Sydney Basin.* University of Newcastle.

[30 June 1986]



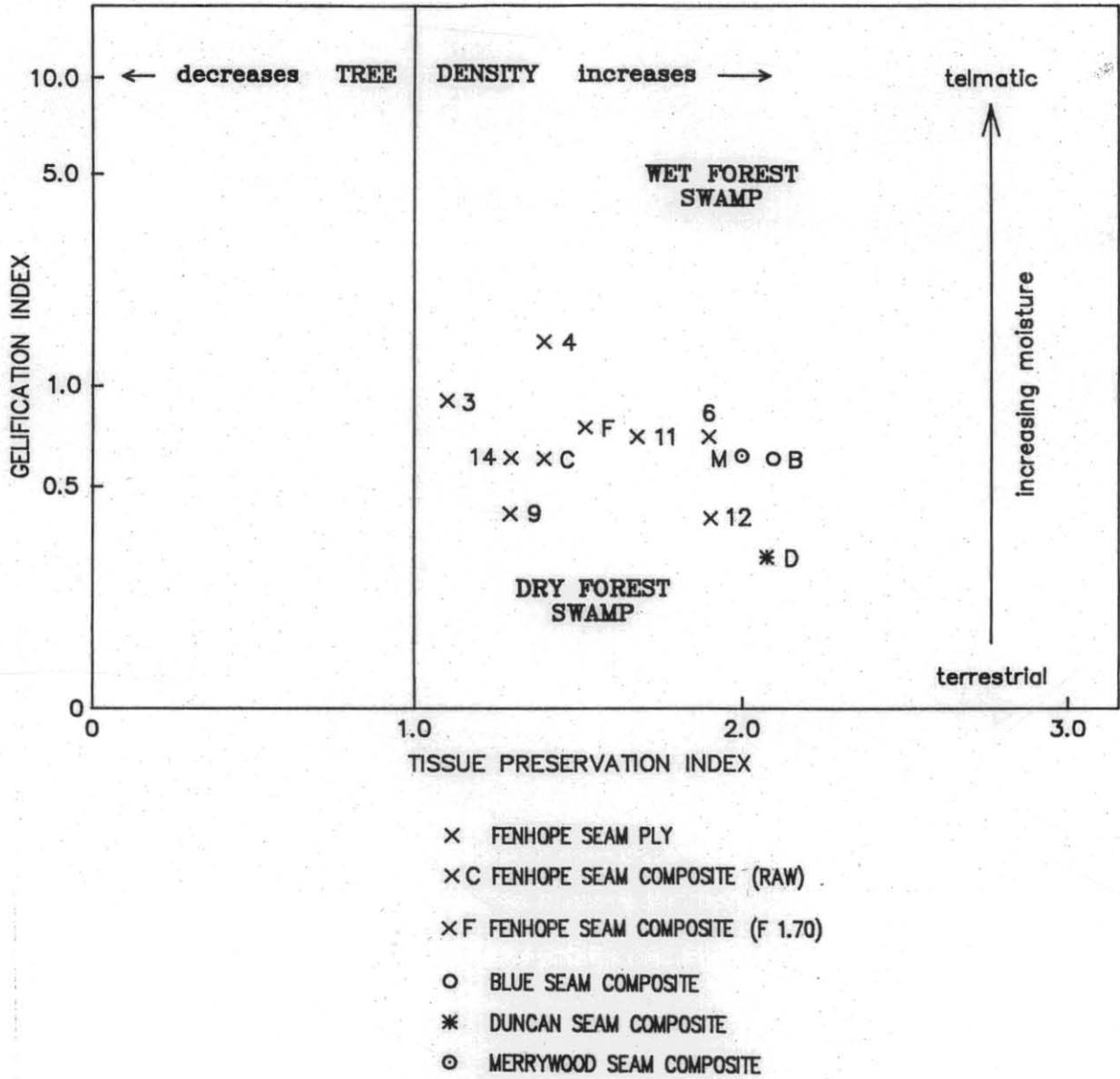


Figure 5. Coal facies, Fenhope seam.

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