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# A stratigraphical framework for the Upper Langsettian and Duckmantian of the East Pennine coalfields

Sustainable Energy and Geophysical Surveys Programme

Internal Report IR/05/070



BRITISH GEOLOGICAL SURVEY

INTERNAL REPORT IR/05/070

# A stratigraphical framework for the Upper Langsettian and Duckmantian of the East Pennine coalfields

T. Huw Sheppard

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# Foreword

This report is the published product of a study by the British Geological Survey (BGS) of the stratigraphy of the upper Langsettian and Duckmantian of the East Pennine Coalfields (Belvoir, Nottinghamshire, and south Yorkshire) with the aim of a) correlating coal seams and achieving a unified nomenclature in the East Midlands, and b) understanding the stratigraphical occurrence and distribution of major named sandbodies. The area of study is covered by BGS 1:50 000 scale maps of Melton Mowbray (142), Nottingham (126), Chesterfield (112), Ollerton (113), Sheffield (100), Barnsley (87) and Wakefield (78). Correlations were undertaken by T.H. Sheppard in 2001-2005, and data sets used include boreholes, BGS Memoirs, and National Coal Board correlation schemes.

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# Summary

This report describes the stratigraphy of named coal seams and sandbodies in that part of the Coal Measures Group which forms the principal productive measures of the East Midlands coalfields (Upper Langsettian and Duckmantian). Coal seams are combined into 'groups', which describe the general association of a number of coal seams rather than formal stratigraphical units. For each seam, preferred nomenclature and known alternatives are presented together with descriptions of the correlations. Sandbodies are described in terms of their position with respect to the established coal seam stratigraphy. A diagrammatic correlation panel, which summarizes the relationships described, is appended.

# 1 Introduction

Successful exploration of the Westphalian Coal Measures Group (Powell *et. al.*, 2000) in the eastern Pennines is dependent upon accurate chronostratigraphic correlation. The complex sedimentary and tectono-eustatic architecture of the Coal Measures Group, together with the paucity of good floral or faunal biostratigraphic information in a broadly non-marine deposystem, means that accurate correlation is persistently difficult. Present correlation between coalfields is dependent upon the recognition of fossiliferous mudrocks deposited during brief marine incursions ('marine bands' or the 'faunal-condensate horizons' of Flint *et. al.* (1995)).

Higher-resolution chronostratigraphy, at the scale of individual cyclothem and coal seams, has been hampered by the proliferation of local nomenclature throughout the coalfields. Mutually-incompatible nomenclatures persist at regional, coalfield and even local colliery level. Thus, not only are multiple names used for the same seam, but, due to past miscorrelations, multiple seams may possess the same name.

Nevertheless, the coal seams of the Westphalian are by far the best chronostratigraphic horizons, as they are numerous and widely distributed, whereas marine bands are restricted in both dimensions. This summary presents the most accurate seam correlations available in the area, with data drawn from unpublished NCB chemostratigraphic seam correlations, borehole records, and BGS coalfield memoirs.

## 1.1 SEAM CORRELATIONS

Seam correlations are presented from the mid-Langsettian (Westphalian A) Kilburn Coal, which represents the first significant coal development following prolonged sand deposition of the Wingfield Flags in the Lower Langsettian, to the Swinton Potteries Coals beneath the Aegiranum Marine Band, which marks the base of the Bolsovian (Westphalian C). Above and below this interval, seams are relatively thin and uneconomic; the selected interval thus represents the major exploration target of the Westphalian in the Melton, Nottinghamshire and Yorkshire coalfields.

### 1.1.1 Constraints on the correlations

Correlations are made on the scale of an individual seam, rather than on the meso- or micro-scale of individual leaves or sub-components of a seam. Thus, when the Tupton Roof Coal of Melton is correlated with the Cockleshell Coal of Nottinghamshire, it is because they both broadly represent the upper coals of the composite Tupton seam. Whether they correlate in their entirety is uncertain, as not all leaves of the Nottinghamshire Cockleshell may split from the Tupton as the Tupton Roof coal in Melton, for example. However, internal seam stratigraphic correlation is outside the scope of this study. Further, no seam correlations have been made with other coalfields (e.g. Warwickshire) which are not contiguous with the outcrop/subcrop of the East Midlands.

## 2 Seam Groups

Seams are described according to the Nottinghamshire nomenclature (see e.g. Charsley *et al.*, 1990). Equivalent names are listed after the seam name for the Melton and Yorkshire coalfields. BGS Lexicon codes are given in **bold**.



## 2.1 UPPER LANGSETTIAN

### 2.1.1 Sub-Silkstone Coals ('Kilburn Group')

#### 2.1.1.1 KILBURN COAL ('GRENOSIDE SANDSTONE COAL', 'BETTER BED') **KBC**

The Kilburn Coal is the lowest seam within the 'productive' succession of the East Midlands coalfields. It represents the first significant development of coal after deposition of the Wingfield Flags, and is one and the same seam as the Grenoside and Better Bed coals of Yorkshire. It is relatively thin (around 30cm) and does not show significant thickness variation anywhere in the East Midlands. No splits or unions have been encountered anywhere in the coalfield.

#### 2.1.1.2 MORLEY MUCK COAL ('MORLEY COAL', 'WHETSTONE') **MOMC**

The seam stratigraphy between the Kilburn and lowermost seams of the Silkstone Group is unclear. In the Melton area, two thin and discrete seams are identified, known as the Mickley Thin and Mickley 4. However, in north Nottinghamshire and south Yorkshire, there is generally only one coal in this interval, being the 'Morley' or 'Morley Muck' coal. It may represent a union of these seams or simply be one or the other. In several boreholes the Morley Muck may be a mis-identified Kilburn, particularly in north Notts and Yorkshire. In the Wakefield area, a coal known as the 'Whetstone' lies at this horizon and is probably correlative.

### 2.1.2 Silkstone Group

#### 2.1.2.1 MICKLEY 3 COAL ('BRAMPTON LOW', 'WALKERS COAL', 'BLACK BED') **M3C**

The Mickley 3 coal of Melton is known in Yorkshire as either the Brampton Low or Walkers coal; the seams are all one and the same. The Mickley 3 is discrete throughout south Yorkshire and Notts, but unites with a combined Mickley 2 and Mickley 1 seam in Melton. In the Barnsley and Wakefield districts, a coal known as the 'Black Bed' appears correlative.

#### 2.1.2.2 MICKLEY 2 COAL ('BRAMPTON HIGH', 'MICKLEY THIN' (OF NOTTS) 'CROW') **M2C**

The Mickley 2 coal of Melton equates directly to the Brampton High of Yorkshire and the Mickley Thin of Nottinghamshire (not to be confused with the Mickley Thin of Melton). It is united with the Mickley 1 throughout most of Melton, but is probably discrete within the remainder of the coalfield. In the Wakefield district, a coal known as the 'Crow' appears to be correlative.

#### 2.1.2.3 MICKLEY 1 ('MICKLEY COAL', 'MICKLEY THICK', 'WHINMOOR', 'LOW BEESTON') **M1C**

The Mickley 1 of Melton equates to the 'Mickley' and Mickley Thick coals of Nottinghamshire, and is called the Whinmoor in south Yorkshire. It is discrete throughout the central part of the coalfield, but it unites with the underlying Mickley 2 in Melton and, as the 'Low Beeston', becomes involved in the complex Beeston-Cherwell split in the Wakefield district.

#### 2.1.2.4 ASHGATE FLOOR COAL ('ASHGATE LEAF 2/ASHGATE LOWER LEAF', 'BLACK BAND') -

The Ashgate Floor Coal is discrete in south Yorkshire, where it is most often recognised as Ashgate Leaf 2. Otherwise it is intimately associated with the Ashgate, and splits from the overlying coal in a complex, localised fashion throughout Nottinghamshire and Melton, never being more than a couple of metres apart, and is generally united with the Ashgate where it merges with the Blackshale in Melton. In the northern part of the coalfield, it is correlated with the 'Black Band' of the Barnsley district, and, once united with the overlying 'Lousey' Coal, is

known as the 'Top Beeston' in the Wakefield district, where it becomes involved in the complex Beeston-Cherwell split.

#### 2.1.2.5 ASHGATE COAL ('*ASHGATE LEAF 1*', '*LOUSEY*') **AGC**

The Ashgate Coal is discrete in south Yorkshire, where it is termed the Ashgate Leaf 1. It merges with the Ashgate Floor Coal before uniting with the Blackshale Coal in Melton. This relationship is mirrored in the Wakefield district where the coal is known as the 'Lousey' and it unites with the underlying Black Band Coal to form the Top Beeston Coal.

#### 2.1.2.6 BLACKSHALE COAL **BSC**

The Blackshale and its associated coals have a very complex split architecture. The Blackshale Coal, as recognised in Melton area, represents leaves 1-3 of that coal of Nottinghamshire; consequently, the quasi-saline *low estheria* mudrock is found in the Blackshale roof here. Leaf 4 of the Nottinghamshire Blackshale is split in Melton as the Yard Floor Coal. The Blackshale merges southward with the lower seams of the group (Mickley 3 upwards), and northward firstly with the Yard Floor Coal of Melton to produce the Blackshale of Nottinghamshire (Blackshale 1-4) where the *low estheria* band lies between leaves 3 and 4, and shortly thereafter with the Yard Coal of Melton to produce the composite Blackshale/Yard Coal of Nottinghamshire, which directly equates to the Silkstone Coal of south Yorkshire (see below).

#### 2.1.2.7 SILKSTONE COAL **SLKC**

The Silkstone is a composite seam comprising the Blackshale (1-3), Yard Floor and Yard coals in north Nottinghamshire and south Yorkshire. Records of the position of Low Estheria are not obvious, but it likely lies in the middle of the seam. It equates directly to the 'Blackshale/Yard' coal of Nottinghamshire. Northward, it splits into the Blocking and Middleton Eleven Yards coals of Barnsley.

#### 2.1.2.8 BOTTOM SILKSTONE COAL ('*BLACKSHALE*' (OF MELTON), '*BLOCKING*') -

The 'Bottom Silkstone' occurs as the lower leaf of a basinward split in the Silkstone in Yorkshire and the periphery of north Nottinghamshire. In the Sheffield district the *low estheria* band lies above the seam, making it roughly equivalent to the Blackshale of Melton with the Ashgate Leaf 1 of Notts. In the Barnsley and Wakefield districts, the Bottom Silkstone is equivalent to the Blocking Coal, the lower leaf of which (equivalent to Ashgate Leaf 1) is split off in the Wakefield district to form the Top Lousey.

#### 2.1.2.9 TOP SILKSTONE COAL ('*YARD*', '*MIDDLETON ELEVEN YARDS*') -

The Top Silkstone occurs as the upper leaf of the Silkstone split in Yorkshire. It is a direct equivalent of the Yard Coal of Nottinghamshire and Melton. In the Barnsley and Wakefield, north of the Silkstone split, the equivalent coal is the Middleton Eleven Yards.

### 2.1.3 Parkgate Group

#### 2.1.3.1 THREEQUARTERS COAL **THQU**

The Threequarters Coal is a seam of moderate thickness which persists across the coalfield. Locally called the 'Tupton Threequarters' in north Nottinghamshire and south Yorkshire, it exhibits complex local splitting in Yorkshire, where it splits and recombines to variously form the Low Main, Lees, Thornecliffe Thin, Wheatley Lime, and Middleton Main. The Threequarters

combines southward in Melton with the Tupton coal to form the Tupton Threequarters, and this merged seam combines with the Parkgate in the extreme south of Melton.

#### 2.1.3.2 LOW MAIN COAL (*'THORNCLIFFE THIN'*) **LMAC**

The Low Main Coal splits from the Threequarters in south Yorkshire, where it is also known as the Thornecliffe Thin.

#### 2.1.3.3 WHEATLEY LIME COAL **WHLC**

The Wheatley Lime Coal is the lowermost seam produced by the split of the Threequarters into the Wheatley Lime and Lees in the Barnsley district.

#### 2.1.3.4 LEES COAL **LEES**

The Lees Coal is the uppermost seam produced by the split of the Threequarters into the Wheatley Lime and Lees in the Barnsley district.

#### 2.1.3.5 MIDDLETON MAIN COAL **MDMC**

The Middleton Main Coal is found in the Wakefield district where it represents the united Lees and Low Main Coals of the south Yorkshire coalfield.

#### 2.1.3.6 THORNECLIFFE COAL **THCC**

The Thornecliffe Coal is found in the Barnsley and Sheffield districts. Northward, it attenuates to seatearth and dirty coal in the Wakefield district, whilst in south Yorkshire it splits into the Cockleshell and Low Tupton Coals.

#### 2.1.3.7 LOW TUPTON COAL **LTUC**

The Low Tupton Coal is the lowermost split of the Thornecliffe Coal in south Yorkshire and north Nottinghamshire.

#### 2.1.3.8 COCKLESHELL COAL **CLCO**

The Cockleshell Coal is the uppermost split of the Thornecliffe Coal in South Yorkshire and North Nottinghamshire.

#### 2.1.3.9 TUPTON COAL (*'THORNECLIFFE'*) **TTC**

In south Nottinghamshire and Melton, the Low Tupton and Cockleshell coals re-unite to form the Tupton Coal, which is therefore a direct equivalent of the south Yorkshire Thornecliffe. In the southern part of the Melton district, it unites with the underlying Threequarters Coal.

#### 2.1.3.10 SECOND PIPER COAL (*'HOSPITAL'*, *'DOGSTOOTH'*, *'MIDDLETON LITTLE'*) **SPIC**

The Second Piper Coal is found throughout most of Nottinghamshire and South Yorkshire, where it variably goes by the name of 'Dogstooth' or 'Hospital'. In the Wakefield and Barnsley districts, it is known as the 'Middleton Little'.

#### 2.1.3.11 FIRST PIPER COAL (*'THIRD BROWN METALS'*) **FPIC**

The First Piper Coal is discrete throughout most of Yorkshire and Nottinghamshire, being known as the 'Third Brown Metals' in Wakefield. It shows very complex local splitting, especially in south Yorkshire, and is frequently recognised as two leaves in north Nottinghamshire.

### 2.1.3.12 PARKGATE COAL ('PIPER', 'DUKERIES') **PGC**

The Parkgate Coal occurs throughout south Nottinghamshire and Melton, and represents the united First and Second Piper seams. It is often known locally simply as 'Piper' or rarely 'Dukeries'. In the southernmost part of the Melton district, it unites with the Tupton and Threequarters coals.

## 2.1.4 Deep Main Group

### 2.1.4.1 DEEP HARD COAL ('SECOND BROWN METALS') **DPHC**

Discrete throughout most of the coalfield, the Deep Hard Coal unites in the Melton area firstly with the Deep Soft, and then with the composite Roof Soft and Top Soft to form the Deep Main Coal. In the Nottinghamshire Coalfield, the Deep Hard also unites in a wide area around Mansfield with the 1st Piper Coal of the Parkgate group. This relationship is also seen north of Wakefield, where the Deep Hard is known as the Second Brown Metals and combines with the underlying Third Brown Metals, which is the local equivalent of the 1<sup>st</sup> Piper in north Yorkshire.

### 2.1.4.2 DEEP SOFT COAL ('FIRST BROWN METALS') **DPSC**

The Deep Soft Coal combines with the Deep Hard in the Melton area, and also in the Barnsley area to form the Fenton Coal, which splits northwards into the 1<sup>st</sup> and 2<sup>nd</sup> Brown Metals coals. The Deep Soft is also known to combine locally with the Roof Soft.

### 2.1.4.3 ROOF SOFT COAL ('SITWELL', 'FLOCKTON THIN', 'MIDDLETON 40 YARDS') **RFSC**

The Roof Soft Coal is a thin coal, generally discrete across the coalfield. In south Yorkshire it is known as the Sitwell or Flockton Thin, and as the Middleton 40 Yards in Wakefield. In Derbyshire it unites with the Top Soft to form the Clay Cross Soft; this relationship is also seen in the southern part of the Melton district and parts of the south Yorkshire coalfield, where the combined seam is known as the 'Flockton'.

### 2.1.4.4 TOP SOFT COAL ('CHAVERY', 'FLOCKTON THICK', 'ADWALTON STONE COAL') **TPSC**

The Top Soft is discrete across most of South Yorkshire, where it is known as the Flockton Thick or Chavery, and the Barnsely and Wakefield districts, where it is known as the Adwalton Stone Coal. It unites with the underlying Roof Soft Coal in parts of south Yorkshire to form the Flockton Coal, and again in Derbyshire to form the Clay Cross Soft Coal.

### 2.1.4.5 DEEP MAIN COAL **DMNC**

The Deep Main is in economic terms the principal coal in the Westphalian A, being often up to 5m thick. It is principally confined, however, to the Melton area, splitting into the sub-components (Deep Hard/Deep Soft and Roof Soft/Top Soft) basinward. Locally, it is united with the overlying Joan Coal in Melton.

### 2.1.4.6 JOAN COAL **JNC**

The Joan is a thin but persistent seam which for the most part directly underlies the Vanderbeckei Marine Band; consequently, it represents the last coal of the Langsettian. The Joan is recognised across the coalfield.

## 2.2 DUCKMANTIAN

### 2.2.1 Coals below the 1<sup>st</sup> Waterloo ('Ell Group')

#### 2.2.1.1 SECOND ELL COAL **SEC**

The Second Ell Coal is the first seam of the Duckmantian, and is known by the same name throughout the coalfield. It is seldom worked and does not split or combine with other coals. In the Wakefield area, it attenuates against the Thornhill Rock.

#### 2.2.1.2 FIRST ELL COAL ('LIDGET') **FEC**

The First Ell Coal is almost always combined with the overlying 4th Waterloo Coal in Melton and south Nottinghamshire, with the split opening northward, the First Ell being known as the 'Lidget' throughout Yorkshire.

#### 2.2.1.3 FOURTH WATERLOO COAL ('NETHERTON THIN', 'LOW HAIGH MOOR') **FHWC**

The Fourth Waterloo is known as the Netherton Thin Coal in the area around Sheffield, and as the Low Haigh Moor around Barnsley, which splits northward into the Little Haigh Moor and Low Haigh Moor Coals of the Wakefield area.

#### 2.2.1.4 THIRD WATERLOO COAL ('NETHERTON THICK', 'TOP HAIGH MOOR') **TDWC**

The Third Waterloo is known as the 'Netherton Thick' in south Yorkshire and as the 'Top Haigh Moor' in west Yorkshire. In the area north of Wakefield, the Top Haigh Moor Coal also includes the Little Haigh Moor Coal, which otherwise forms the upper leaf of the Fourth Waterloo (see above).

#### 2.2.1.5 SECOND WATERLOO COAL ('SWALLOW WOOD') **SDWC**

The Second Waterloo Coal is discrete throughout the coalfield, being known as the 'Swallow Wood' in Yorkshire.

### 2.2.2 Dunsil Group

#### 2.2.2.1 FIRST WATERLOO COAL ('GAWBER') **FTWC**

Across most of Melton and Nottinghamshire, the First Waterloo is united with the Dunsil Coal, and in the extreme south of Melton, with the overlying Top Hard. Northwards, however, the First Waterloo can be traced throughout the coalfield, being known as the 'Gawber' in the Wakefield district.

#### 2.2.2.2 DUNSIL COAL ('BECK BOTTOM STONE') **DSLCL**

In the Wakefield and Barnsley districts, the Dunsil Coal is known as the Beck Bottom Stone. Southwards, it unites successively with the Top Hard and Coombes before forming part of the Top Bright of Melton.

## 2.2.3 Top Hard Group

### 2.2.3.1 TOP HARD COAL **THC**

The Top Hard Coal, of Nottinghamshire, is a union of the Top Hard of south Yorkshire with the Coombe coals, whilst the Top Hard of Melton is a union of this coal with the Main Smut. The south Yorkshire Top Hard is directly correlative with the Low Barnsley Coal in both the Sheffield and the Wakefield districts.

### 2.2.3.2 BARNSELY COAL **BARC**

In the area around Barnsley itself, the Low Barnsley unites with the Barnsley Top Softs, equivalent to the Nottinghamshire Coombes, to form the Barnsley Coal. In the area south of Wakefield, the split opens again, and the Top Barnsley is likely the correlative of the Coombe coals.

## 2.2.4 Top Bright Group

### 2.2.4.1 MAIN SMUT COAL (‘*SECOND ST. JOHN’S*’, ‘*BARNSELY RIDER*’) **MNSC**

The Main Smut is the lowest seam of the Top Bright Group, the component seams splitting northwards from the Top Bright in the Melton area, where the Top Bright and Top Hard are locally united. In South Yorkshire it is known as the Second St. John’s, and in north Yorkshire it is known as the Barnsley Rider, being united with the Top Barnsley in the Wakefield district to form the Warren House Coal.

### 2.2.4.2 CINDERHILL MAIN COAL (≡ ‘*FIRST ST. JOHNS*’, ‘*KENTS THICK*’) **CHMC**

The Cinderhill Main Coal is known as the 1<sup>st</sup> St John’s in south Yorkshire and as the Kent’s Thick Coal in the Wakefield district, where it unites with the Kent’s Thin to form the Methley Park Coal.

### 2.2.4.3 HIGH HAZELS COAL (≡ ‘*HIGH HAZLES*’, ‘*KENTS THIN*’) **HHC**

The High Hazels Coal takes its name from the Yorkshire village of High Hazels, which appears to originally have been spelt as ‘High Hazles’, leading to the confusion above. The High Hazels Coal is known as the Kent’s Thin in north Yorkshire, where it unites with the underlying Kent’s Thick. In south Nottinghamshire, it unites with the overlying Brinsley Coal, before forming a leaf of the Top Bright in Melton.

### 2.2.4.4 BRINSLEY COAL (‘*STANLEY MAIN*’) **BSLC**

The Brinsley Coal is found across much of the coalfield, uniting in south Nottinghamshire with the underlying High Hazels Coal. It is known as the ‘Stanley Main’ in the Barnsley district, and in the area around Wakefield it splits into the Top Beamshaw and Low Beamshaw coals.

### 2.2.4.5 ABDY COAL (≡ ‘*LOW BRIGHT*’, ‘*WINTER*’) **ABDY**

The Abdy Coal is found throughout the coalfield. In west Yorkshire it is known as the Winter Coal, whilst in Melton it is known as the Low Bright, where it forms the uppermost leaf of the Top Bright Coal.

#### 2.2.4.6 TOP BRIGHT COAL **TOPB**

The Top Bright Coal is found in the south Nottinghamshire and Melton coalfields. At most, it includes the Abdy, High Hazels, Cinderhill Main, Main Smut and Top Hard coals, which successively unite southward. However, the name 'Top Hard' is applied to any coal though to represent a union of two or more of the above seams.

#### 2.2.4.7 TWO FOOT COAL ('CAT') **TFTC**

The Two Foot Coal lies close beneath the Maltby Marine Band. It does not unite with the Top Bright coals but is grouped with them for convenience. It is known as the Cat Coal in west Yorkshire.

### 2.2.5 Seams above the Maltby Marine Band

#### 2.2.5.1 MAIN BRIGHT COAL ('FOXEARH', 'WATHWOOD', 'MELTONFIELD', 'WOODMOOR', 'WAKEFIELD MUCK') **MBTC**

The Main Bright Coal, so-called in Melton and Nottinghamshire, is a discrete seam of variable quality above the Maltby Marine Band. It is called the Wathwood in south Yorkshire and the Woodmoor or Wakefield Muck in west Yorkshire. 'Foxearth' and 'Meltonfield' are local north Nottinghamshire names.

#### 2.2.5.2 MANTON COAL -

The Manton Coal is found in Melton and Nottinghamshire, where a prominent *estheria* band forms the seam roof. The coal attenuates northwards.

#### 2.2.5.3 CLOWNE COAL ('CLOWN', 'NEWHILL', 'CASTLEFORD FOUR FOOT') **CLNC**

The Clowne Coal is found across the coalfield, being known as the Newhill in south Yorkshire and as the Castleford Four Foot in the Wakefield district.

#### 2.2.5.4 SWINTON POTTERIES COAL **SPOC**

The Swinton Potteries Coal is found throughout the coalfield, and is generally the last named seam below the Aegiranum Marine Band. Although local splits are common, it does not unite with any other coals, and retains the same name throughout the East Pennines.

## 3 Sandbodies

### 3.1 UPPER LANGSETTIAN

#### 3.1.1 Penistone Flags **PF**

The Penistone Flags are found immediately above the Grenoside Sandstone (Kilburn) Coal in the area between Barnsley and Chesterfield. They comprise intercalated leaves of mudstone and flaggy sandstone, and are approximately 100m thick. The Whinmoor (Mickley 1) Coal forms a cap to the unit.

### **3.1.2 Thick Stone TKS**

The Thick Stone, which is better developed in the Leeds district, lies beneath the Black Bed (Mickley 3) Coal and above the Better Bed (Kilburn) Coal in the Wakefield district, where it is relatively thin.

### **3.1.3 Whinmoor Rock -**

The Whinmoor Rock lies immediately above the Whinmoor Coal in the Barnsley and Sheffield districts. It is a flaggy, thin-bedded, fine-grained sandstone about 30m thick and may be associated with minor washouts in the Barnsley district.

### **3.1.4 Mickley Rock MRK**

Known only from the Melton District, the Mickley Rock is around 50m thick. It comprises five leaves of fine-grained sandstone, and lies immediately above the Mickley 4 Coal, being capped by the Blackshale Coal.

### **3.1.5 Slack Bank Rock SBR**

The Slack Bank Rock is confined to the Wakefield district, where it is up to 30m thick. The rock is encountered in the roof of the Blocking (Blackshale) Coal, and is capped by the Middleton Main (Threequarters) Coal.

### **3.1.6 Silkstone Rock SR**

The Silkstone Rock is flaggy, fine to medium grained, and up to 50m thick. It is found in the area around Sheffield, although the lowest leaf of the sandbody extends as far north as Barnsley where it has been termed the 'Falhouse Rock'. The Silkstone Rock lies between the Silkstone and Thornecliffe Coals in the Sheffield district.

### **3.1.7 Tupton Rock TUPR**

The Tupton Rock occurs throughout the Nottinghamshire Coalfield where it is up to 40m thick. It contains conglomeratic horizons which may suggest it has to some degree washed out older strata. It lies between the Threequarters and First Piper coals.

### **3.1.8 Parkgate and Deep Hard Rocks PKR, -**

The Parkgate and Deep Hard Rocks are found in the Barnsley and Sheffield districts. The Parkgate Rock lies in the roof of the 1<sup>st</sup> Piper, whilst the Deep Hard Rock lies between the Deep Hard and Top Soft coals. The two rocks are united in the Sheffield area where the Deep Hard Rock may have washed out the Deep Hard Coal. Where united, the rocks are over 60m thick. The Parkgate rock is strongly cross-bedded, whilst the Deep Hard Rock is generally more massive.

### **3.1.9 Emley Rock ER**

The Emley Rock is a thin bed of flaggy sandstone found only in the area around Wakefield, and lying in the roof of the Middleton 40 Yards (Roof Soft) Coal.



## **3.2 DUCKMANTIAN**

### **3.2.1 Thornhill Rock TR**

The Thornhill Rock is found in the Wakefield area, where it is around 40m thick. It is fine grained, normally thick bedded, and has been worked as a building stone. It extends as far down as the Joan coal, indicating that it has possibly washed out the Vanderbeckei Marine Band, and is capped by the Low Haigh Moor (4<sup>th</sup> Waterloo) Coal.

### **3.2.2 Haigh Moor and Kexborough Rocks HMR, -**

The Haigh Moor Rock is a fine-grained, cross-bedded shaly sandstone found in the Wakefield and Barnsley districts. It is around 15m thick, and has a conglomeratic base associated with washouts in the underlying Top Haigh Moor Coal. The rock, which in the southern part of the Barnsley area is known as the Kexborough Rock, is capped by the Swallow Wood Coal.

### **3.2.3 Woodhouse Rock -**

The Woodhouse rock lies between the Swallow Wood and Dunsil coals in the Sheffield district. It is up to 30m thick, and is described as fine-grained and cross-bedded. A conglomeratic base may indicate that it has washed out some older strata.

### **3.2.4 Horbury Rock HRR**

The Horbury rock is a fine-grained, soft-yellow-brown cross-bedded sandstone which is confined to the Wakefield area, where it is over 50m thick. It lies between the Beck Bottom Stone and Warren House coals.

### **3.2.5 Barnsley Rock BNR**

A yellow-brown to reddish, fine-grained, flaggy sandstone, the Barnsley Rock is up to 30m thick in the district of that name. It lies between the Barnsley and Barnsley Rider coals.

### **3.2.6 Handsworth Rock HWR**

The Handsworth Rock, also known as the Kent's Thick Rock, is a white, fine-grained, thick bedded sandstone up to 15m thick. It lies between the Kent's Thick and Kent's Thin coals in the area around Barnsely and Sheffield.

### **3.2.7 Kent's Rock KNR**

The Kent's Rock (also known as Kent's Thin Rock) is around 10m in thickness and comprises brown, cross-bedded sandstones. It lies between the Kent's Thin and Stanley Main/Brinsley coals in the Barnsley and Sheffield districts.

### **3.2.8 Abdy Rock ABR**

The Abdy Rock is a cross-bedded, fine-grained sandstone found in the roof of that coal in the Barnsley and Wakefield districts. It is around 50m thick at maximum.

### **3.2.9 Woolley Edge Rock WE**

The Woolley Edge Rock comprises thick, coarse, cross-bedded sandstones, similar in lithology to sandstones of the Millstone Grit, in the Barnsley area. Pebble beds are common, and the maximum thickness is approximately 40m.

### **3.2.10 Crigglestone Rock CRRO**

The Crigglestone Rock is a flaggy sandstone up to 20m thick, found in the roof of the Castleford Four Foot Coal in the Wakefield district.

### **3.2.11 Oaks Rock OR**

The Oaks Rock is a soft, fine-grained, thick-bedded sandstone, with intercalated shale lenses, around 45m in thickness. It is found in the roof of the Swinton Potteries Coal in the Wakefield, Barnsley, and Sheffield districts.

# References

Most of the references listed below are held in the Library of the British Geological Survey at Keyworth, Nottingham. Copies of the references may be purchased from the Library subject to the current copyright legislation.

CHARSLEY, T. J, RATHBONE, P. A. & LOWE, D. J. 1990. Nottingham: a geological background for planning and development. *British Geological Survey Technical Report* WA/90/1. British Geological Survey, Keyworth.

FLINT, S., AITKEN, J. & HAMPSON, G. 1995. Application of sequence stratigraphy to coal-bearing coastal plain successions: implications for the UK Coal Measures. In: Whateley, M. K. G. & Spears, D. A. (Eds), *European Coal Geology. Geological Society of London Special Publication* **82**, 1-16.

POWELL, J. H, CHISHOLM, J. I, BRIDGE, D. MCC, REES, J. G, GLOVER, B. W. & BESLY, B. M. 2000. Stratigraphical framework for Westphalian to early Permian red beds of the Pennine Basin. *British Geological Survey Research Report*, RR/00/01. British Geological Survey, Keyworth.

WAKEFIELD

BARNSELY

SHEFFIELD

OLLERTON & CHESTERFIELD

NOTTINGHAM

MELTON

*Aegiranum*

Lower Similis-Pulchra

Modiolaris

Communis

Middle Coal Measures

Lower Coal Measures

DUCKMANTIAN

LANGSETTIAN

