

**DERBY AND DERBYSHIRE
MINERALS AND WASTE DEVELOPMENT FRAMEWORK**

Minerals Core Strategy

Key Issues and Options

Evidence Base Papers

Prepared jointly by Derbyshire County Council and Derby City Council



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1 INTRODUCTION

These papers set out the information we have gathered so far for each mineral as part of our preparation of the Minerals Core Strategy. They draw on information from a wide variety of sources and represent the current status of our knowledge on these minerals. They include information on the uses, geology, production and consumption figures, reserves, methods for their exploration, working and reclamation and markets of the mineral concerned. We would be pleased to receive any further information or comments from you that may help us develop these papers. They will be updated and developed as we progress the Plan.

There is also a paper on minerals safeguarding, which sets out how we will define safeguarding areas for different types of mineral to ensure that they are not sterilised unnecessarily by other development and, therefore, that they will be available for use by future generations.

2 BRICK AND FIRE CLAY

Introduction and Background

Brick Clay

Brick clay is the term used to describe clay, shale and mudstone used in the manufacture of structural clay products. The largest use is for facing and engineering bricks (facing bricks alone account for 90% of production (source: Brick Clay Factsheet, British Geological Survey (BGS), 2007), followed by pavers, clay roofing/cladding tiles, clay pipes. Some clay and shale is used for engineering and environmental purposes i.e. capping and lining areas of landfill, and lining water bodies such as lakes, ponds and canals. Fireclay is also used in the manufacturing of these products and is dealt with in a separate evidence paper.

The term 'clay' is used loosely when discussing bricks and other structural clay products, since the clay mineral content can range from 20% to 80% and non-clay minerals such as iron oxide, calcium carbonate and quartz can affect the properties and finish of the end product.

Brick clays are gained via open pit methods in shallow or deep quarries. Clay source come under Mercia Mudstone (formerly called Keuper Marl) and Carboniferous Clays (mudstones of the Coal Measures Group). The latter is extracted in Derbyshire to produce clay products. Open air stockpiling is common practice nationally, allowing the stored clay time to 'sour', a process of weathering over several months to increase plasticity.

Brick clays are found in many parts of the UK, however, only certain sources have the specific geological properties suitable for manufacturing structural clay ware or for engineering and environmental purposes. These properties include structural strength, porosity, durability etc. Aesthetic appearance is an important factor and different brick clays provide different colours and textures. The Etruria Formation (Staffordshire and other parts of the West Midlands) for example is a valued clay which is becoming increasingly scarce as it has a limited outcrop and large parts have been sterilised by development (source: Paragraph 85, Planning and Minerals Practice Guide, Communities and Local Government, 2006).

Safeguarding

A study of the sterilisation of brick clay resources was carried out by the British Geological Survey in 2001. This highlighted the loss of large parts of the Etruria Formation through urban development on the outcrop. In the Midlands and the North of England, urban development is the most significant constraint, whilst in the South-East environmental designations are more

important in affecting brick clay resources i.e. the High Weald Area of Outstanding Natural Beauty which affects the Wadhurst Clay reserves in Surrey, Kent and Sussex (source: Paragraph 1.43, Brick Clay: Issues for Planning, BGS, 2001 and Brick Clay Factsheet, BGS, 2007).

Fireclay

Fireclays are sedimentary mudstones, the 'seatearth' under most coal measures. Seatearths are the fossil soils on which carbon based vegetation once grew. These are distinguished from associated sediments by the absence of bedding and the presence of rootlets.

The term 'fireclay' encompasses seatearths that are of economic interest, irrespective of their refractory properties. The relatively high alumina and low alkali content of some fireclays also make them suitable for use in the manufacture of certain refractory products. Demand for refractory use has declined due to changing technology in the iron and steel industry. Only very minor quantities of fireclay are now used for refractory applications. Fireclays are mainly used for the manufacture of structural clay products, especially high quality facing bricks (source: Factsheet – Fireclay, British Geological Survey (BGS), 2006).

Fireclay is used to produce cream and buff coloured bricks. Fireclay has a low iron content. In comparison brick clay has a high content of iron oxides which gives common bricks the characteristic red colour. The proportion of fireclay used in the brick varies from 50 to 100 percent, depending on the fireclay properties, the other clays used in the blend and the aesthetic and technical properties of the finished product required (source: paragraph 7.6, Appendix 7 Brick Clay Issues for Planning, BGS, 2001).

The vitrification characteristics of fireclays enable their use in the manufacture of bricks to meet specifications for water absorption and frost resistance.

Fireclays are mixed in roughly equal proportions with clays and shales for the manufacture of clay pipes. The fireclay adds plasticity, an important property governing the ease with which the material can be shaped. It also widens the temperature range within which vitrification takes place, thus making firing more manageable.

Most fireclay used by the brick industry is obtained as a by-product of opencast coal activities. Opencast coal sites provide one of the few viable sources of fireclay. As underground mining declined, opencast coal sites have become increasingly important in the supply of fireclay.

Open air stockpiling allows the stored clay time to 'sour', a process of weathering over several months to increase plasticity.

There is a regionally important fireclay stocking facility in Leicestershire (Donington Island) which abuts Overseal, Derbyshire. This has just gained planning consent to extend operations to 2017.

National and Regional Policy

National Planning Policy

Central Government Policy for Brick Clay is set out in Minerals Policy Statement (MPS) 1: Planning and Minerals, specifically in Annex 2: Brick Clay. As set out in paragraph 2 of this Annex the policy objectives for brick clay are:

Maintain and enhance the diversity of brick clay produced by making appropriate provision for supply in mineral planning authorities (MPAs) local development documents;

Provide and make available brick clays at a level that reflects the high initial investment in, and high levels of capital expenditure required to maintain and improve new and existing brick making plant and equipment;

Safeguard and where necessary stockpile supplies of clays, particularly premium clays such as those from the Etruria Formation and fireclay.

Paragraph 3.2 of Annex 2 to MPS1 states that brick clay should be extracted as close as practicable to the brickworks that it supplies and that MPA's should consider the potential for extraction of brick clay close to the works and the potential for extensions to existing planning permissions to maintain supplies.

Central Government Policy for fireclay is set out in Mineral Policy Statement 1, Annex 2: Brick Clay Provision in England. This focuses on fireclay as brick clay and recognises that fireclays are scarce nationally. The guidance states that the level of opencast coal extraction in England has major implications for future fireclay supply.

MPS1 states in paragraph 3.4 to Annex 2 that MPAs should take account of the need to provide a stock of permitted reserves to support the levels of actual and proposed investment required

for each new or existing manufacturing plant and the maintenance and improvement of existing plant and equipment. The guidance states that this will normally be sufficient to provide for 25 years of production. This guidance adds that MPAs should encourage coal companies to utilise fireclay reserves where they exist, for example in opencast coal sites, and where practicable, find markets for these.

Regional Planning Policy

The East Midlands Regional Plan was adopted in March 2009. Brick clay is specifically mentioned in paragraph 3.3.52 as a mineral of national and regional significance. It is recognised in this text that the working of brick clay is unlike other minerals in that it is usually won in conjunction with individual brickworks and involves relatively small quantities of mineral when compared with the needs of the cement industry for example.

Regional Plan Policy 37: Regional Priorities for Minerals does not specifically refer to brick or fire clay but states that Local Development Frameworks should identify sufficient environmentally acceptable sources to maintain an appropriate supply of minerals of regional or national significance. The policy also states that minerals should be safeguarded from development that would sterilise future exploitation, including those required to maintain historic buildings and monuments or new construction that reflects local character.

Derby and Derbyshire Minerals Local Plan

Policy MP32: Clay states that proposals for the working of clay will be permitted provided: the mineral is needed to enable the continuation of production and employment in the clay products industries/ as a raw material in the construction of waste disposal facilities; the proposal would not have an unacceptable impact on the environment and is designed to secure the rapid working and reclamation of the site.

The policy also states that planning permission will not be granted where the stocking of clay on the mineral site would significantly delay the reclamation of the site.

Demand

Demand for bricks particularly, has declined since the 1970s. This is mainly due to the demise of common bricks in houses which have been replaced in the inner leaves of cavity walls by concrete blocks and in internal walls by blocks and plasterboard. Output of facing and engineering bricks has remained relatively static in this decade. Clay roofing tiles, sales once

suffering because of competition from concrete tiles, are now more popular and market share has increased. Clay pipes have suffered a downturn in use, however, in competition with plastic and concrete pipes (source: Factsheet - Brick Clay, BGS, 2007).

Commercial fireclays have a restricted distribution because most reserves are not of commercial quality. Fireclay is a low value mineral but being worked with coal has offset the cost of extraction. The future of the market depends on adequate permitted reserves and a continuing market for indigenous opencast coal.

Sales of fireclay have fallen since the 1950s due mainly to the fall in demand for fireclay as a refractory raw material. Fireclay output has been dominated by England which accounted for 88% of sales in 2005 of 395,000 tonnes. Fireclay sales have been dominated by the South Derbyshire Coalfield where there is a concentration of fireclay and coal seams (source: Factsheet – Fireclay, BGS, 2006).

Production

In Derbyshire, clay has, historically, been extracted mainly from the coal measures covering parts of northern, eastern and southern Derbyshire. A range of industries historically evolved including refractories (for furnace linings), pipes, bricks, sanitary ware and tableware. Brick clay occurs widely in the County. It is also used in the construction and waste disposal industries (source: Derby and Derbyshire Minerals Local Plan, Derbyshire County Council (DCC), 2000).

Waingroves

There is a brick clay extraction site and a mothballed brickworks at Waingroves, Derbyshire. Planning consent exists up to the year 2042. Brick clay extraction is undertaken in a 'campaign' where there is a concentrated short period of extraction. The brickworks at Waingroves ceased production in 2006. No clay extraction has taken place since August 2007 and stockpiles have been removed off site and taken to Nottinghamshire and Leicestershire brickworks. The next campaign is scheduled for August 2009 and it is estimated that 30-40,000 tonnes will be extracted (source: Derbyshire County Council Minerals Monitoring Records (Case Officers Notes), 2009).

Mouselow

There is a brick clay and shale extraction site at Mouselow, Derbyshire. This supplies clay and shale to Denton Brickworks, Greater Manchester, part of the same company. There has been

no extraction since the latter part of 2007. The owner has indicated the possibility of further extraction later in 2009. Some shale stocks are being removed. A review of the planning consent is due in September 2009 (source: Derbyshire County Council Minerals Monitoring Records (Case Officers Notes), 2009).

Barrow Hill

Planning permission was granted in 2008 for the extraction of brick clay at Foxlow Tip and adjacent land at Staveley. The excavation will last three years and clay will be stockpiled for eighteen years further on the footprint of the old tip. The clay will supply the Phoenix Brickworks at Barrow Hill.

An energy from waste scheme was approved by Derbyshire County Council in June 2008 subject to a Section 106 agreement for Phoenix Brickworks, Barrow Hill. This involves a materials recycling facility processing commercial and industrial waste. Recovered fuel in the form of pellets will be used in a Combined Heat and Power system which will provide electricity and heating for the brickworks as well as selling electricity to the National Grid. The brickworks were using methane gas from an adjacent landfill until a year ago. The brickworks have mothballed production at the moment, however, the opportunity remains to utilise landfill gas again if the manufacturer wishes to do so.

The Office for National Statistics (ONS) Mineral Extraction in Great Britain, Business Monitor PA1007 states that extractors sales of clay and shale by end-use and area of origin for Derbyshire totalled 606,000 tonnes in 2007. The East Midlands produces 18% of clay bricks nationally (source: BGS Factsheet – Brick Clay, 2007).

There are no national guidelines to indicate future demand for brick clay and therefore, recent levels of production are the best indicator of demand. MPS1 Practice Guide indicates in paragraph 87 that demand for brick clays has been fairly stable at about 8 million tonnes per annum over recent years.

Most fireclay deposits are relatively shallow (less than 1 metre thickness), with the exception of the Pottery Clays Formation of the South Derbyshire Coalfield. Extraction on its own is thus economically unviable because of high overburden to mineral ratios. The amount of fireclay recovered from a site is generally small in comparison with the coal recovered. The exception is the South Derbyshire Coalfield where a concentration of thick fireclays has historically produced large tonnages.

In 2001 opencast coal sites accounted for 90% of all fireclay supply, both from operation sites and stockpiles associated from former sites. In 2001 the most important of these was the Donington Island stockpiles in the South Derbyshire Coalfield (in Leicestershire). This alone accounted for 25-30% of the fireclay market (paragraph 7.51, Appendix 7 Brick Clay Issues for Planning, BGS, 2001). From the 1970s to the 1980s large amounts of fireclay were extracted with coal i.e. Albion site, near Woodville and Hicks Lodge near Moira, Leics. (source: Factsheet – Fireclay, BGS, 2006). As of August 2009 there are approximately 1.7 million tonnes of stockpiled fireclay at Donington Island. The planning consent expires at the end of 2012. A potential problem, however, is that at current levels of use, the stockpiles will not be depleted by the end of the consent period (source: Telephone conversation with Nigel Hunt, Minerals Planning Manager, Leicestershire County Council, 7 August 2009).

The Office for National Statistics (ONS) Mineral Extraction in Great Britain, Business Monitor PA1007 provides figures of fireclay extractors' sales by area of origin nationwide. There are no figures for Derbyshire.

Transportation

Where brick clays are worked close to brickworks, conveyor systems are utilised in many cases to transport the clay. The BGS, in their Brickclays Factsheet (2007) recognise an increasing trend towards the importation of clays from other sources into brickworks which would have previously sourced its clay from an on-site pit. This allows greater flexibility in producing different technical specifications, textures and colours. The BGS acknowledge that it is unlikely that this movement of clay will be by any other method than road and that the finished product is usually delivered to the market by road.

Brick clay is a high weight and low value commodity and as such transportation affects costs significantly. The UK is self-sufficient in brick clay and there is little or no import or export market of raw material. There is low level importation of finished bricks comprising only 1-2 percent of the total brick market even at the height of the building boom of the 1980s (source: Brick Clay: Issues for Planning, BGS, 2001).

MPS1 states in paragraph 3.2 of Annex 2 that it is generally desirable that brick clay should be extracted as close as practicable to the brickworks that it is supplied to, and that therefore consideration should initially be given to the potential for extraction of brick clay close to the

works and the potential for extensions to existing planning permissions to maintain supplies. Local supply is generally desirable in order to reduce costs and the environmental and social impacts of transportation of clay from the pit(s) to the works, as well as to maintain the investment in the factory and local employment.

All fireclay is transported by road. It has a higher value than brick clay and as such this allows longer journeys being economically feasible. Transport is an important element in the delivered price of fireclay.

Restoration

Both the Mouselow and Waingroves extraction sites are covered by planning conditions with respect to restoration. These include site profiling and planting and landscaping. With regard to the planning consent at Foxlow Tip and adjacent land at Staveley, land will be progressively restored where stockpiled clay has been removed to supply Phoenix Brickworks, Barrow Hill. Most of the site will be returned to agriculture but the area of the former tip will become a habitat to reinforce the existing 'riverside meadows' landscape.

There is concern to avoid a landscape of active and inactive extraction operations by ensuring that sites are worked comprehensively and rapidly rather than at the rate which clay is required by the market. Conversely there is a need to keep the stockpiling of clay on the extraction site to acceptable limits to minimise detriment to the environment (source: paragraph 14.6, Derby and Derbyshire Minerals Local Plan, DCC, 2000).

Planning authorities increasingly require surface mining schemes to embrace quick restoration. The short duration of extraction and time limits for restoration limits stockpiling opportunities (source: Fireclays in Ceramic Production, British Ceramic Foundation, 2002). Unless marketable fireclays can be stockpiled effectively on or off site, then they are lost after being backfilled (source: paragraph 7.52 Appendix 7 Brick Clay Issues for Planning).

Wider View

Ceramic products, with their longevity and high thermal mass, can be considered to be highly sustainable building materials. The safeguarding of clay resources suitable for the manufacture of these products is therefore considered to be a 'sustainable' goal.

The British Geological Survey is presently reviewing its 2007 guidance on mineral safeguarding. This has been commissioned by Central Government and BGS expects to submit a draft by March/ April 2010. It is unclear at the moment what the Dept. for Communities and Local Government (DCLG) timetable is for the document after that (telephone conversation with Senior Geologist, BGS, 28 January 2010).

Minerals Planning Officers at Leicestershire County Council (LCC) see no justification for delineating all of the brick clay reserves in Leicestershire, which extend to approximately half of the County. After discussion with the BGS on this issue and discussion with operators the preferred approach is to safeguard areas around existing brick clay extraction and reserves that clay operators can identify as being of potential value. They also propose to delineate buffer zones around these to avoid potential bad neighbour developments (source: telephone conversation with Minerals Planning Manager, Leicestershire County Council 26 January 2010).

Similarly, the Minerals Planning Manager, Nottinghamshire County Council, sees no justification for delineating fireclay reserves where they exist alongside coal reserves. The Minerals Planning Manager, Leicestershire County Council, echoes this and said that if one safeguards coal reserves then one also safeguards fireclay reserves. It is important to note here that not all coal reserves have economically feasible reserves of fireclay (source: Telephone conversations 26 January 2010).

The clay products industry is subject to market forces as with others. At the time of writing this paper the brick manufacturing industry is in a recession. The slowdown of the construction industry as a result of Britain's national financial problems means less demand for building products. For example, Ibstock Brick Ltd. (a major brick manufacturer) has mothballed several plants. A representative of this company stated that if the building industry picks up suddenly, there may be a shortage of products which would necessitate imports. A Hanson (part of the Heidelberg Cement Group who make bricks as well as other products) representative also stated that many staff were on short hours, half pay, or unfortunately made redundant (source: Notes of Meetings Planning Officers Society and British Ceramics Confederation, 3 and 17 December 2009).

Conclusion

There are no national, regional or county demand figures for clay production. The industry is market led and closely related to the needs of consumers. The clay products market follows trends in the construction industry. During building booms there is much demand for clay to produce bricks, tiles, terracotta pipes etc. During periods of decline of the construction industry demand reflects this with the mothballing or shut down of extraction and processing facilities.

In reflecting the issues covered by Government guidance on clay working importance is attached to maintaining essential supplies to consumers, seeking to encourage the rapid working and reclamation of sites and resisting proposals in which the stocking of clays would lead to delays in the reclamation of the site. There is a preference for clay to be stocked at the industrial site rather than the mineral site. There may be a benefit in allowing the joint working of coal and clay where this would enable clay to be worked in an efficient, economic and environmentally acceptable manner, and where the scheme is designed in such a way which avoids the sterilisation of important clay resources. These considerations are reflected in Minerals Local Plan Policy 32 which provides for the working of clay where the mineral is needed to enable the continuation of production and employment in the clay products industries, or as a raw material in the construction of waste disposal facilities. This policy approach seems to remain generally relevant.

It is not necessary to safeguard fireclay as this occurs as the seatearth with coal reserves. Thus in defining safeguarded areas of coal reserves we should take into account that they will also have a role in safeguarding fireclay. Remaining commercially viable fireclay reserves in Derbyshire are considered to be limited although some fireclay will be produced as a by-product of opencast coal extraction. There are sufficient fireclays stockpiled in Leicestershire to supply local consumers.

3 BUILDING STONE

Introduction and Background

Natural stone has been used for building and roofing purposes in the UK for over two thousand years. Potential building stones are naturally occurring rocks of igneous, sedimentary or metamorphic origin, which are sufficiently consolidated to enable them to be cut, shaped or split into blocks or slabsⁱ.

In Derbyshire, the main source of building stone is the sandstone/gritstone of carboniferous origin. Limestone is also produced in small amounts for this purpose as a by-product at some of the major limestone quarries.

The market for building stone is small but profitable and is mainly concerned with the repair and restoration of historic buildings or with the repair/extension of existing properties or new build properties and structures in areas of high environmental value, such as conservation areas where it is important to preserve and enhance local distinctiveness and local building character.

Reserves of building and roofing stone often lie in areas of high quality landscape; it is the geology that gives rise to the distinctive landscape. The need to protect the landscape will, therefore, be a significant constraint on any proposals to work this resource.

National and Regional Policy Guidance

National Policy Guidance

MPS1 (Annex 3) sets out national objectives for building and roofing stone. It seeks to encourage the re-use of building and roofing stone resources in the repair of buildings where technically feasible, to assess the need for small scale extraction of quantities of stone for the conservation and preservation of historic monuments and buildings and other structures within protected areas; to enhance the overall quality of the environment once extraction has ceased, taking account of any benefits that the site may have in terms of wildlife and geological conservation.

ⁱ British Geological Survey, Building and Roofing Stone Factsheet: March 2007

MPS1 also contains specific policies relating to building and roofing stone. It states that English Heritage and the industry should make MPAs aware of important sources of building stone that they consider should be safeguarded from other forms of development. Safeguarding will be most appropriate where the stone is believed to be of suitable quality and is scarce in terms of its technical and aesthetic properties and has been identified as having characteristics which match those required for repair or preservation purposes, including those relating to culturally important buildings.

It states that important historic quarries should be safeguarded where it can be shown that the quarry was the original source of stone used in the construction of an historic building or that the stone is technically compatible with material in the structure to be repaired and also that there are no viable alternatives available.

PPG15: Planning and the Historic Environment, refers to the treatment of historic building and the wider historic environment. This involves the sourcing of particular types of building and roofing stone.

East Midlands Regional Plan

This plan states that whilst locally won building and roofing stone is needed for use in heritage protection, this must be carefully balanced against the important requirement to protect the natural environment, particularly where this coincides with environmentally sensitive areas like the Peak District National Park.

Policy 37 (Regional Priorities for Minerals) of this plan refers to the need to indicate areas within which sites needed for land-won minerals should be safeguarded from development that would sterilise their future exploitation, including those required to maintain historic buildings and monuments or new construction that reflects local character.

Geology and Resource Data

Three main groups of building stone have been exploited in the area.

The Visean (Lower Carboniferous) Limestones were formed around 330 million years ago from an organic rich sediment, made up of the broken shells of millions of marine organisms that accumulated on the seabed in tropical or sub-tropical settings. This material is cemented together with natural calcium carbonate. Sandstones were deposited by large rivers flowing into

these shallow seas, forming large deltas. The limestones are concentrated in the north western part of Derbyshire, mainly around Buxton and the Matlock/Wirksworth area.

The Namurian (Upper Carboniferous) sandstones, known as Millstone Grit or gritstone where it is coarse grained, are also located in the north western parts of the county and were formed around 340 million years ago. A finer grained sandstone of the same age is found in eastern parts of the county, in association with the coal measures.

In essence, the Visean limestones are structurally complicated, but also massive, whereas Namurian sandstones (the Millstone Grits) are generally a more uniformly bedded stone.

The Cadeby (Permian) Limestone outcrop on the eastern side of the county is also an important source of building stone. This was deposited around 250 million years ago. All these stones and less significant local types have been used in Derbyshire for centuries and their particular characteristics have strongly influenced the pattern of traditional building.

The most important attributes of a good building stone are hardness, durability and porosity. The two most common rocks building stone rocks in Derbyshire, as described above, sandstone and limestone, are mainly composed of the minerals quartz and calcite respectively, whose contrasting properties affect the character of the whole rock. Quartz is hard and is also chemically resistant, whereas calcite is easily corroded by naturally acidic rainwater. In consequence, quartz-rich sandstones are tough and durable; by contrast, calcite rich limestones tend to corrode and crumble over time.

Sediments are composed of individual particles (grains of sand or clay, plant or shell fragments etc.). There are, therefore, initially gaps between them that are filled with water or air. Porous rocks can suffer from frost damage if they become soaked with water and then frozen, especially if the mineral grains are poorly cemented. When water in the pores turns to ice, it expands. This may cause the rock to split, and in extreme cases, it becomes a crumbling mass of fragments — an undesirable tendency in a building material.

However, the main sedimentary building stones in Derbyshire have undergone lithification, which involves the closure of voids by compaction during burial, combined with their infill by natural mineral cements. This process of cementation involves dissolution of material such as silica (SiO₂) or calcium carbonate (CaCO₃) from the sedimentary particles, followed by

reprecipitation of the same material in the voids. This process makes the rocks extremely tough and non-porous.

Most sandstone and limestone occurs in areas of high quality landscape. The need to protect the landscape will therefore be a significant constraint on any new proposals for working these reserves and should be balanced against the need for the material. In practice, operations to extract stone for building purposes are often small in scale with modest production levels, enabling their impact to be minimised.

Geological maps indicate the location of the resources. DCC, with English Heritage, has commissioned a study by Derby University to define the resources of building and roofing stone, which should be safeguarded as a result of their economic or conservation value.

Current Permissions and Production

In Derbyshire, there are ten quarries that produce stone specifically for building purposes. Larger quarries, producing mainly aggregate as their principal product, can also produce quantities of building stone to order, as an ancillary product. Detailed figures for the period 2006-2008 are set out in Table 1 below. In 2008 the quarries produced around 2800 tonnes of building stone. Production has been variable over the last few years with only 1200 tonnes being produced in 2003, before production increased in 2004 and 2005, possibly as a result of specific orders for large scale projects. Production decreased again in 2006 before picking up again.

Provision to be Met

Unlike for aggregates, a specific provision figure for building and roofing stone is not identified at the regional level and thus not cascaded into the Core Strategy. Provision for building and roofing stone is, therefore, made on the basis of specific demand.

Table 1: Building Stone Production at Derbyshire Quarries (tonnes)

Quarry	2004	2005	2006	2007	2008
Bolehill Quarry, Wingerworth	0	0	0	24	0
Dukes Quarry, Whatstandwell	1050	470	1144	1404	1042
Hardwick Hall Quarry	100	100	100	200	100
Birch Vale Quarry, Hayfield	35	50	50	50	50
Brickyard Farm, Matlock	0	0	0	1420	0
Halldale Quarry, Darley Dale	0	0	0	242	484
Hayfield Quarry	0	0	0	0	0
Mouselow Quarry, Glossop	3000	3000	0	0	0
Stancliffe Quarry, Darley Dale	613	500	570	149	1000
Highlikely Quarry, Ashover	140	62	50	50	90
Total	4938	4182	1914	3539	2766

Past, Current and Future Demand

With the notable exception of churches and bridges, stone was little used as a building material in the area until the C18th. Growing affluence followed by industrialisation, the development of canals then railways led to an increase in its use, which peaked in the 19th century during Victorian times.

Through the 20th century, natural stone was gradually substituted by other materials such as brick, clay, concrete, steel and glass, particularly in domestic housing. The main reason for this substitution is cost — particularly the cost of dressing natural stone to the required size and shape for building. Bricks and concrete blocks are much easier to make; their production is highly mechanised and, as they are of a standard size and shape, building with them is easier, and cheaper, than with stone.

Since the 1970s, however, the use of locally sourced building and roofing stone has increased, becoming an increasingly important factor in the promotion of local identity and together with the desire to create a diversity of building forms with a wider range of materials in new housing outside designated areas, the national demand for traditional building materials has increased. The market for building stone is now small but relatively buoyantⁱⁱ. There is no reason to assume that this general trend will not continue throughout the period of the Core Strategy.

Method of Working

The use of powerful explosives in extracting building stone is less likely than for aggregate because of the need to recover large, undamaged blocks from the quarry face; blasting would seriously affect the structure and size of the stone. Much quarrying of building stone today is undertaken by mechanical means. Rock is usually extracted from the face by an excavator. Black powder (a less powerful and less destructive explosive than, for example, gelignite) is used occasionally to assist with the removal of rock from the face and the quarried stone is removed from the quarry floor using an excavator and dump truck. Processing of the stone either begins at the quarry or at centralised cutting sheds.

Joint and bedding planes rarely provide perfectly shaped blocks and will require careful cutting to maximise saleable rock and minimise waste.

ⁱⁱ BGS Building and Roofing Stone Factsheet: March 2007

Large blocks are reduced in size by hammer and chisel, drilling and the use of iron wedges. Wire saws are also used to split the stone; Holes are drilled in the rock, each hole being made large enough to accommodate a pulley and the shaft to which it is attached. The wire, extending from one pulley to another, presses down against the rock between them. As the cut is deepened by the constantly moving wire, the pulleys are continuously lowered into the holes.

Reclamation

Quarries which produce building stone often produce relatively small amounts of stone over long periods and often regenerate naturally to some extent between periods of extraction. Final restoration depends on the particular characteristics of the site but usually, given their generally secluded countryside location, a variety of uses including agriculture, woodland and nature conservation is appropriate.

Transportation

The often remote location of these quarries and the volumes and form of material involved means that transportation of the stone by means other than road is often impractical and unviable. No building stone quarries are connected to the commercial rail networkⁱⁱⁱ.

The specific properties and value of building stone mean that it is often economically viable to transport it substantial distances to where it is required.

Markets

Unprocessed building stones are relatively low value commodities (although higher value than aggregates). As a result, the cost of moving them to where they are needed can soon outstrip their value. This means they tend to be produced in local quarries supplying a relatively small area.

However, should building stones be processed, by polishing and cutting, they can command a much higher price. In addition, they can also have very specific qualities which are important in the restoration and repair of prestigious buildings throughout the country. As a result, in these cases, the economics dictate that the stone can be transported longer distances to its market. For example, stone from the Dukes Quarry at Whatstandwell has been used recently in the restoration of Hereford Cathedral and in the building of the Mappa Mundi Library, also in

ⁱⁱⁱ Mineral Safeguarding areas for building stone in Derbyshire; National Stone Centre 2009

Hereford^{iv}. Halldale Quarry in Darley Dale was reopened in 2007 to provide stone for a prestigious building project in Derby^v. This prestige sector has maintained a steady rate of production in recent years, boosted by projects undertaken with Heritage Lottery Funding. The heritage repair market for building stone is also growing.

National mineral planning policy in MPS1 (2006) has emphasised the need to source locally distinctive stone for repair, extension and new build projects in sensitive areas such as conservation areas. People's evolving tastes have also assisted this growth in demand.

Environmental Impact

Small quarries with low output, characteristic of building stone extraction in the UK at the start of the 21st century, tend to be fairly 'environmentally friendly'. High explosives — which would shatter the stone — are avoided; heavy machinery is employed sparingly; and associated traffic is light due to the low output of small quarries.

Contribution to the Economy

Prices for building stone range from a few tens of pounds a tonne to several hundred of pounds^{vi}. Total sales of building stone in Great Britain in 2007 were £103 million.^{vii} Sales figures for Derbyshire are not readily available.

^{iv} Planning Application ref CM6/1008/113

^v Planning application ref CM3/0602/36

^{vi} Building and Roofing Stone Factsheet BGS, March 2007

^{vii} Product Sales and Trade PRA 26700, ONS, 2007

4 CEMENT

Introduction and Background

In the most general sense of the word, cement is a binder, a substance which sets and hardens independently, and can bind other materials together.

The most important use of cement is the production of mortar and concrete - the bonding of natural or artificial aggregates to form a strong building material which is durable in the face of normal environmental effects.

Cement should not be confused with concrete because the term cement explicitly refers to the dry powder substance. Upon the addition of water and/or additives the cement mixture is referred to as concrete, especially if aggregates have been added.

National Policy

MPG10 provides planning advice to mineral planning authorities (MPA) on the provision of raw material for the cement industry. The Guidance recognises the need for cement production facilities in terms of national economic growth. Paragraphs 2 and 3 of MPG10 state:

“The cement industry is of major importance to the national economy as it supplies an essential product to the construction and civil engineering industries. It is therefore necessary to have an adequate and continuous supply of raw material to maintain production”; and

“The Government places great importance on reducing the level of imports of building and construction material, and wishes to encourage domestic production to counter the rising import trend and to provide employment. The Government would also not wish to discourage any export opportunities that might arise. The Government therefore looks to mineral planning authorities to make provision for adequate supplies of raw material for the industry as it endeavours to meet future domestic demand”.

In terms of the location of cement plants, MPG10 states under paragraph 19:

“The availability of suitable raw materials, particularly chalk and limestone is normally the dominant locational factor in the cement industry. Market and transport considerations and the availability and cost of fuel and labour are also important. In order to be considered potentially suitable for use in cement manufacture the raw materials must not only meet fairly stringent quality requirements, but they must be capable of being exploited economically and be available in sufficient quantity to justify the high capital investment required for a modern cement works. Among the factors to be considered in this regard are: the geological structure of the deposit, the thickness of overburden, disposition relative to the water-table, cavitation, mineralisation etc. Consequently, it is only economically feasible to manufacture cement in a limited number of locations. Rising energy costs further encourage the use of raw materials with low moisture content. These costs will continue to influence the location of future plant development.”

Paragraph 58 states that MPAs should aim to maintain cement plants with a stock of permitted reserves of at least 15 years. In addition, where new investment is agreed, the plant should have a stock of permitted reserves of at least 25 years.

Cement Production

Modern cement operations are usually large-scale and long-lived. The economies of scale needed to make them viable demand long reserves of raw materials and mean that a typical plant has a production capacity of at least 750,000 tonnes per year.

Raw Materials

Three essential ingredients are needed to make cement: calcium carbonate, silica and alumina as well as a little iron. Conveniently, all these can be assembled by mixing two common rocks – limestone (for CaCO_3) and mudstone (for SiO_2 and Al_2O_3).

Modern cement plants require raw materials whose compositions are strictly regulated to ensure the correct mix of chemical ingredients. For instance, the Magnesian Limestone of Permian age found in the north-east of Derbyshire is unsuitable for cement manufacture because even relatively minor amounts of magnesium in the cement mix drastically weaken the cement. The purer limestones from the west of Derbyshire, which are of more consistent chemical composition, are therefore favoured.

To increase the proportion of silica and alumina in the cement mix, a mudstone such as shale or clay must be added to the limestone. There is usually around 10-20% mudstone in the mixture, often with other additives.

Cement Manufacture

Limestone and clay or shale are mixed together and then fired in a kiln to a temperature of about 1400C. During firing, water vapour is given off first, followed by CO₂, indicating the decomposition of first the clay/shale and then the limestone to a mixture of anhydrous compounds known as cement clinker.

On exit from the kiln, clinker is cooled from approximately 1200C to less than 150C. The clinker is conveyed and stored in dedicated silo in readiness for being milled into cement. The milling process involves the addition of gypsum (which acts as a set retardant) and a proportion of limestone filler.

The milled cement is conveyed to cement silos in readiness for despatch, either to the existing on-site bagging plant, by road going bulk tanker or to the rail despatch facilities.

With fuel representing some 35 per cent of variable costs, the need to remain competitive has led the industry to examine several alternative fuels over the past ten years. These have included used tyres, recycled liquid fuels, plastic packaging wastes, animal products (tallow and meat and bone meal) and sewage sludge pellets.

Adding water to the cement powder forms new hydrated minerals, which grow as long crystals, locking the cement and any inert particles present into a hard mass. This process is known as setting.

Production & Consumption

In 2007 UK cement consumption was 15.8m tonnes with the UK's four cement manufacturers producing 11.9m tonnes from a network of 14 plants. The annual use of cement substitutes has increased to 2.8m tonnes and imports are approximately 1.2 to 1.4m tonnes per annum.^{viii}

^{viii} http://www.cementindustry.co.uk/the_industry/profile.aspx#plantLocationMap

Based on the 2008 closure of several older, less efficient cement manufacturing kilns, UK production capacity has been reduced by approximately 1.7m tonnes per annum (this has increased in recent months to 2.8mt as a result of the mothballing – possibly permanent closure - of further kilns as a result of the recent downturn). In addition, a study of the UK cement market commissioned by Tarmac in late 2007 has indicated that demand for cement is likely to grow to 17.5m tonnes per annum by 2020, thus exacerbating the shortfall between domestic production and consumption. Whilst the recent recession has led to a decline in demand in 2008, this medium term assessment is still considered to be robust.

Derbyshire Production

Since limestone generally comprises 70-90% of the mixture, it has the greater influence on the siting of cement works.

Facilities within the plan area are;

Tunstead, Derbyshire	Tarmac	1,000,000 tpa
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There is a planning application currently outstanding for a second cement kiln at Tunstead, which, if approved would increase capacity to 2 million tonnes per annum by the end of 2013.

At Tunstead, the main raw materials to make cement - limestone and clay – are sourced on site and make up 80% of the materials required for cement making. Most of the clay required comes from the quarry in the form of slurry resulting from the washing of limestone for the production of chemical stone for industry. This is thickened to a paste and the excess water re-used in the washing plant.

Other raw materials - sand, marl, shale and mill scale - are imported from nearby sources

Facilities close to the plan area are;

Hope, Derbyshire	Lafarge Cement UK	1,300,000 tpa
Cauldron, Staffordshire	Lafarge Cement UK	930,000 tpa

Each of these quarries is located near to a supplying quarry with large reserves and so would be unlikely to need to source raw materials from the plan area.

Economic Importance

The second cement kiln proposed for Tunstead will involve £200 million of investment, the 30 month construction period will involve up to 800 construction personnel and will generate, once complete almost 60 full time jobs and approximately 40 elsewhere in the UK.^{ix}

The industry provides jobs at both skilled and semi-skilled levels for some 3,400 people and supports about 15,000 indirectly. Many of those jobs are in rural areas where employment is scarce^x.

Transport

Tunstead is rail linked, and approximately 49% of the total output is dispatched by rail.

^{ix} Tunstead Planning Application

^x http://www.cementindustry.co.uk/the_industry/profile.aspx#plantLocationMap

5 COAL

Introduction and Background

Coal is a combustible rock, formed by the alteration of dead plant material that initially accumulates as a deposit of peat at the surface which is then buried beneath layers of younger sediment. As the temperature rises due to increasing depth of burial, the peat may be sequentially altered by the process of ‘coalification’ through ‘brown coals’, which include lignite and sub-bituminous coal, to ‘black coals’ or ‘hard coals’ that comprise bituminous coal, semi-anthracite and anthracite.^{xi}

The degree of change undergone by a coal as it matures from peat to anthracite has an important bearing on its physical and chemical properties.^{xii}

The fundamental division of bituminous coal by end-use, and thus also by trade category, is into thermal or steam coal, used for burning in power stations and in other industrial and domestic uses, and coking or metallurgical coal, used in the steel industry to de-oxidise iron ore in the blast furnace.^{xiii}

There are two principle methods of extracting coal. Where coal seams are shallow, i.e. within the ‘exposed coalfield’ area, the coal can be extracted by surface mining methods; where the seams are deeper, underground methods are employed.^{xiv}

Policy

General Government Policy

In a written reply to the House of Commons on 18 November 2008^{xv} Mike O’Brien, Minister of State for Energy and Climate Change stated that “coal needs to remain an important part of our energy mix. It provides the most flexible generation (increasingly needed as back up as the percentage of intermittent renewables increases in the overall mix) and an alternative to over dependence on gas. We are supporting development of clean coal technologies including carbon capture and storage, higher efficiency processes, and co-firing with biomass. Our

^{xi} Mineral Profile: Coal, British Geological Survey, March 2007, 1.1

^{xii} World Coal Institute, The Coal Resource; A Comprehensive Overview of Coal, 2005, p3

^{xiii} Mineral Profile: Coal, British Geological Survey, March 2007, 3.1

^{xiv} Derby & Derbyshire Minerals Local Plan, Derbyshire County Council, 2002, p 89

^{xv} <http://www.publications.parliament.uk/pa/cm200708/cmhansrd/cm081118/text/81118w0028.htm#0811193000010>

ambition is to see CCS commercially deployable by 2020. The extent of coal's future use will depend on decisions by operators and technological development”.

National Planning Policy

National guidance for the extraction of coal and the disposal of colliery waste as set out in MPG3, (published in March 1999) is to ensure that such development only takes place when the best balance has been achieved between community, social, environmental and economic interests, consistent with the principles of sustainable development.

As set out in Paragraph 8 of MPG3, in applying the principles of sustainable development to coal extraction, whether opencast (an alternative term for surface mining) or deepmine, and to colliery spoil disposal, the Government believes there should normally be a presumption against development unless the proposal would meet the following tests:

- Is the proposal environmentally acceptable, or can it be made so by planning conditions or obligations?
- If not, does it provide local or community benefits which clearly outweigh the likely impacts to justify the grant of planning permission?

MPG3 also states that additional environmental tests should apply to proposals within or likely to affect areas of Outstanding National Beauty (AONBs), National Parks, Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) and Green Belt.

There is currently no Government target for annual UK coal production whether by underground or opencast mining. MPG3 states that it is for the industry to determine the level of output they wish to aim for in the light of market conditions.

MPG3 at paragraph 38 advises that Mineral Local Plans should indicate any areas where coal extraction and the disposal of colliery waste may be acceptable in principle and similarly where such development is unlikely to be acceptable or where coal resources are to be safeguarded for future working. However, the Guidance acknowledges the extent to which it will be possible to identify particular areas for working or spoil disposal, and the level of detail that can be shown in relation to possible sites, will depend upon local circumstances and the level of knowledge about the resource. MPG3 therefore suggests three alternative approaches that Mineral Planning Authorities may wish to adopt:

- Broad areas of search and/or
- The extent of the shallow coalfield area and the constraints within that area

MPG3 also advises that areas where working is unlikely to be acceptable should be indicated.

National Energy Policy

The UK became a net importer of natural gas in 2004 and is expected to become a net importer of oil by 2010. By 2020, the UK is likely to be importing three-quarters of its energy supplies. The Government has said that it does not propose to set targets for the share of total energy or electricity supply to be met by different fuels; it believes that this is a matter for the markets, reinforced by long term policy measures.^{xvi}

The Government has identified two long-term energy challenges:

- Tackling climate change by reducing carbon dioxide emissions both within the UK and abroad; and
- Ensuring secure, clean and affordable energy as we become increasingly dependent on imported fuel.

Meeting the Energy Challenge, 2007 states that England, Wales and Scotland's substantial remaining coal reserves have the potential not only to help to meet our national demand for coal and to reduce our dependence on imported primary fuels, but also to contribute to the economic vitality and skills base of the regions where they are found.^{xvii}

As evidence of the continuing role of coal in the generating mix, the operators of 75% of UK coal-fired capacity have opted to fit flue gas desulphurisation (FGD) equipment to enable their power stations to continue to operate until at least 2015 in compliance with the EU Revised Large Combustion Plants Directive, a significant increase on the total originally anticipated. There will, therefore, be a continuing market for coal. Several operators have also recently announced their interest in building new coal-fired plant, not only with state of the art cleaner burn technology from the outset but also designated to retrofit future enhancements as they come to market.^{xviii}

Additionally, in April 2009 the Government announced that up to four new coal-fired power stations will be built in Britain by the end of 2020.

^{xvi} BGS & DLCCG, Summary of Information on Coal for Land Use Planning Purposes; p5

^{xvii} DTI, Meeting the Energy Challenge, 2007; 4.27

^{xviii} BGS & DLCCG, Summary of Information on Coal for Land Use Planning Purposes; p6

Geology

The coal measures in Britain comprise a series of sedimentary rocks which were deposited around 300 million years ago during the Upper Carboniferous period (see Figure 1 below). Carboniferous Britain and northern Europe formed a low lying plain backed by newly formed mountains to the south and a shallow sea to the north, beyond present day Scandinavia. Tropical waterlogged mires developed across Britain and Ireland, and whilst coal formed across the whole area, uplift due to tectonic activity and erosion has removed much of the coal bearing sequence^{xix}.

Figure 1; Source Open University 2008

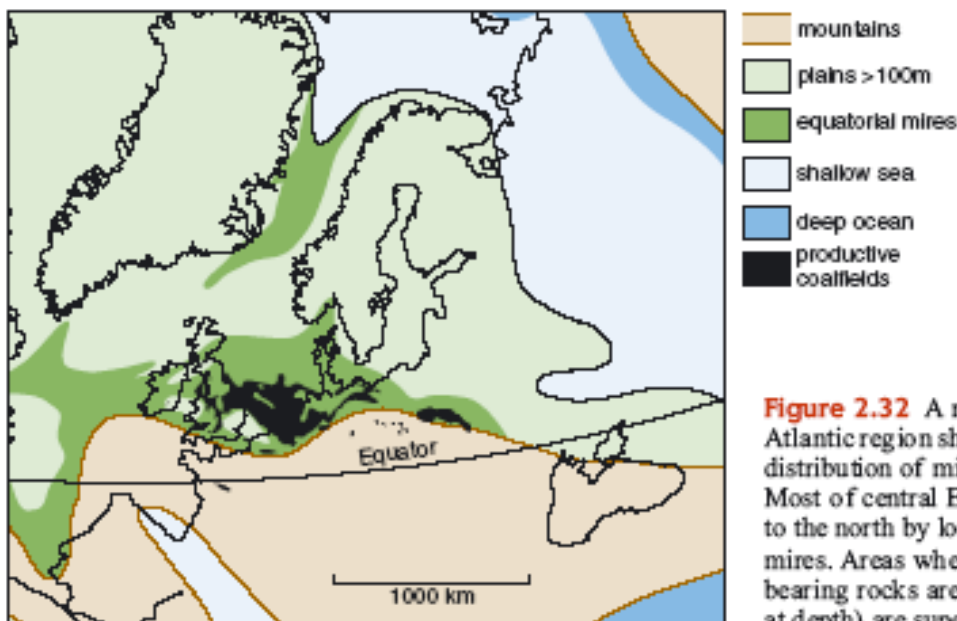


Figure 2.32 A map of the present-day North Atlantic region showing the palaeogeographical distribution of mires in Late Carboniferous times. Most of central Europe was mountainous, bounded to the north by low-lying plains and coal-forming mires. Areas where the major Carboniferous coal-bearing rocks are preserved (both at the surface and at depth) are superimposed in black.

There are two coalfield areas within Derbyshire (see Figure 3 below). The North Derbyshire Coalfield is the southern part of the much wider Yorkshire/Nottinghamshire/Derbyshire Coalfield stretching from Southern Leeds in the north to the Nottingham area in the south. The South Derbyshire Coalfield is part of the Midlands Coalfield, which extends from Staffordshire in the west through southern Derbyshire into Leicestershire.^{xx} The coal seams vary in thickness up to several metres and, in Derbyshire; around 30 seams in all are substantial enough to be worked commercially.^{xxi}

^{xix} Open University, Energy, 2008, p64-5

^{xx} Derby & Derbyshire Minerals Local Plan, Derbyshire County Council, 2002, p 89

^{xxi} Derby & Derbyshire Minerals Local Plan, Derbyshire County Council, 2002, p 89

The South Derbyshire Coalfield is a north-west to south-east trending coalfield located to the south east of Burton-on-Trent. It covers an area of 36km², and is contiguous to the west, beyond the Neverseal fault, with the East Staffordshire area of concealed coal measures. It is connected to the adjacent Leicestershire Coalfield to the east by the north-west trending Ashby anticline.^{xxii}

Coals are known from the Lower, Middle and Upper Coal Measures. The main seams are the Upper Kilburn, Block, Little, Little Kilburn, (Over & Nether) Main, Little Woodfield, Lower Main, Woodfield, Stockings, Eureka, Stanhope, Kilburn, Fireclay and Yard. The seams in the South Derbyshire Coalfield are mainly high volatile and non-caking. There is very little variation in rank across the coalfield. Seams in the South Derbyshire Coalfield are fairly shallow, typically less than 450m in the deepest parts of the coalfield.^{xxiii}

Within Derbyshire, the shallow coal measures occur in a substantial tract of the County in the area around Chesterfield, between Bolsover in the east and the Peak District National Park in the west, extending southwards, east of a line from Holymoorside to Belper, as far west as Ilkeston. Around Swadlincote, shallow coal deposits occur in the area from Burton on Trent and Repton Common in the north to Measham, in Leicestershire, in the south. Shallow coal deposits also occur in the north west of the County mainly outside the National Park boundaries between Charlesworth and Whaley Bridge, but these are not, generally, of commercial quality.^{xxiv}

There is also the underground coal resource; located to the east of the main Derbyshire shallow coal measures, below an area of Permian Limestone. Whilst there is no potential for surface extraction in this area (the thickness of the limestone beds would make this uneconomic), there may be some potential for either underground mining or alternative extraction methods such as coal gasification or coal bed methane extraction (see Oil & Gas Research Paper).

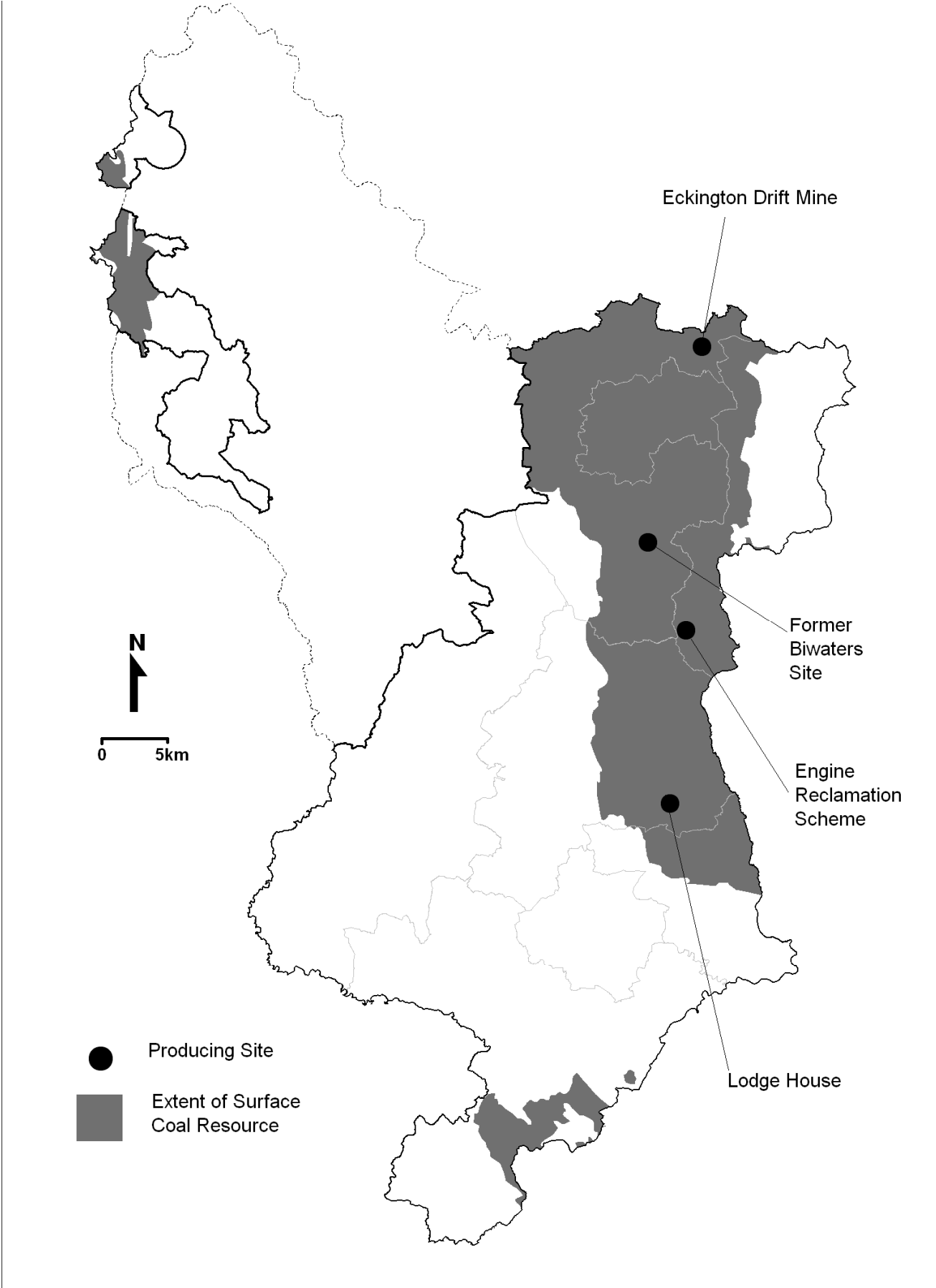
^{xxii} DTI, UK Coal Resource for New Exploitation Technologies, 2004, p57

^{xxiii} DTI, UK Coal Resource for New Exploitation Technologies, 2004, p57

^{xxiv} Derby & Derbyshire Minerals Local Plan, Derbyshire County Council, 2002, p 89

Figure 3: Derbyshire Surface Coal Resource & Operating Sites

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Production, Consumption & Reserves of Coal

Global

In 2007, the world produced some 6.4 billion tonnes of coal. 85% of this production came from seven countries, China (41.1%), USA (18.7%), Australia (6.9%), India (5.8%), South Africa (4.8%), Russia (4.7%) & Indonesia (3.4%)^{xxv}.

The quantity of coal that is traded is relatively small compared to the amount consumed as many of the large consumers have indigenous coal resources. Around 16 per cent of global coal consumption was traded with steam coal accounting for around 70 per cent of the total and coking coal for the remainder.^{xxvi}

National

Production of coal in the UK peaked in 1913 at 287 million tonnes^{xxvii}. Thereafter, output declined, due in part to the loss of export markets during and subsequent to the First World War and in part to competition from oil and other fuels. However, the UK remained a net exporter of coal until the early 1980s.

In 1994, the nationally owned British Coal Corporation was privatised. Since then, production has continued to fall; from 53 million tonnes from 32 operational mines in 1995 to 17 million tonnes from 8 operational mines in 2007^{xxviii}. Almost all of the bituminous coal produced in the UK is steam coal, in 2005, only 1.4% was described as coking coal^{xxix}.

Whilst UK coal production has fallen sharply, consumption has remained comparatively steady in recent times, falling from 76.9 million tonnes in 1995 to 62.9 million tonnes in 2007^{xxx}. The difference has been made up by an almost three-fold increase in coal imports, from 15.9 million tonnes in 1995, to 43.4 million tonnes in 2007^{xxxi}. The main sources of imports are Russia (39.9%), South Africa (29.6%), Australia (10.1%) and Columbia (7.5%)^{xxxii}.

^{xxv} BP Statistical Review of World Energy, June 2008

^{xxvi} Mineral Profile: Coal, British Geological Survey, March 2007, 5

^{xxvii} Derby & Derbyshire Minerals Local Plan, Derbyshire County Council, 2002, p 89

^{xxviii} BERR

^{xxix} Mineral Profile: Coal, British Geological Survey, March 2007, 7.4

^{xxx} BERR

^{xxxi} BERR

^{xxxii} Mineral Profile: Coal, British Geological Survey, March 2007, 7.6

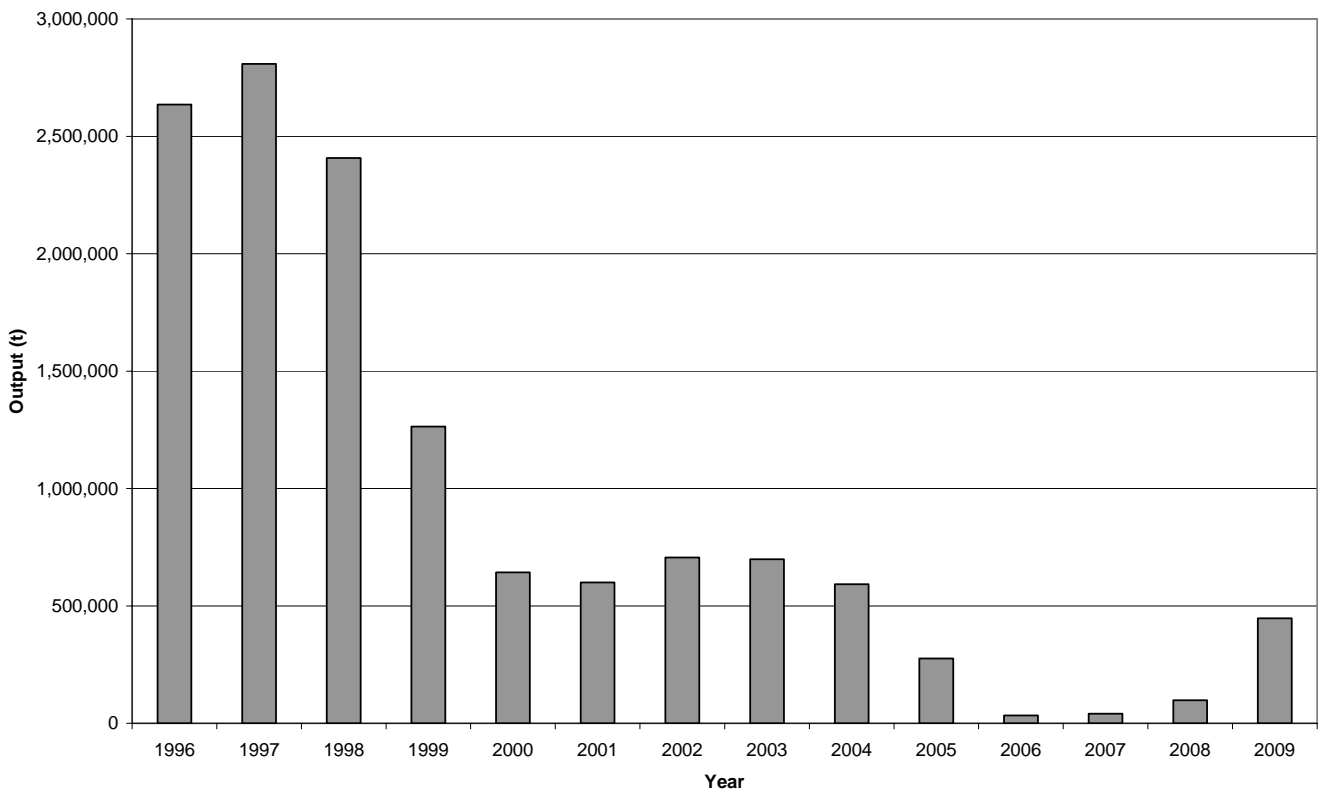
The largest use of coal within the UK is for electricity generation, consuming approximately 83.6% of the UK’s supply. Other notable uses include coke manufacture (9.4%) and blast furnaces (2.0%). Domestic heating uses approximately 1.1%.^{xxxiii}

Currently, the UK is estimated to have reserves of approximately 155 million tonnes of anthracite and bituminous coal, which equates to approximately 9 years worth of current production rates.^{xxxiv}

Derbyshire

As can be seen from Figure 2, production of coal in Derbyshire has fallen from over 2.6 million tonnes per annum in 1996 to about 0.4 million tonnes in 2009^{xxxv}, or by about 85%. Over that period, Derbyshire’s proportion of national coal production has fallen from over 5.1% to about 2.6%.

Figure 2: Derbyshire Coal Production from Surface & Underground Mining



Surface Coal Mining

The working of coal, by modern methods of opencasting, began in Derbyshire in the 1940’s, as in other coalfields, to help supply the country’s war time energy needs. Since that time a large

^{xxxiii} Commodity Balances, 2007

^{xxxiv} BP Statistical Review of World Energy, June 2008

^{xxxv} Coal Authority

proportion of the area of the shallow coalfield has been exploited with annual output reaching a peak of 2.7 million tonnes in 1956.^{xxxvi}

There are currently three operational surface coal mines in Derbyshire; Lodge House, Smalley operated by UK Coal, the Former Biwaters Works Site, Clay Cross operated by Cavendish Estates and the Engine Reclamation Site, operated by Shire Developments. Lodge House is estimated to have current reserves of 1 million tonnes, which will be extracted over a five year period, at a rate of 220 thousand tonnes per annum. The Former Biwaters Site is estimated to have reserves of 130,000 tonnes, to be extracted over an 18 month period. The Engine Reclamation Scheme is expected to extract about 500,000 tonnes of coal over a two year period.^{xxxvii}

There are areas technically amenable to opencast coal mining in the South Derbyshire Coalfield, and there have been numerous previous opencast mines within this area. However, the coalfield is of a limited size and the main constraints will be finding areas that are not urbanised and have not been previously opencasted.^{xxxviii}

There is considered to still be considerable potential for opencasting in the Yorkshire/Nottinghamshire/Derbyshire Coalfield.^{xxxix}

Underground Coal Mining

Underground coal mining in Derbyshire has declined in line with the national picture. Fifty years ago around 60,000 people were employed in over fifty Derbyshire collieries, but as the older mines working the shallower seams closed, working became concentrated on the newer mines to the east, working the deeper, more profitable seams. The last three remaining British Coal collieries at Bolsover, Markham and Shirebrook closed in 1993. It is unlikely there will be proposals for major new colliery developments in Derbyshire in the foreseeable future, although there may be some potential for the development of smaller scale mines to work the remaining pockets of coal.^{xi}

There is currently one operational underground coal mine in Derbyshire; Eckington Drift Mine operated by the Eckington Coal Partnership. It is estimated to have current reserves of perhaps

^{xxxvi} Derby & Derbyshire Minerals Local Plan, Derbyshire County Council, 2002, p 89

^{xxxvii} File information

^{xxxviii} DTI, UK Coal Resource for New Exploitation Technologies, 2004, p59

^{xxxix} DTI, UK Coal Resource for New Exploitation Technologies, 2004, p83

^{xi} Derby & Derbyshire Minerals Local Plan, Derbyshire County Council, 2002, p 89

600 thousand tonnes, which is estimated to be being extracted at a rate of 25 thousand tonnes per annum. The planning permission ends in January 2013. The site supplies the Ratcliffe-on-Soar Power Station as run-of-mine and local coal merchants as lumps and cobbles.^{xli}

The last pit in the South Derbyshire Coalfield area, Cadley Hill, closed in 1988. The outcropping part of the coalfield can be viewed as largely exhausted, leaving potential only in the west, where it joins with the East Staffordshire prospect.

Potential Sites

In January 2007, UK Coal released proposals for a surface mine at Chesterfield Canal, to the north of Staveley. This mine would have a life of some three years (coaling over two years) and produce about 530,000 tonnes of coal. No planning application has yet been received.

Exploration, Working and Reclamation

Coal reserves are discovered through exploration activities. The process usually involves creating a geological map of the area, then carrying out geochemical and geophysical surveys, followed by exploration drilling. This allows an accurate picture of the area to be built up. The area will only become a mine if it is large enough and of sufficient quality that the coal can be economically recovered. Once this has been confirmed, mining operations begin.^{xlii}

The choice of mining method is largely determined by the geology of the coal deposit.

Surface Working

After carrying out preparatory works, the operator begins excavation with the separate stripping and stocking of top soil and sub soil. These are often used to form embankments on the edge of the site to screen it and to provide noise baffles. Where possible, extraction is then phased so that only part of the whole site is disturbed at any one time, which enables phased restoration to begin. This may avoid the long term storage of soil which is detrimental to its quality. A series of 'benches' of coal is exposed by removing the over burden and the coal is then extracted; where seams of coal are covered by rock, blasting is sometimes required to loosen it. The coal is normally loaded onto lorries and taken either to the nearest coal disposal point for grading or direct to the customer.^{xliii}

^{xli} File information

^{xlii} World Coal Institute, *The Coal Resource; A Comprehensive Overview of Coal*, 2005, p4

^{xliii} Derby & Derbyshire Minerals Local Plan, Derbyshire County Council, 2002, p 90

The economics of a surface coal mine are largely determined by the market for coal within the site. Economic sites are typically worked at an overburden-to-coal ratio of between 10 to 1 and 15 to 1. Consequently, the surface mining of coal involves using large engineering plant and machinery in order to remove relatively small quantities of coal, and the impact of a surface coal operation on the environment can therefore be significant. Although surface mining is essentially a temporary use of land, lasting anything from 18 months to 10 years, some of its effects can remain for many years after working has ceased.

However, the effects can be ameliorated to some extent by the careful planning and monitoring of operations. The large amounts of overburden that have to be removed means that, through sympathetic restoration, original landforms can be recreated or more attractive ones produced over time. Furthermore, as the amount of material extracted is relatively small, sites can be restored to original levels. Some schemes can provide important local environmental benefits. Operations have, in the past, enabled despoiled land to be reclaimed or involved the removal of problems arising from underground workings such as subsidence, and dangerous emissions of methane gas. The opportunities for such environmental benefits are, however, likely to be more limited in the future as Derbyshire's stock of despoiled land, which offers the potential for surface mining diminishes.

Underground Mining

There are two main methods of underground mining: room-and-pillar and longwall mining. In room and pillar mining, coal deposits are mined by cutting a network of 'rooms' into the coal seam and leaving behind 'pillars' of coal to support the roof of the mine. Longwall mining involves the full extraction of coal from a section of the seam or 'face' using mechanical shearers.^{xliv}

The underground working of coal at major collieries creates large volumes of waste or 'spoil', the disposal of which is one of the main potential causes of environmental problems from coal mining. Increased mechanisation has resulted in large increases in the production of spoil, and despite the cessation of large scale deep mine production in Derbyshire, the remaining spoil tips are part of the legacy of the major collieries of the past. Some of the tips are covered by planning conditions to reclaim them whilst pre-date planning regulations and their reclamation will depend on arrangements to be reached with the landowners/operators/Coal Authority as appropriate. The most widespread impact of underground working, however, is caused by subsidence at the surface. A survey commissioned by ten Local Authorities in Derbyshire and

^{xliv} World Coal Institute, *The Coal Resource; A Comprehensive Overview of Coal*, 2005, p7

Nottinghamshire revealed that 33,000 houses in the two counties had been affected by mining subsidence.^{xlv}

The environmental impact of smaller drift mines is much less significant. In particular the problems of waste disposal and subsidence can virtually be avoided where the extraction of coal is not highly mechanised but is selective and limited through the use of a pillar and stall system. The waste that is produced can sometimes be deposited in the remaining void following extraction of the coal. This usually offers a satisfactory solution provided its impact on water resources is acceptable.^{xlvi}

Hybrid Methods

A recently proposed method of mining in this country is Augering, which is a mechanical form of underground mining. It can be carried out within the excavation of an opencast mine or, where the coal seams are close to the surface, by ‘trenching’. It involves boring along the coal seams adjacent to the excavation or trench by an Auger; supporting pillars of coal are left within the seam to minimise the risk of subsidence. Augering can enable additional coal to be removed, which may not otherwise be extracted due to economic or environmental constraints.^{xlvii}

Coal Preparation

Coal straight from the ground, known as run-of- mine (ROM) coal, often contains unwanted impurities such as rock and dirt and comes in a mixture of different-sized fragments. However, coal users need coal of a consistent quality. Coal preparation – also known as coal beneficiation or coal washing – refers to the treatment of ROM coal to ensure a consistent quality and to enhance its suitability for particular end-uses.^{xlviii}

Coal Transportation

The way that coal is transported to where it will be used depends on the distance to be covered. Coal is generally transported by conveyor or truck over short distances. Trains and barges are used for longer distances within domestic markets, or alternatively coal can be mixed with water to form coal slurry and transported through a pipeline. Coal transportation can be very expensive – in some instances it accounts for up to 70% of the delivered cost of coal.^{xlix}

^{xlv} Derby & Derbyshire Minerals Local Plan, Derbyshire County Council, 2002, p 92

^{xlvi} Derby & Derbyshire Minerals Local Plan, Derbyshire County Council, 2002, p 92

^{xlvii} BGS & DLCC, Summary of Information on Coal for Land Use Planning Purposes; p7

^{xlviii} Coal Institute, The Coal Resource; A Comprehensive Overview of Coal, 2005, p8

^{xlix} Coal Institute, The Coal Resource; A Comprehensive Overview of Coal, 2005, p9

By-Products

Methane gas released by coal mining is recovered and used as a process fuel on site. Methane extracted from some abandoned coal mines can be used to generate electricity but it is not used to its full potential because of logistics (see Oil & Gas Paper). An important by product of open cast coal mining is fireclay – a type of mudstone that underlies most coal seams and which is used primarily in the production of buff coloured facing brick and pavers. Fireclay production is crucially dependent on opencast coal mining, although only a small proportion of sites produce fireclay, either because they do not contain fireclay of suitable quality or because of planning restrictions (see Clay Paper). Mudstones occurring in coal-bearing strata may be of potential for use as brick clay from some opencast coal sites. Sandstone has also been recovered from some sites for use as an aggregate and as a source of dimension stone.ⁱ

Colliery spoil is produced at all deep-mine operations and consists mainly of mudstone and siltstone. It may be used as a low-grade aggregate, for example as bulk engineering fill. In 2001 783 thousand tonnes was used for fill in England and Wales out of total arisings of 8 million tonnes. Old colliery spoil is also used on a small scale in brick making, and at one site in North Wales it is used as the clay feedstock for cement manufacture. Some coal tips may be reworked to recover any remaining coal present.

Economics

International Trade

In 2004, the DTI estimated that coal would trade in a delivered price range of £1.10-1.48/GJ in 2016, which is much lower than the price at the time of £1.70/GJ and suggests that the UK coal producers will face tougher price competition than is the current situationⁱⁱ. In 2008, the price of coal reached a high of £4.40/GJ in the summer, but by the end of the year had fallen to £2.34/GJ.ⁱⁱⁱ

UK Coal Prices

The average price received by UK Coal plc, the largest coal producer in the UK was £1.92/GJ in 2008, up 18.5% from the £1.62 received in 2007. UK Coal state that their average selling price was constrained by the effect of legacy contracts.^{liii}

ⁱ BGS & DLCCG, Summary of Information on Coal for Land Use Planning Purposes; p7

ⁱⁱ DTI, UK Coal Production Outlook: 2004-16, March 2004; p3

ⁱⁱⁱ UK Coal plc, Annual Report & Accounts; Year Ended 27 December 2008

^{liii} UK Coal plc, Annual Report & Accounts; Year Ended 27 December 2008

Most coal from both surface and deep mines in the UK is produced and delivered to the rail networks at costs that are competitive with imports. The Government expects that if UK producers can obtain world market equivalent prices, profits can be generated for investment in existing deep mines and in new surface mines. Prices would have to rise considerably, however, for development of new deep mines to be economic in the UK, given the current investment climate in the industry.^{liv}

Coal Quality Issues

Most UK produced coal will fall in the high sulphur band between 1.4-2.2%, with the average around 1.7-1.8%. There is little prospect of this being significantly lowered given the lack of accessible low sulphur reserves in the UK and the high costs of washing fines to remove sulphur.^{lv}

In the current international market most coal that is traded has sulphur levels in the range 0.6% to 0.85% on a weight basis. A small proportion of coal is traded with sulphur levels close to UK norms (1.7%), and these coals tend to be traded at a discount to standard grades. Similarly there are larger tonnages of very low sulphur coals, primarily from Indonesia, which attract a premium.^{lvi}

The implication for UK mined coals is that sulphur levels are going to impact negatively on the price that they can achieve in the market place. The extent this happens will depend on the value of low sulphur in the UK and international markets and the supply of low sulphur coals, and the extent to which the retro-fitting of flue gas desulphurisation equipment onto more power stations expands the number of sites able to burn coal mined in the UK.^{lvii}

The Potential for Coal Exports

The DTI suggests that there is little prospect of the UK being able to export coal, due to the lack of purpose built coal export capacity and the high sulphur and ash content, and low CV and the expectation that UK coal prices will be too high.^{lviii}

^{liv} BERR, Energy Markets Outlook, 2007, 6.3.3

^{lv} DTI, UK Coal Production Outlook: 2004-16, March 2004; pS-1

^{lvi} DTI, UK Coal Production Outlook: 2004-16, March 2004; p3

^{lvii} DTI, UK Coal Production Outlook: 2004-16, March 2004; p3

^{lviii} DTI, UK Coal Production Outlook: 2004-16, March 2004; p5

6 CONVENTIONAL OIL & GAS

Introduction and Background

Petroleum is the term for a complex mixture of hydrocarbons and lesser quantities of other organic molecules containing sulphur, oxygen, nitrogen and some metals. Hydrocarbons are compounds that contain only hydrogen and carbon and the number of carbon atoms in a compound determines its physical properties. For example, simple compounds such as methane have boiling temperatures below 0oC and are therefore gases under ambient conditions. Larger, more complex hydrocarbon compounds are liquids under ambient conditions, whilst even larger compounds with a high molecular weight form waxy solids.^{lix}

Petroleum occurs naturally in several forms: natural gas – mainly gaseous hydrocarbons but also containing variable amounts of carbon dioxide; a liquid, called crude oil, that typically contains a very wide range of hydrocarbon compounds; and solid bitumen.^{lx}

The development of an accumulation of petroleum starts with a source rock sufficiently rich in organic matter to generate petroleum when buried and heated. This petroleum is expelled from source rocks during burial and compaction as sediments lose pore space between grains increasing the pressure within them until it is sufficient to drive the petroleum into adjacent rocks that are at a lower pressure. Once expelled from the source rock, buoyancy takes petroleum from depth up towards the surface of the earth because it is less dense than pore water and so floats on top of it in the reservoir rock. Where this petroleum becomes trapped by overlying impermeable rocks or some other feature such as a fault, oil and gas fields are created.^{lxi}

Both oil and natural gas are used primarily as fuel and make a major contribution to total energy production in the UK. Other components are used as raw materials for the petro-chemicals industry and in the manufacturing of drugs and plastics.^{lxii}

There are four main types of oil and gas development;

1. Conventional on-shore oil and gas development – extraction of petroleum or hydrocarbon oils and gases by drilling and, if necessary, pumping from land based sites;
2. Coalbed methane – extraction by drilling into un-mined coal seams to release methane;

^{lix} Open University, Energy: Fossil Fuels, Nuclear & Renewables, 2006, 3.1

^{lx} Open University, Energy: Fossil Fuels, Nuclear & Renewables, 2006, 3.1

^{lxi} Open University, Energy: Fossil Fuels, Nuclear & Renewables, 2006, 3.1

^{lxii} Derbyshire County Council, Derby & Derbyshire Minerals Local Plan, 2002; p113

3. Capture of methane from coal mines that has accumulated in, and may be freely vented from mine voids; and
4. Underground coal gasification – drilling into and subsequent controlled underground gasification of pressurised coal seams and the recovery and use of the resulting gases.

This paper is concerned with point 1. Points 2, 3 & 4 are examined in the Gas from Coal Evidence Base Paper.

Policy

Government planning policy on planning control of land based exploration, appraisal, development and the extraction of oil and gas (including gas from coal) resources in the England is set out in Annex 4 of MPS1.^{lxiii}

Conventional oil and gas development broadly consists of three phases – exploration, appraisal and production. Each phases requires a separate planning permission. MPAs should include policies in their local development documents that distinguish clearly between the three phases and should also identify any environmental and other constraints on production and processing sites, within areas that are licensed for oil and gas exploration or production.^{lxiv}

Geology

The eastern part of Derbyshire is on the western margin of the East Midlands oil province. This province comprises a series of major Carboniferous rift basins, within which sequences containing important source and reservoir rocks were deposited. Provided that undrilled traps exist, there is a good chance that further oil or gas accumulations will be found, particularly in the area east of Calow, Hardstoft and Ironville.^{lxv}

The area west of Calow, Hardstoft and Ironville is somewhat less prospective, as the main East Midlands reservoir sandstones (the Crashaw Sandstone and the Chatsworth Grit) are absent or only shallowly buried. However, oil shows occur in some wells.^{lxvi}

^{lxiii} Communities & Local Government, Minerals Policy Statement 1: Planning & Minerals, 2006, p26

^{lxiv} Communities & Local Government, Minerals Policy Statement 1: Planning & Minerals, 2006, p28

^{lxv} BGS & DOE, Mineral Resource Information for Development Plans, Derbyshire: Resources & Constraints, 1995, p14

^{lxvi} BGS & DOE, Mineral Resource Information for Development Plans, Derbyshire: Resources & Constraints, 1995, p14

Exploration, Working and Reclamation

The production of oil and gas is subject to the same planning controls applicable to any other mineral.

Exploration

The main method of determining whether an area has potential traps for petroleum is seismic exploration. Seismic sections provide images of the sub surface. Once detected, a potential trap can be mapped in detail using 3-D seismic data to define its shape and thickness of petroleum-bearing parts of the reservoir. Porosity and permeability of the reservoir rock determined by direct measurements of exploration-well samples then allow the volume of oil and gas that can be recovered to be estimated.^{lxvii}

Working

Primary recovery methods produce at best 30% of the oil present. Secondary recovery techniques that pump pressurised water and gas into the reservoir can boost the amount to about 65%, and more still can be recovered by injecting steam or chemical and biological additives into the reservoir to reduce viscosity.^{lxviii}

Environmental Impact

The environmental impact of oil and gas development is relatively limited, the most significant risk being from accidental spillage during transportation. The rig may be visually intrusive during the drilling of the well, but this stage is likely to only take a few months. Noise can also be a major factor at the drilling stage, but careful siting and distance from settlements can reduce its impact. If a find is made the rig is replaced with well head gear which is usually about 10-12 ft high. Small scale production facilities at the well head site can be relatively unobtrusive but if there is a need for a gathering station and export terminal the greater area required by these is likely to be more visually intrusive. The possibility of pollution through spillage is a potential problem which can be ameliorated by a system of banks and ditches surrounding the site to contain any pollutants. Consideration must also be given to the need to dispose of drilling mud, other residues and unwanted gas.^{lxix}

^{lxvii} Open University, Energy: Fossil Fuels, Nuclear & Renewables, 2006, 3.1

^{lxviii} Open University, Energy: Fossil Fuels, Nuclear & Renewables, 2006, 3.1

^{lxix} Open University, Energy: Fossil Fuels, Nuclear & Renewables, 2006, 3.1

Transportation

At the production stage consideration needs to be given to the proposed mode of transporting oil to the refinery, the use of rail or pipelines will reduce road traffic but the advantages need to be weighed against the economic and environmental costs of providing such facilities. Commercial quantities of gas may be piped into the National Grid system. The restoration of sites is relatively straightforward, involving the removal of all structures, equipment etc. the plugging of wells and replacement of top soils.^{lxx}

Underground Gas Storage

Set against rapidly depleting UK gas reserves, it is predicted that UK gas consumption will rise, resulting in an increasing import dependency and raising issues over security of supply. Depleted oil and gas fields can be used to store natural gas (which have a proven capability to retain hydrocarbons for millions of years) can safely provide strategic and long term capacity. However, UGS is only possible in certain geological strata and these are present in only a limited number of locations onshore in the UK. There is no known capacity in Derbyshire.

Production, Consumption & Reserves

Global

In 2007, global production of oil was approximately 81.5 million barrels of oil per day, equivalent to some 3.9 billion tonnes over the course of the year. Proved reserves of oil stand at some 1.24 billion barrels; 41.6 years of current production.

In 2007, global production of natural gas was approximately 2.94 trillion cubic metres (2.65 billion tonnes of oil equivalent). Proved reserves of gas stand at some 177.4 trillion cubic metres; 60.3 years of current production.

National

In the UK, at the end of 2007, proved reserves stand at 3.6 billion barrels of oil and 410 billion cubic metres of natural gas. Production during 2007 was approximately 600 million barrels of oil (6 years of current production) and 72.4 billion cubic metres of natural gas (5.7 years of current production).

^{lxx} Derbyshire County Council, Derby & Derbyshire Minerals Local Plan, 2002; p113

Onshore fields provide a small proportion of UK oil and gas production, the largest onshore oilfield in the UK is at Wytch Farm, Dorset which contributed 4.5 million tonnes of onshore oil produced in 1997. The majority of other commercial onshore oilfields are found in an area between central Nottinghamshire and north west Lincolnshire.^{lxxi}

Derbyshire

Derbyshire was one of the first areas in Britain to be explored for oil in an attempt to shore up the nations supplies during the First World War.

Whilst there are currently no operational conventional oil & gas developments in Derbyshire; oil and gas have been exploited in Derbyshire at Heath and Calow (gas), and Hardstoft, near Pilsley (oil).^{lxxii}

^{lxxi} Derbyshire County Council, Derby & Derbyshire Minerals Local Plan, 2002; p113

^{lxxii} Derbyshire County Council, Derby & Derbyshire Minerals Local Plan, 2002; p113

7 CRUSHED ROCK FOR AGGREGATES

Introduction and Background

Crushed rock is produced from hard rock formations, particularly limestone and sandstone, by mechanical crushing. Crushed rock resources vary greatly and the many markets for its use can be divided into two main types, depending mainly upon the physical or chemical properties of the mineral. Limestone which is valued for its specific chemical properties is used primarily in the chemical and manufacturing industries and is commonly referred to as “industrial” limestone. This is discussed in a separate paper. This paper is concerned with the limestone, which (together with a small amount of sandstone) is valued mainly for its physical properties and is used as an aggregate for construction purposes, mainly as fill material, roadstone and in the manufacture of concrete. (Quarries which produce mainly “industrial” limestone also produce some aggregate quality stone as a by-product).

National and Regional Policy Guidance

National policy guidance for minerals in MPS1 seeks to reduce the extraction of primary aggregates in favour of secondary and recycled aggregate. It specifies that MPAs should have a landbank (stock of permitted reserves) of crushed rock available at all times to last at least 10 years. In cases where the landbank is judged by the MPA to be excessive, it states that new permissions should only be given where, for reasons of specific type and quality, demand could not be met from existing reserves. In such cases, operators are encouraged to consider revocation of permissions at sites that are unlikely to be worked again. It refers to the National and Regional Guidelines for Aggregates Provision, which provides figures for aggregate provision in each region. Regional Planning Bodies use these figures in apportioning provision to each MPA in their region.

Regional policy for the East Midlands in RSS8 states that LDFs should identify sufficient environmentally acceptable sources to maintain an appropriate supply of aggregates and that there should be a progressive reduction in the proportion of aggregates from the Peak District National Park.

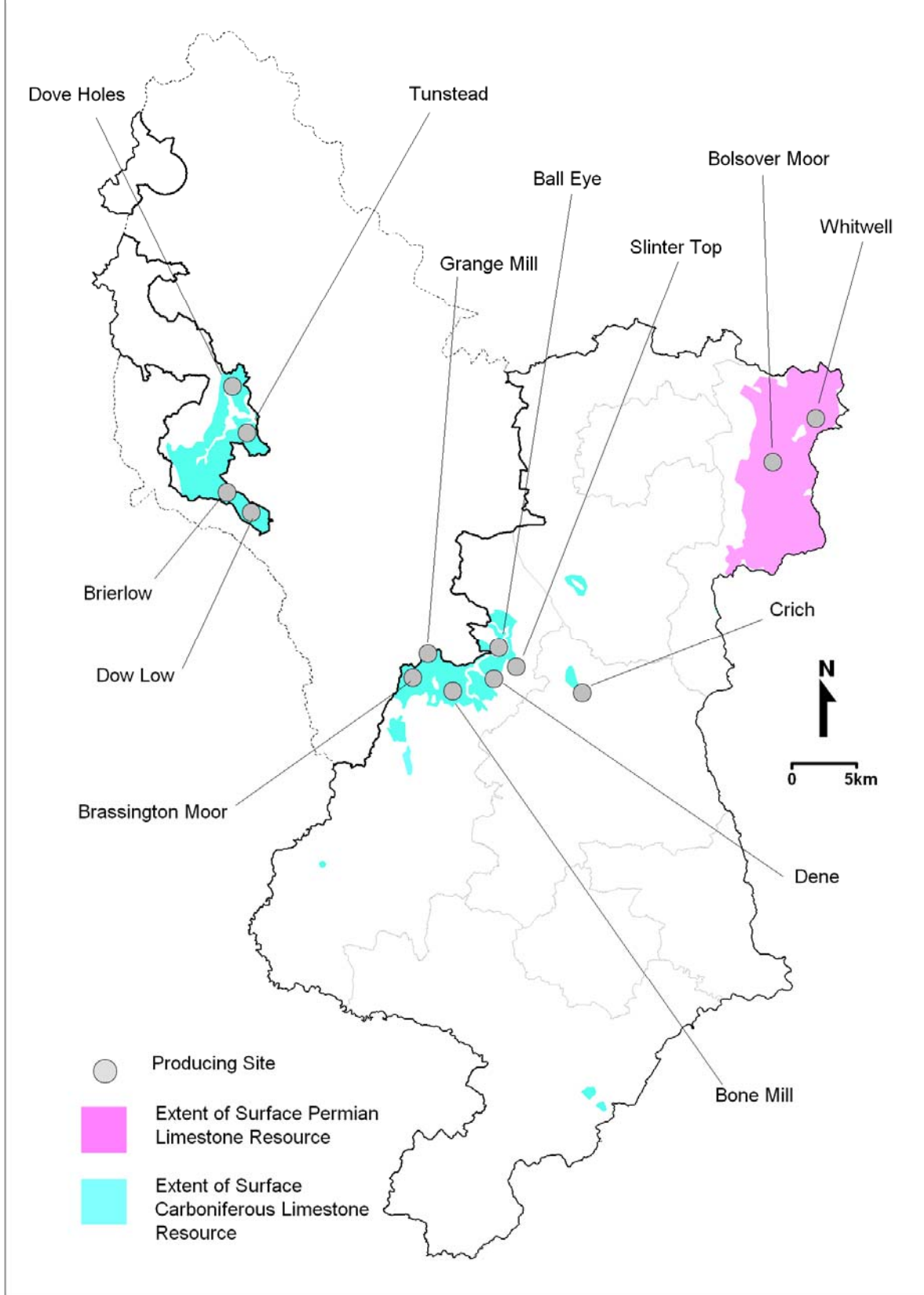
Geology and Geographical Distribution of Crushed Rock in Derbyshire

The area of Derbyshire, excluding the Peak National Park, produces the second highest annual output of limestone in England. It has long been one of the most important limestone producing areas in the country. Limestone is the name given to the group of sedimentary rocks in which the calcium carbonate content exceeds 50%.

Carboniferous limestones were laid down in shallow tropical seas in the Carboniferous period around 350 million years ago. Millions of living organisms decayed in these seas, forming an organic rich sediment, which over time became lithified (turned into rock) by natural pressures in the earth's crust to form the rock seen today. Many of the sandstones and gritstones quarried in Derbyshire were also laid down during this period by large rivers flowing in to the shallow seas and depositing their sediment within deltas. As the seas became shallower, with increased sedimentation from these rivers, together with a possible drop in sea level, vegetation was able to grow. This organic material gradually decayed and eventually formed the coal measures. Subsequent rises in sea level flooded these areas once again to form the shallow seas where the conditions once again favoured the formation of limestones, and so on.

The principal sources of Carboniferous limestones within Derbyshire are found outcropping mainly around Buxton (Woo Dale and Chee Tor Limestones) and also in the area around Matlock and Wirksworth/Cromford (Bee Low and Monsal Dale Limestones).

Sometimes, there is a significant content of calcium magnesium carbonate within the limestone. Where this occurs and where it is accompanied by a significant quantity of magnesium carbonate, the mineral is known as Dolomite. This is characteristic of the Permian Limestone which was formed slightly more recently, around 250 million years ago. This is found outcropping in the north east of the county around Bolsover and Whitwell.



Map 1: Crushed Rock (Aggregate) Resources and active quarries in Derbyshire

Whilst total resources of sandstone and gritstone within Derbyshire are large, deposits of acceptable quality for use as aggregates are much scarcer and this restricts substantially the demand for their exploitation. Relatively small amounts of this material are quarried in the north west of the county around New Mills and Hayfield.

Current Permitted Sites and Production

The following sites were producing crushed rock for aggregate in 2008;

Buxton Area

Brierlow Quarry, Buxton

Dove Holes Quarry, Buxton

Dow Low Quarry, Buxton

Tunstead Quarry, Buxton

Wirksworth/Cromford Area

Dene Quarry, Cromford

Ball Eye Quarry, Cromford

Slinter Top Quarry nr. Cromford

Bone Mill Quarry nr. Cromford

Grange Mill Quarry

Longcliffe Quarry

Crich Quarry

Bolsover Area

Bolsover Moor Quarry

Whitwell Quarry

These quarries produced a total of 9.076 million tonnes of crushed rock for aggregate in 2007. This is significantly greater than the production for the four years previous to this, which averaged 6.86 million tonnes. 2008 production of aggregate crushed rock reverted to previous recent levels at just under 7 million tonnes.

Table 1: Recent Production of Crushed Rock (Aggregate) in Derbyshire (Figures in million tonnes)

2005	2006	2007	2008
6.886	7.511	9.076	6.907

Historically, production of crushed rock for aggregate has been focused on these broad areas around Buxton, Matlock/Cromford/Wirksworth and Bolsover.

The following sites were not in production in 2008 (inactive) but could, in theory, be reactivated at relatively short notice because a new set of working conditions would not have to be agreed before recommencement of working:

Buxton Area

Ashwood Dale Quarry

Hindlow Quarry

Hillhead Quarry

Wirksworth Area

Middle Peak Quarry

Middleton Mine

Hoe Grange Quarry

Provision to be met

The Government publishes National and Regional Guidelines for Aggregates Provision. These help to ensure that an adequate and steady supply of aggregates is maintained to meet the anticipated needs of the construction industry and to reflect housing provision and growth. These are further refined, by the Regional Planning Body, to sub-regional (county) level and incorporated into the Regional Spatial Strategy for the East Midlands (RSS8). Derbyshire's annual apportionment for the period 2005-2020 is for an average annual figure of 8.74 million tonnes of crushed rock, amounting to 139.9 million tonnes for the 16 year period.

We have to determine the amount of rock that already has permission for extraction in Derbyshire. A "landbank" is a stock of valid planning permissions for the extraction of minerals

– its aim is to ensure that the reserves are a sufficient size to enable continuity of production to be maintained. The landbank is the sum of all permitted reserves with valid planning permission. It excludes dormant sites (i.e. those that cannot be worked until new conditions have been determined under the ROMP procedures) and is sometimes expressed in terms of the number of years of supply it provides. To take account of the logistics for bringing new crushed rock sites into production, the minimum landbank requirement for crushed rock in Derbyshire is established as 10 years.

Allowing for reserves of crushed rock, which it has been estimated will be available for use in the “industrial market” (366 million tonnes) and deducting dormant sites (which require new conditions before they can be worked again - 32 million tonnes), there is an estimated reserve of 828 million tonnes of rock for aggregate use with permissions in Derbyshire^{lxxiii}. The current length of the landbank for crushed rock aggregate (i.e. excluding reserves of industrial limestone) in Derbyshire is calculated as follows:

Landbank	=	828 million tonnes
Length of plan period	=	26 years
Annual Apportionment	=	8.74mt
Landbank period (Landbank ÷ annual apportionment)	=	95 years

Table 2 below sets out the surplus of the total “landbank” of permitted reserves over and above the remaining apportionment figure for the Core Strategy period. This is based on 2008 information, which is the latest available.

^{lxxiii} EMAWP Annual Report 2007

Table 2: Crushed Rock (Aggregate) Provision – Reserves and Requirements

	Crushed Rock	Million tonnes
A	Production Requirement 2005-2020 (Sub-Regional Apportionment)	139.9
B	Actual Sales 2005-2008	30.3
C (A-B)	Net Requirement 2008-2020	109.6
D	Total permitted reserves, excluding reserves in dormant sites, at 31 December 2008	1194.7
E	Less estimate of permitted reserves of “industrial” limestone (active and inactive sites)	366.8
F (D-E)	Total reserves of crushed rock for aggregate (Landbank)	827.9
G (F-C)	Surplus 2008 -2020	718.3

In determining whether any additional sites will need to be allocated for crushed rock aggregate in this plan, we have considered the current supply situation and the level of permitted reserves (i.e. those with planning permissions to extract mineral). Using information from operators, we have made an assessment of all the crushed rock quarries in Derbyshire to determine the permitted reserves that are likely to come forward in the plan period and those that, for various reasons, are unlikely to come forward. This provides a figure that identifies the reserves that can make a realistic contribution to meeting the sub-regional apportionment figure.

It is estimated from this that an estimated 311 million tonnes of this landbank is on sites that are likely to be unproductive during this plan period. However, there are over 464 million tonnes at active sites that can be worked without requiring further consent. This is still equivalent to a landbank of over 48 years.

It is clear that sufficient reserves of crushed rock are already permitted to satisfy the agreed sub-regional apportionment and beyond. As a result, there is no need for any additional provision to be made and, therefore, no justification for any allocation to be made in this strategy for the extraction of crushed rock for aggregates. Allocating more land would only seek

to frustrate the national objectives of making prudent use of finite resources, protecting the environment and reducing excessive landbanks.

Current and Future Demand for Crushed Rock

Nationally, demand for crushed rock declined significantly in 2008 as a result of the global recession causing a downturn in construction activity. For the year as a whole, sales volumes of crushed rock sales fell by 12% on the previous year and in the last quarter sales of crushed rock and sand and gravel were down 28% on the same period in the previous year.^{lxxiv}

Production figures give a good indication of demand. In Derbyshire, production of crushed rock was steady between 2003 and 2006 at around 6-7 million tonnes per year. This increased to over 9 million tonnes in 2007 but dropped again to 7 million tonnes in 2008.

The aggregates and concrete markets slowed down significantly in 2008 and this trend accelerated in the fourth quarter as the slowdown in construction activity spread well beyond the well documented housing collapse. The asphalt market started the year positively, but again declined rapidly towards the year end.^{lxxv}

Increase in demand will correspond to increase in economic activity once the current recession ends. Indications are that this could be in 2013.

The table below shows the various uses for the crushed rock produced from Derbyshire in 2008.

Table 3: How Crushed Rock Aggregate produced in Derbyshire is used, 2008 (Figures in tonnes)

Roadstone/ Asphalt	Concrete Aggregate	Other screened graded aggregate	Construction fill	Unknown	Total
1,293,175	1,670,408	2,355,322	1,664,654	4,600	6,988,159

Method of Working

Vegetation, soil and overburden is stripped initially, to reveal the bedrock. Explosives are then used to loosen the rock to enable it to be extracted, usually in a series of benches to allow for

^{lxxiv} QPA Press Release, 9 February 2009

^{lxxv} QPA Press Release, 9 February 2009

progressive working downwards. The broken rock is then transported by dump trucks or conveyor system to a processing plant, where it is crushed and graded in to various sizes for use by industry. .

Reclamation Issues

The extraction of hard rock has the potential for substantial impact on the environment. The scale of the operations and the relatively small quantities of waste material involved compared to rock means that it is not generally possible to restore land to its original levels following completion of working. This means that the configuration of the land is changed permanently, although where the operation can be designed so as to be visually contained by the existing topography in advance of working, visual impact can be limited. Progressive restoration is difficult to achieve, although an early start can often be made in the treatment of the quarry face or floor. Final restoration depends to a large extent on the depth of the quarry. In cases where the depth is not too great, the quarry floor can be restored for agriculture. Bolsover Moor Quarry is a good example of this. Built development can also be viable in such cases. Natural regeneration is usually more appropriate where the quarry is deeper and many quarries can become important areas for wildlife and natural history in such cases.

Markets

The areas referred to above provide the majority of crushed rock from Derbyshire. Around 75% of Derbyshire's limestone aggregates production is sold outside the county. The largest share of these exports is to the North West Region (35% of total production). 15% of total production is sold to other counties within the East Midlands and 25% to more distant markets notably the Yorkshire and Humberside, the West Midlands and the East of England regions. ^{lxxvi}

Transportation

In 2005, transport of the mineral by road was predominant, with 61% being transported by this means; all transportation of Derbyshire mineral within the East Midlands Region was by road. 39% of all crushed rock produced in Derbyshire was transported by rail or water. This was to

markets outside the East Midlands Region, mainly to the North West and the Yorkshire and Humberside regions.^{lxxvii}

Contribution to the Economy

The extraction of rock provides benefit to the economy in terms of the supply of the material from the region and the direct employment at the quarry as well as indirect employment mainly through the use of haulage contractors.

The mining, energy and water supply industries provide employment for 1.5% of Derbyshire's residents^{lxxviii}. This proportion is half as much again as the national average, but way below the 1991 figure, which was around 10% of employment.

The main reason for this dramatic change was the final round of Derbyshire colliery closures, which occurred in the early 1990s.

The largest proportions of mining, energy and water supply workers are now found in the limestone quarrying areas around Buxton and Wirksworth^{lxxix}.

^{lxxvii} EMAWP Annual Report 2005

^{lxxviii} 2001 Census Atlas of Derbyshire

^{lxxix} 2001 Census Atlas of Derbyshire

8 GAS FROM COAL

Introduction

The coalification process, whereby plant material is progressively converted to coal, generates large quantities of methane-rich gas which are stored within the coal.^{lxxx}

Gas can be used for electricity generation or supplied to local industry for use in oilers and kilns.

There are currently four main ways in which gas can be extracted from coalbeds;

- Coal Mine Methane Extraction (CMM)
- Abandoned Mine Methane Extraction (AMM)
- Virgin Coalbed Methane Extraction (VCBM)
- Underground Coal Gasification (UCG)

Coal Mine Methane

Methane drained from working mines, known as Coal Mine Methane (CMM), has been exploited in the UK since at least the 1950s. The majority of currently operational coal mines use this technology, either to generate electricity or heat. There is potential to increase the exploitation of CMM in the UK but this is mainly a question of economics.^{lxxxii}

Abandoned Mine Methane

Methane drained from abandoned mines, known as Abandoned Mines Methane (AMM), is a methane-rich gas that is obtained from abandoned mines by applying suction to the workings.^{lxxxiii}

Virgin Coalbed Methane

Virgin Coalbed Methane (VCBM) is produced via boreholes from unworked coal seams^{lxxxiiii}. The methane is absorbed into the solid coal matrix and is released when the coal seam is depressurised.^{lxxxv}

^{lxxx} <http://energy.usgs.gov/factsheets/Coalbed/coalmeth.html>, accessed 24/02/2010

^{lxxxii} DTI, UK Coal Resource for New Exploitation Technologies, 2004

^{lxxxiii} DTI, UK Coal Resource for New Exploitation Technologies, 2004

^{lxxxiiii} BGS & CLG, Mineral Planning Factsheet, Coal & Coalbed Methane, 2006, p2

^{lxxxv} http://en.wikipedia.org/wiki/Coal_bed_methane_extraction, accessed 25/02/2010

Underground Coal Gasification

Underground Coal Gasification (UCG) is the process whereby the injection of oxygen and steam/water via a borehole results in partial in-situ combustion of the coal to produce a combustible gas mixture. This product gas is then extracted via a producing well for use as an energy source. The technique has the potential to provide a clean and convenient source of energy from coal seams where traditional mining methods are impossible or uneconomic.^{lxxxv}

Policy

Government planning policy on planning control of land based exploration, appraisal, development and the extraction of oil and gas (including gas from coal) resources in the England is set out in Annex 4 of MPS1.^{lxxxvi}

Regarding CBM, MPS1^{lxxxvii} states that local development document policies should indicate that where initial proposals are environmentally acceptable and accord with the principles of sustainable development, planning permission might be granted for the initial hub of exploration wells, subject to their removal and restoration, if gas is not found in commercially viable quantities (or they are not needed to keep pumping water to protect production from an adjoining gas area). However;

- this does not extend to the later approval of detailed schemes for production from those wells should the occasion arise
- options for the further development of the area should be presented for consideration in principle at the same time, to ensure that the immediate and potential longer-term environmental impacts of the development are understood by the MPA and that the applicant is aware of the risk of a subsequent refusal of planning permission
- further hubs of wells for the exploration, appraisal or later production phases will require separate applications and permissions on the same basis, supported where necessary by an environmental statement (or supplementary statement) related to the further development for which permission is sought

The industry should therefore discuss its proposals fully with the MPA well before a formal planning application is made, so that all the options and longer-term issues can be properly considered.

^{lxxxv} Communities & Local Government, Minerals Policy Statement 1: Planning & Minerals, 2006, p33

^{lxxxvi} Communities & Local Government, Minerals Policy Statement 1: Planning & Minerals, 2006, p26

^{lxxxvii} Communities & Local Government, Minerals Policy Statement 1: Planning & Minerals, 2006, p32

MPAs should identify in their LDDs the extent of the coalfield with reserves at depths below the surface of between 200 – 1500m and of areas which are licensed for CBM by the Coal Authority. The LDDs should also list the principal constraints likely to affect any proposed production and processing sites within those areas.

As methane is a potent greenhouse gas MPAs in coalfield areas should, encourage capture and use by including appropriate policies in their development documents.^{lxxxviii}

Geology^{lxxxix}

There are two coalfield areas within Derbyshire. The North Derbyshire Coalfield and the South Derbyshire Coalfield.^{xc} The coal seams vary in thickness up to several metres and, in Derbyshire; around 30 seams in all are substantial enough to be worked commercially.^{xcii}

Within Derbyshire, the shallow coal measures occur in a substantial tract of the County in the area around Chesterfield, between Bolsover in the east and the Peak District National Park in the west, extending southwards, east of a line from Holymoorside to Belper, as far west as Ilkeston. Around Swadlincote, shallow coal deposits occur in the area from Burton on Trent and Repton Common in the north to Measham, in Leicestershire, in the south. Shallow coal deposits also occur in the north west of the County mainly outside the National Park boundaries between Charlesworth and Whaley Bridge, but these are not, generally, of commercial quality.^{xcii}

There is also the underground coal resource; located to the east of the main Derbyshire shallow coal measures, below an area of Permian Limestone. Whilst there is no potential for surface extraction in this area (the thickness of the overlying limestone beds would make this uneconomic), there may be some potential for either underground mining or alternative extraction methods such as coal gasification or coal bed methane extraction.

^{lxxxviii} Communities & Local Government, Minerals Policy Statement 1: Planning & Minerals, 2006, p33

^{lxxxix} See the Coal Evidence Base Paper for a more detailed picture of the coal resource.

^{xc} Derby & Derbyshire Minerals Local Plan, Derbyshire County Council, 2002, p 89

^{xcii} Derby & Derbyshire Minerals Local Plan, Derbyshire County Council, 2002, p 89

^{xcii} Derby & Derbyshire Minerals Local Plan, Derbyshire County Council, 2002, p 89

Potential for Gas from Coal Extraction in Derbyshire

South Derbyshire Coalfield

There are no working mines within the South Derbyshire Coalfield and therefore no potential for CMM. AMM and VCBM prospects are poor due to low measured seam methane contents of only 1.3m³/tonne of coal.^{xciii}

North Derbyshire Coalfield

AMM projects have been initiated at several sites in the area, indicating good potential. The VCBM prospects are poor however, due to the relatively low seam gas contents and uncertainty over the permeability of the coals.^{xciv}

Underground Coal Gasification

The DTI report^{xcv} states that the resource criteria for UCG includes coal seams more than 2m thick at depths of between 600m and 1200m. This would suggest that there is no potential in Derbyshire. However the BGS^{xcvi} notes that there have been recent commercial-scale UCG operations in Australia at much shallower depths than those suggested by the DTI (up to 30m^{xcvii}).

Carbon Dioxide Sequestration

Carbon Dioxide sequestration onto coal is a technology that has been proposed as a greenhouse gas mitigation option. Carbon Dioxide has an affinity to be absorbed onto coal and this affinity is greater than that of methane. Therefore the Carbon dioxide could be used to enhance coalbed methane production by displacing the methane from sorption sites on the coal. Again however, the issue of coalbed permeability needs to be overcome, in addition, the most preferential area for carbon dioxide sequestration occurs at depths in excess of 1200m, ruling out any potential in Derbyshire.^{xcviii}

^{xciii} DTI, UK Coal Resource for New Exploitation Technologies, 2004, p64

^{xciv} DTI, UK Coal Resource for New Exploitation Technologies, 2004, p84

^{xcv} DTI, UK Coal Resource for New Exploitation Technologies, 2004

^{xcvi} BGS & CLG, Mineral Planning Factsheet, Coal & Coalbed Methane, 2006, p8

^{xcvii} http://en.wikipedia.org/wiki/Underground_coal_gasification, accessed 25/02/2010

^{xcviii} DTI, UK Coal Resource for New Exploitation Technologies, 2004, p68

Exploration, Working and Reclamation

Coalbed Methane Developments

To economically retrieve reserves of methane, wells are drilled into the coal seam, the seam is dewatered, then the methane is extracted from the seam, compressed and piped to market. The goal is to decrease the water pressure by pumping water from the well. The decrease in pressure allows methane to desorb from the coal and flow as a gas up the well to the surface.^{xcix}

MPS1 states that CBM developments do not have the same discrete phases of exploration, appraisal and production as conventional oil and gas developments. Exploration and appraisal is a single process. The same wells that have been used for exploration/appraisal will be used, as soon as possible, for production, though there may be a necessary delay because of the need for dewatering.^c

Development of a coalbed methane production area usually involves an incremental approach where groups of new wells will be added to a “hub” of wells already in production. This allows the knowledge gained in the drilling and completion of wells to be used to the maximum effect in the drilling of adjacent wells.^{ci}

The main environmental impacts associated with CBM development are similar to those for conventional oil and gas. However, particular attention should also be paid to the abstraction of any groundwater and its impacts, as well as the disposal of water produced during well stimulation and production of gas.^{cii}

Coal Mine Methane & Abandoned Mine Methane

Methane escapes from coal seams during the working of mines and can present explosion and health hazards. Therefore working mines are ventilated, and methane is sometimes extracted and used for energy production usually for the operation of the mine itself. On abandonment or closure of the mine, if the workings do not become flooded, methane may accumulate in residual voids from which it can potentially be extracted. In some cases, methane escaping naturally from such voids may cause a danger to property or health. In such cases it is

^{xcix} http://en.wikipedia.org/wiki/Coal_bed_methane_extraction, accessed 25/02/2010

^c Communities & Local Government, Minerals Policy Statement 1: Planning & Minerals, 2006, p32

^{ci} Communities & Local Government, Minerals Policy Statement 1: Planning & Minerals, 2006, p32

^{cii} Communities & Local Government, Minerals Policy Statement 1: Planning & Minerals, 2006, p32

necessary to vent the gas in a controlled manner. In either circumstance, it may sometimes be economic to recover and use the gas, for example for local electricity generation.^{ciii}

Underground Coal Gasification

In the UCG process, injection wells are drilled into an unmined coal seam, and either air or oxygen is injected into the cavity. Water is also needed and may be pumped from the surface or may come from the surrounding rock. The coal face is ignited, and at high temperatures (1,500 kelvins) and high pressures, this combustion generates hydrogen, carbon monoxide, carbon dioxide, and minimal amounts of methane and hydrogen sulfide.^{civ}

In terms of environmental impacts; UCG eliminates the need for mining which results in a number of environmental benefits including the elimination of solid waste discharge and reduction in emissions as no coal is brought to the surface and the gas can be processed to remove its CO₂ content.^{cv}

The reduction of solid waste is a major advantage of UCG over traditional coal mining, where large quantities of coal ash, oxides and waste rock need to be dealt with. In the case of UCG, this waste is either avoided or contained underground.

The impact of UCG on ground-water systems has been highlighted as an environmental concern. Organic and often toxic materials remain in the underground chamber after gasification and therefore are likely to leech into the ground water, should inappropriate site selection occur.

A further potential environmental concern is that of substantial subsidence due to removal of the coal seam. While it may leave the ash behind in the cavity, the depth of the void left after UCG would be significantly more than other methods of coal extraction. Subsidence is likely to be more of a problem if gasification occurs in a shallow coal seam, closer to the surface but is less of a problem if the seam is deep.^{cvi}

^{ciii} Communities & Local Government, Minerals Policy Statement 1: Planning & Minerals, 2006, p33

^{civ} <https://www.llnl.gov/str/April07/Friedmann.html>, accessed 25/02/2010

^{cv} <http://www.ucgp.com/key-facts/basic-description/>, accessed 25/02/2010

^{cvi} <https://www.llnl.gov/str/April07/Friedmann.html>, accessed 25/02/2010

Production, Consumption & Reserves

Global

In 2007, global production of natural gas was approximately 2.94 trillion cubic metres (2.65 billion tonnes of oil equivalent). Proved reserves of gas stand at some 177.4 trillion cubic metres; 60.3 years of current production.

National

In the UK, at the end of 2007, proved reserves of natural gas stood at 410 billion cubic metres. Production during 2007 was approximately 72.4 billion cubic metres of natural gas (5.7 years of current production).

Derbyshire

The DTI, in 2004^{cvi} published research into the UK for resource for new exploitation technologies. It identified two sites in Derbyshire that were utilising AMM at that time. One other site (Whitwell) received planning permission after the publication of the study;

- Shirebrook, AMM extracted from a former colliery drift fuels an on-site power station used for electricity generation. Currently dormant.
- Markham, AMM is produced from one of the former colliery shafts and supplies gas for industrial heat applications at Coalite Chemicals and Coke Smokeless Fuels plant. Inactive since March 2007, unlikely to reopen as the seams have been flooded.
- Former Whitwell Colliery, AMM. Currently operational.

^{cvi} DTI, UK Coal Resource for New Exploitation Technologies, 2004

9 INDUSTRIAL LIMESTONE

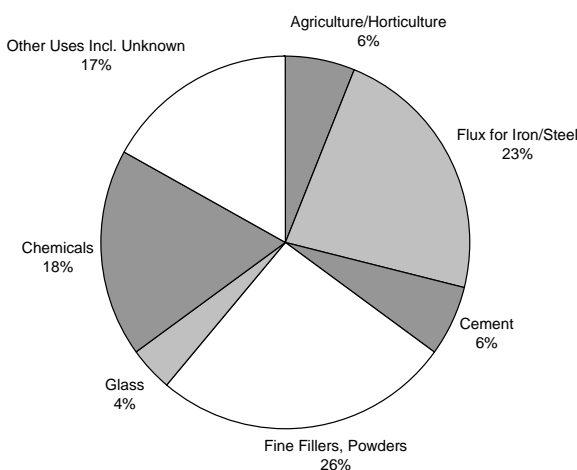
Introduction and Background

One of the most widely used industrial minerals is calcium carbonate, which occurs in many natural forms. However, it is most familiar as the main constituent of limestone. Limestone is widespread and relatively inexpensive, so it has long been used as a building stone, as well as for making other building materials (e.g. lime mortar and for aggregates). The physical and chemical properties of limestone, and its availability, mean that it has countless everyday applications.^{cviii}

This Evidence Base Paper is concerned with the use of limestone for industrial purposes. Whilst the use of limestone for aggregates (see Crushed Rock Paper) depends primarily on the physical properties of the rock, the supply of industrial limestone depends primarily on its chemical properties.^{cix}

The chemical properties of Industrial Limestone make it a valuable mineral for a wide range of uses. It is used in the agricultural and steel industries, in cement manufacturing, sugar refining and glass making and is used as a filler in a range of manufactured products such as paints, plastics, rubber, sealants, pharmaceuticals, toothpaste etc.^{cx}

Use of Industrial Limestone Produced in Derbyshire 2008^{cx}



^{cviii} The Open University, Bulk Minerals for Building and Industry, 2006, p61

^{cix} Derbyshire County Council, Derby & Derbyshire Minerals Local Plan, 2005; p83

^{cx} Derbyshire County Council, Derby & Derbyshire Minerals Local Plan, 2005; p83

^{cx} EMRAWP

Throughout this paper, references to Derbyshire (unless stated otherwise) includes Derby City and the part of Derbyshire County outside the Peak District National Park.

Specification

The term 'high purity' is normally defined in terms of calcium carbonate content, with > than 96-97% calcium carbonate defining high purity limestone and > 98-98.5% very high purity limestone. However for many applications it is the level, or absence, of the specific impurities present or the consistency or colour of the limestone which are of paramount importance, rather than the absolute values for calcium carbonate; e.g. use for cement and some insulating products may permit an appreciable content of silica and aluminium but may not tolerate a high magnesium or fluorine content. On the other hand, for many industrial uses such as glass making, sugar refining and metallurgical fluxes, a high chemical purity of the limestone is imperative, but even so, tolerance of specific impurities varies (e.g. glass making has a higher tolerance for leads than use in animal feed or pharmaceuticals).^{cxii}

For these reasons, the term 'industrial' limestone is more appropriate than 'high purity'.

Relationship with Aggregate Limestone

There are no fundamental reasons why industrial quality limestone cannot be used for aggregate purposes. The aggregates uses of limestone can therefore make calls upon permitted reserves of limestone which could, more appropriately be used for "industrial" purposes. Bearing in mind the relatively limited occurrence nationally of limestone which can be used for industrial purposes of particular qualities and the frequent problem of non-availability of alternative source materials, there is a strategic need to minimise the use of this material for aggregate purposes. In recent years it has been the Mineral Planning Authority's policy that planning permission for the working of industrial limestone will be permitted only where the mineral produced is intended primarily for non-aggregate uses.

However, the extraction of non-industrial quality limestone at industrial limestone quarries is inevitable. Current policy (MP25 in the Minerals Local Plan) seeks to minimise production of this aggregate limestone, bearing in mind the excessive landbank for crushed rock.

^{cxii} BGS & DoE, Mineral Resource Information for Development Plans, 1995; p7

Method of Working

Extraction

Carboniferous limestones usually occur in thick, uniform beds which are structurally simple, and once the initial investment in infrastructure (which can be high) is made, are relatively inexpensive to extract.^{cxiii}

The price of limestone is largely governed by the cost of extraction, processing and transportation. The high capital costs of quarrying, due to the high investment in machinery to work and process the stone, has led to the development of large quarries that can produce large outputs over long periods of time. Because transport costs may exceed production costs, it is important for the quarry to have good road, rail and/or water transport links and for the most appropriate form of transportation to be used.^{cxiv}

Alternatives/Recycling

Because of its intrinsic properties as a neutralising agent and/or as a source of alkali, there are few opportunities for substitution or recycling of limestone used in the manufacture of chemicals. However, calcium carbonate is recovered from the sugar refining process and sold for agricultural purposes.^{cxv}

Limestone and chalk powders used as fillers compete with other minerals such as kaolin or talc. Because limestone and chalk powders tend to be of lower cost relative to those other minerals, limestone has tended to increase its market share relative to many other minerals in the filler market. Recycling of paper and some plastics allows the mineral component to be recovered. Recycling glass also recycles lime and soda ash used in their manufacture.^{cxvi}

^{cxiii} BGS & DoE, Mineral Resource Information for Development Plans, 1995; p7

^{cxiv} BGS & ODPM, Industrial Minerals: Issues for Planning, 2004; p174

^{cxv} BGS & ODPM, Industrial Minerals: Issues for Planning, 2004; p174

^{cxvi} BGS & ODPM, Industrial Minerals: Issues for Planning, 2004; p174

Geology & Geographical Distribution in Derbyshire

Although limestones are widely distributed in England, many are unsuitable for industrial use because of their chemical and/or physical properties. The only important resources of industrial limestone in England are the Carboniferous Limestone and Cretaceous-age Chalk.^{cxvii}

Within Derbyshire, the three main areas of Limestone production are the Buxton area of Carboniferous Limestone, from Dove Holes to Earl Sterndale, the Wirksworth area of Carboniferous Limestone, from Longcliffe to Crich, and the Whitwell/Bolsover area of Permian Limestone, east of a line from Barlborough to Hardwick Hall. The limestone resources in these areas include a variety of qualities of stone supplying a very wide range of markets. All these areas produce limestone for the industrial markets.^{cxviii}

Carboniferous Limestones

Some of the purest limestones in Britain are found in the Carboniferous Limestone areas – over 99% calcium content in places. However, the quality of deposits can vary significantly; the geology is often complicated by igneous rocks, faults, mineral veins and, in places, severe chemical alteration (dolomitisation or silicification). When the market for limestone depends on very precise specifications these variations can be critical.^{cxix}

Carboniferous limestones in Derbyshire are generally pale coloured, massive or thickly bedded limestones which were deposited in a relatively shallow water environment. They are compositionally uniform over wide areas and are often of very high purity (>98% Calcium Carbonate). The carboniferous limestones are also resources of good quality aggregate materials.

The Bee Low Limestones, a unit of consistently very high purity and uniform chemistry, provide most of the Carboniferous limestone quarried in Derbyshire. The formation typically contains limestones with only small proportions of magnesium oxide (MgO), silica, alumina, iron and other impurities. The purity is locally downgraded in beds adjacent to clay bands and igneous horizons (basaltic lavas and tuffs) which are locally inter-bedded with the limestone. The zone of alteration is, however, usually less than 2m and impurities rarely total more than 5% of the rock. The Bee Low Limestones are extensively dolomitised in the Matlock-Wirksworth area,

^{cxvii} BGS & ODPM, Industrial Minerals: Issues for Planning, 2004; p171

^{cxviii} Derbyshire County Council, Derby & Derbyshire Minerals Local Plan, 2005; p83

^{cxix} Derbyshire County Council, Derby & Derbyshire Minerals Local Plan, 2005; p83

containing high levels of magnesium oxide, mostly in the range 18.0-20.5% MgO. In the past, they have been valued for their MgO content and between 1963 and 1966 were used for the extraction of magnesium metal (Mg). They are not currently worked for this purpose.^{cxx}

The Bee Low Limestones generally produce strong, low porosity, aggregate materials, although where dolomitised in the Matlock-Wirksworth area they are relatively porous and weak. However, even the poorest quality limestone aggregate from Derbyshire is harder and less porous than, for instance, most Jurassic limestone or chalk aggregates. The Bee Low Limestones are also the most important source of industrial limestone with a range of applications, including lime production, soda ash manufacture, flue gas desulphurisation, glassmaking and as a filler in paint, rubber and plastics.^{cxxi}

The beds immediately beneath the Bee Low Limestones, termed the Woo Dale Limestones are not widely exposed. They are also of high purity and together the two formations comprise over 300m (thickness) of industrial limestone resources. The Woo Dale Limestones are slightly dolomitised in the Buxton area, but MgO values are generally less than 1%. Purity remains high throughout the uppermost 100m of strata, but lower in the sequence the unexposed beds contain limestones with higher silica, alumina, iron and sulphur contents.^{cxxii}

The limestone sequence above the Bee Low is much more chemically varied and somewhat less pure. The Monsal Dale and Eyam Limestones both contain cherty and shaly beds and the Monsal Dale Limestones also contain several volcanic (lavas and tuffs) units which make up a large proportion of the total thickness in the Matlock-Ashover area. Both limestone formations produce good quality aggregates, and are quarried for crushed rock aggregates used in concrete and road construction (except road surfacing). The resource potential of the Derbyshire limestones is locally affected by mineralisation. Flourite-barytes-lead mineralisation is mostly confined to veins and replacement bodies in the Matlock-Ashover-Wirksworth area. However, the effects are localised and generally restricted to the width of the mineral vein or body.^{cxxiii}

^{cxx} BGS & DoE, Mineral Resource Information for Development Plans, 1995; p8

^{cxxi} BGS & DoE, Mineral Resource Information for Development Plans, 1995; p8

^{cxxii} BGS & DoE, Mineral Resource Information for Development Plans, 1995; p8

^{cxxiii} BGS & DoE, Mineral Resource Information for Development Plans, 1995; p8

Permian Limestones

Where there is a significant content of calcium magnesium carbonate, or magnesium carbonate, the mineral is known as 'dolomite'. The Permian Limestone has particular importance as a source of high grade dolomite which is important in steel manufacturing. It is worked for these purposes in the Permian Limestone area of north-east Derbyshire.^{cxxiv}

The Permian Limestone is the main source of dolomite in Britain. It consists of dolomites, dolomitic limestones and limestones, and extends in a narrow belt, almost continuously from Durham to Nottinghamshire. A small part of the outcrop (the Cadeby Formation) occurs in the north-east of the county, east of Bolsover.^{cxxv}

The Permian Limestone is highly variable, both regionally and locally, in its physical, mechanical and chemical properties and thus its suitability for particular applications. The formation is quarried for a range of construction uses, mostly for fill and sub-base material, and, less commonly, for concrete aggregate and coated roadstone. Some is used for block making and for building stone. Fines are sold for agricultural purposes. It is inferior to Carboniferous limestones as a source of aggregate because of its variable character, and generally lower strength and higher porosity. Impurities such as silica, iron and alumina are a prime consideration in the selection of dolomite for its various industrial applications. At Whitwell Quarry, the upper part of the dolomite has a sufficiently low silica and iron oxide content for it to be used, after processing, as a refractory raw material and as a flux for steelmaking. The underlying dolomite is utilised for a range of construction applications.^{cxxvi}

^{cxxiv} Derbyshire County Council, Derby & Derbyshire Minerals Local Plan, 2005; p83

^{cxxv} BGS & DoE, Mineral Resource Information for Development Plans, 1995; p8

^{cxxvi} BGS & DoE, Mineral Resource Information for Development Plans, 1995; p9

Production, Consumption & Reserves

National Production, Consumption & Reserves

Total national demand for limestone for industrial and agricultural use was 7.3 million tonnes in 2002.^{cxxvii}

There is no national or regional framework for demand forecasts for industrial limestone.

There are no national level figures for total permitted reserves of industrial limestone, although permitted reserves at most major sites are believed to be extensive. There are also reserves of limestone that would be suitable for industrial use at quarries that do not produce limestone for non-aggregate purposes.^{cxxviii}

Derbyshire Production & Reserves

During 2008, 3.1 million tonnes of industrial limestone and dolomite was produced in Derbyshire.

At the end of 2008, Derbyshire had estimated reserves of some 322 million tonnes of industrial limestone, equivalent to approximately 104 years of production at current rates.^{cxxix}

Derbyshire Industrial Limestone Quarries

In 2008, a total of nine quarries produced industrial limestone within Derbyshire (See Map 1), most of these quarries also produce limestone for aggregate use and in some cases industrial limestone production is quite low;

- Ashwood Dale
- Bolsover Moor (although majority of production aggregate)
- Bone Mill
- Brassington Moor
- Dene (although majority of production aggregate)
- Dow Low
- Grange Mill
- Tunstead
- Whitwell

^{cxxvii} BGS & ODPM, Industrial Minerals: Issues for Planning, 2004; p168

^{cxxviii} BGS & ODPM, Industrial Minerals: Issues for Planning, 2004; p173

^{cxxix} EMRAWP

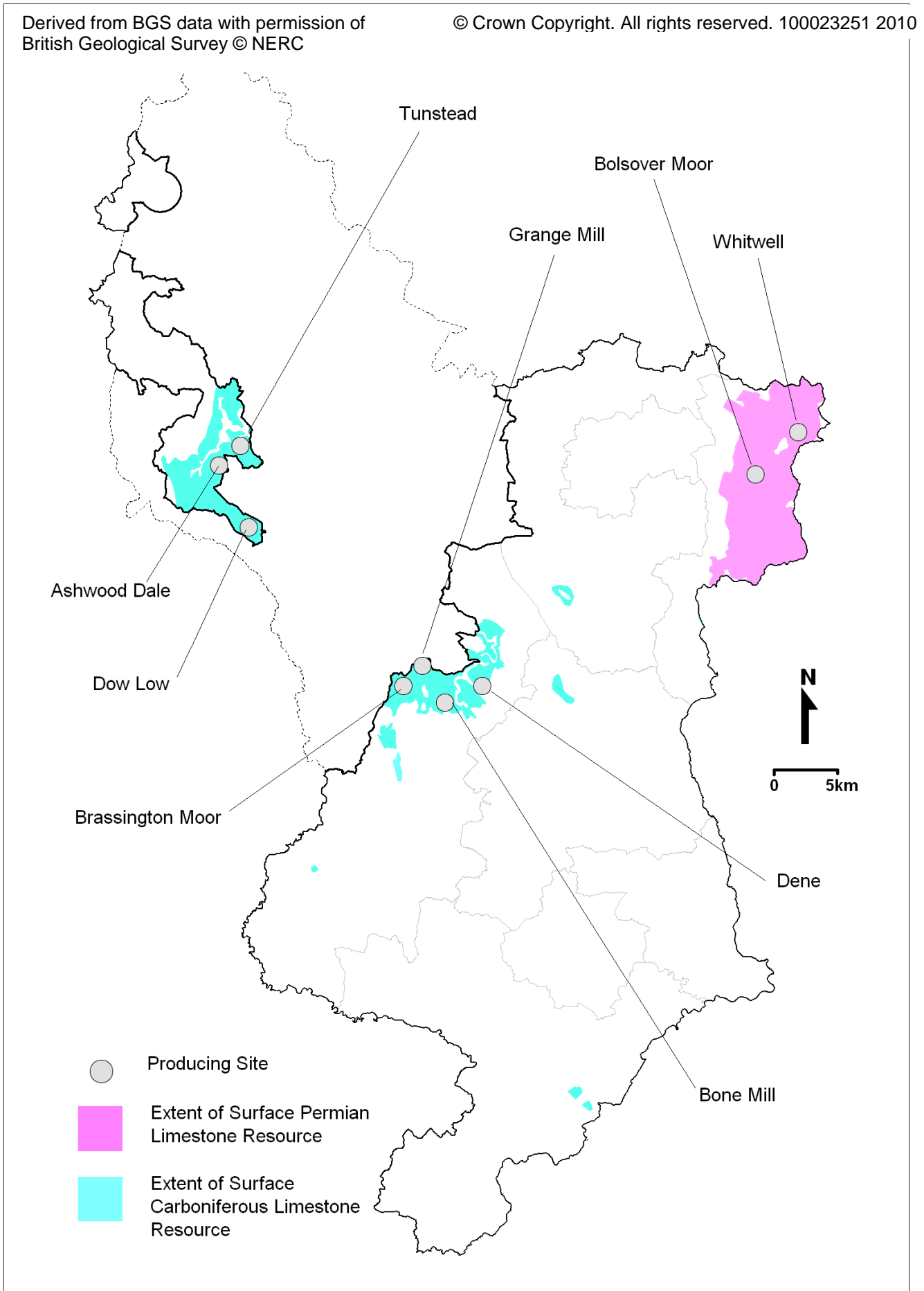
Based on a forward projection of the 2008 production figures compared to reserves at that time, only Bolsover Moor and Whitwell are likely to run out of reserves of industrial limestone during the plan period. However Bolsover Moor Quarry is currently mothballed, with no extraction operations being carried out at this time.^{cxxx}

In addition, a further seven quarries have reserves of industrial limestone (in total 192.7 million tonnes), and would not require a new planning permission to resume extraction, but are not currently producing industrial limestone;

- Ball Eye
 - Primarily vein minerals
 - Operational, but all production stated as being used for aggregate
- Brierlow
 - Operational, but all production stated as being used for aggregate
- Dove Holes
 - Operational, but all production stated as being used for aggregate
 - Some industrial limestone produced in 2007, but not 2008
- Hillhead
 - Working is temporarily suspended as operator has sufficient reserves at other sites
- Hindlow
 - No quarrying since 1988, limestone is imported from Tunstead by rail and processed by the plant at Hindlow.
 - The operators have stated that the considerable reserves at Hindlow form an integral part of the company's long term resources and a resumption of quarrying would take place.
- Middle Peak
 - No production since 2005
- Middleton Mine
 - No production since 2005

^{cxxx} Information on file

Map 1: Derbyshire Industrial Limestone Quarries in 2008



10 SAND AND GRAVEL EVIDENCE BASE PAPER

Introduction and Background

Sand and gravel deposits are accumulations of rock fragments and mineral grains, which have been derived from the weathering and erosion of hard rocks by glacial and river action. Sand and gravel was the principal source of primary aggregate until 1979 when crushed rock output exceeded it for the first time. By 2003, it accounted for just 39% of total primary aggregate supply^{cxix}.

National and Regional Policy

The Government publishes national guidelines for aggregate production to ensure that there remains an adequate and steady supply to meet the needs of the construction industry.^{cxix} The current guidelines cover the period 2005-2020 and set out that the East Midlands Region should provide 174 million tonnes of sand and gravel, over the 16 year period. The Regional Planning Body is responsible for apportioning this figure to each Mineral Planning Authority within the region, taking account of advice from the East Midlands Aggregates Working Party.

MPS1 sets out the Government's aim to reduce the consumption of primary aggregates by promoting greater efficiency of use and encouraging greater use of recycled and secondary aggregates.

Geology and Mineral Resource Data

Derbyshire has substantial resources of sand and gravel in the river valleys of the Trent, Lower Derwent and Lower Dove, occurring within the fluvial/alluvial and terrace deposits. The formation of these drift deposits took place following the last ice age when considerable amounts of sand, gravel, silt and clay, in the form of glacial and weathered rock deposits, were eroded rapidly by glacial melt waters and deposited in wide tracts alongside these rivers. The thickness of the river valley deposits varies considerably, ranging from less than one metre

^{cxix} Planning4Minerals, Sand and Gravel, British Geological Survey:

^{cxix} National and Regional Guidelines for Aggregates Provision in England: 2005-2020

thickness in some areas to eight or nine metres thick in other areas. The gravel content of the deposits is usually high (50%-70%), the remainder being sand and fine silts^{cxxxiii}.

Deposits of sand and gravel also occur in the solid bedrock tracts of the Sherwood Sandstones. These are much older than the river valley deposits, having been laid down around 230 million years ago in the Triassic period. Their thickness varies considerably from 100m to virtually nothing. The proportion of gravel also varies greatly but is usually much less than in the river valley deposits. It is an important source of soft building sand and there is currently only one operation in the county. This is located at Mercaston in an area between Derby and Ashbourne.

Mineral resource information for Derbyshire was compiled by the British Geological Survey in 1995^{cxxxiv}. Resource information for sand and gravel is available at the 'inferred level', that is, those mineral resources that can be defined from available geological information. Parts of the sand and gravel resource in the County have, however, been evaluated by mineral companies and, therefore, knowledge of the economic potential of the resource is established at a reasonably high level. In practice, we are largely reliant on the mineral companies to supply detailed authoritative information on quality and quantity of the resource.

Provision to be met

The government's national guidance for aggregates provision (Minerals Policy Statement 1) sets out regional apportionments in order to ensure an adequate and steady supply of aggregates is maintained to meet anticipated needs of the construction industry and including for housing provision and major construction projects. These have then been further refined to sub-regional level, through the RAWP, and incorporated into the Review of the East Midlands Regional Plan (RSS8).

Current sub regional apportionments for aggregates are for the period 2005 to 2020. These indicate that Derbyshire should provide 23.84 million tonnes of sand and gravel, which works out at 1.49 million tonnes per annum. Between 2005 and 2008, 4.86 million tonnes of this have already been worked and 10.64mt already have planning permission. This means that we will have to find additional sites to provide the remainder of 8.34 million tonnes to 2020 to meet the agreed apportionments.

^{cxxxiii} Minerals Local Plan, Derbyshire County Council 2002

^{cxxxiv} British Geological Survey, Mineral Resource Information for Development Plans, Derbyshire: Resources and Constraints, 1995

Responses to the Issues and Options Paper will help to determine how we calculate provision for the remaining part of the plan period from 2021 to 2030.

However, to set the context to this issue, it should be noted that if the agreed annual apportionment is rolled forward on a straight line basis to 2030, this would amount to an additional 14.9 million tonnes for the period 2021-2030. This means that we would have to find further sites to provide a total of 23.24 million tonnes for the period of the Core Strategy.

The Supply Situation – Current Production, Permissions and Remaining Requirement

In Derbyshire, recent production of sand and gravel between 2005 and 2008 has averaged 1.21 mt.

Annual Production of Sand and Gravel in Derbyshire 2005-2008

Year	Production (million tonnes)
2005	1.34
2006	1.20
2007	1.22
2008	1.10

This is shown by site in the table below. Figures are in million tonnes.

Quarry	2005	2006	2007	2008
Attenborough	0	0	0.09	0.18
Swarkestone	-	0.36	0.3	0.12
Shardlow	-	0.46	0.45	0.45
Willington	-	0.26	0.21	0.21
Mercaston	-	0.14	0.15	0.14

At the end of 2008, **Shardlow, Swarkestone, Willington, Attenborough and Mercaston** were the active pits. At this time, permitted reserves of sand and gravel in Derbyshire totalled around 10.6 million tonnes. This information is shown by site below.

Site	Reserves 2008 (million tonnes)
Active Sites	
Attenborough	0.36
Swarkestone	1.9
Shardlow	2.8
Willington	1.4
Mercaston	1.38
Inactive Sites	
Elvaston	0.6
Potlocks Farm	2.2
Total	10.64

This stock of permitted reserves is known as the landbank. Government guidance requires landbanks to be maintained for all aggregate minerals, with the recommended landbank period for sand and gravel being at least 7 years. The current length of the landbank for sand and gravel in Derbyshire is calculated as follows:

Landbank of permissions = 10.64 million tonnes

Annual Apportionment = 1.49 million tonnes

Landbank period = **7.2 years**

(landbank ÷ annual apportionment)

Dormant Sites

There has been no working at Egginton Pit for a number of years now and it is now classified as being dormant i.e. a new set of conditions would have to be approved before it could be worked again. Mugginton pit in the Sherwood Sandstones is also classified as being dormant. Reserves at these quarries are estimated to be 2.1 million tonnes and 0.3 million tonnes respectively. The reserves at these quarries are not included in the landbank.

Table: Sand and Gravel Provision – Reserves and Requirements

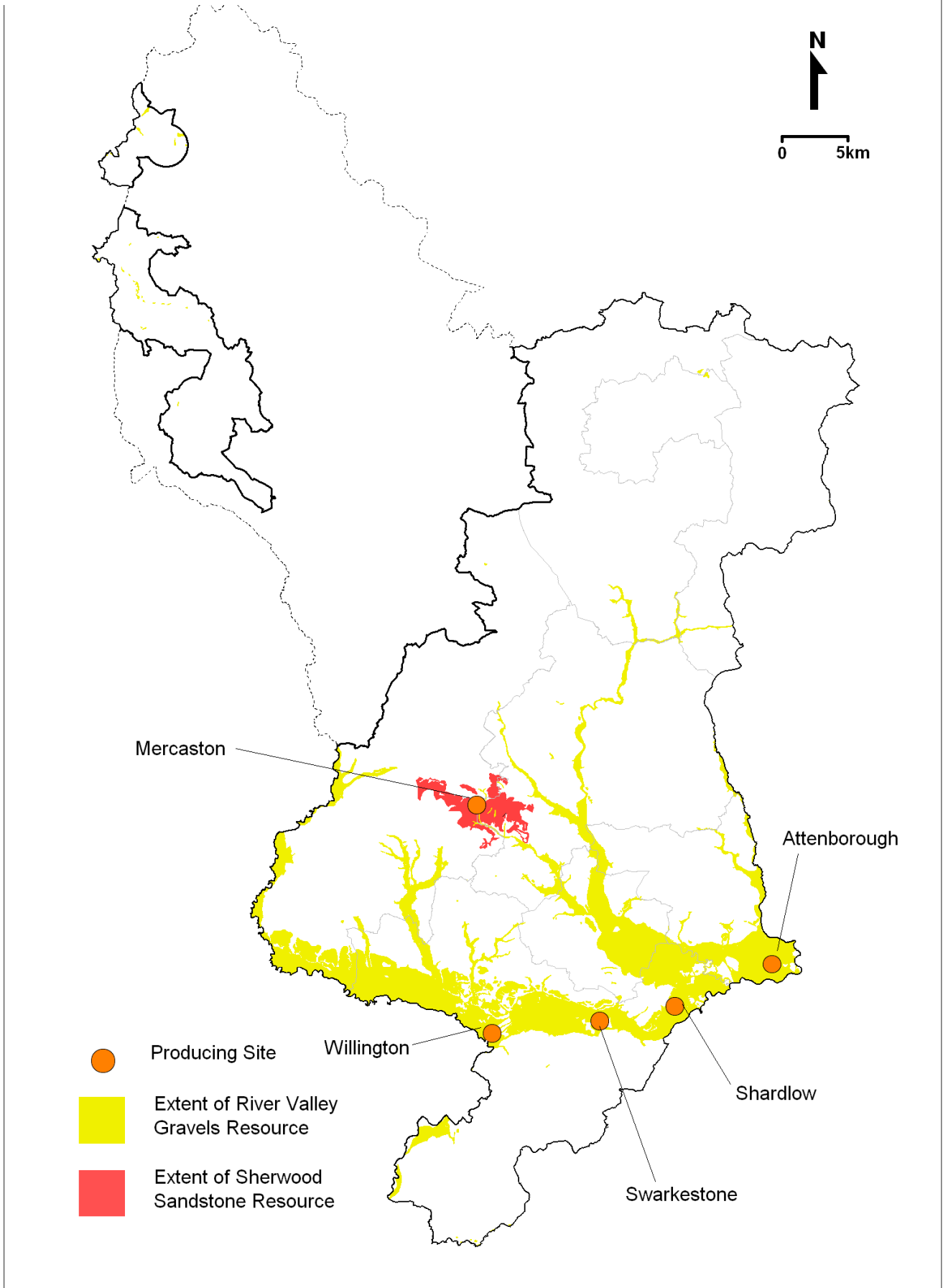
	Sand and Gravel	Million Tonnes
	Requirement	
A	Production Requirement 2005-2020	23.84
B	Actual sales 2005-2008	4.86 ^{CXXXV}
C (A-B)	Net requirement 2008-2020	18.98
Reserves		
D	Permitted Reserves (Landbank) at 31/12/2008	10.64 ^{CXXXVI}
E	Reserves permitted between Jan 2008 and April 2009	0
F(D+E)	Total Permitted Reserves	10.64
Shortfall		
G(C-F)	Shortfall 2008 – 2020	8.34

^{CXXXV} RAWP surveys 2005/2006/2007/2008

^{CXXXVI} RAWP survey 2008 figures, excluding 2.4 mt of reserves on "dormant" sites

Derived from BGS data with permission of British Geological Survey © NERC

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Map 1: Sand and Gravel Resources and Active Sites in Derbyshire

Derby & Derbyshire Minerals Core Strategy Development Plan Document – Evidence Base, April 2010

Current and Future Demand

Demand for sand and gravel has remained fairly constant for the last 6 years, with production levels being maintained at between 1.2 and 1.5 million tonnes per annum. The effects of the 2008/2009 economic recession became evident as production slowed and some mineral sites became mothballed amidst falling demand. It is likely that demand and production will increase again as the effects of the recession recede and construction activity picks up.

Method of Working and Reclamation

There are three stages in the production of sand and gravel; extraction, processing and reclamation. Extraction initially involves the stripping of topsoil, subsoil and overburden. These materials are used either in progressive restoration or stored and used at a later stage in the restoration programme. Extraction of the mineral is usually carried out in a de-watered working area by dragline. The excavated material is then either loaded into dump trucks for transportation to the processing plant or loaded into a hopper, which feeds a conveyor. At the plant, a series of crushing and screening operations grade and sort the minerals into the different sizes of sand and gravel required by the construction industry. The processed material is stored in stockpiles according to size before being transported to the customer or used on site in the manufacture of concrete. The plant and stockpile areas can be visually intrusive in the often open valley landscapes. Although the shallow nature of sand and gravel extraction results in high land take, it also enables restoration to be undertaken to a high standard. The lack of waste produced on site does require importation of fill in many cases to restore land to original levels. Alternatively, areas extracted below the water table will return naturally to the water level, presenting opportunities for water- based after-uses.

Although most of the permitted sand and gravel workings in Derbyshire have conditions requiring their restoration to agriculture, restoration to water uses is becoming more common as inert fill material becomes increasingly scarce. This is because there are now far fewer coal fired power stations, with the resultant decline in their by-product of pulverised fuel ash. Also, construction and demolition wastes are now increasingly being recycled rather than used as fill material in restoration. Restoration to agriculture is a priority on sites close to airports; birdstrike is an issue where such sites are restored to water. We work closely with airport authorities in ensuring that sites close to airports are restored in such a way to minimise the risk of birdstrike.

Transportation

All sand and gravel extracted from within Derbyshire is transported to its markets by road^{cxxxvii}. Viable alternatives are not currently available, but will be explored where possibilities arise.

Markets

Sand and gravel is used primarily in the manufacture of ready mixed concrete, pre-cast concrete products and as bulk filling material. In Derbyshire, a high percentage of sand and gravel is used in the manufacture of concrete. Most of the active pits in Derbyshire have ready mixed concrete plants on site, producing concrete for the pre-cast concrete plants within the county. These serve a national and regional market for products such as blocks, floors, pipes, kerbs and street furniture. Sand is used mainly in the production of mortars and asphalt.

Most sand and gravel originating from Derbyshire is used within 10-15 miles of the pits, mainly because of the high cost of transporting the material (local markets require local sources), but also because of competition from other sources of aggregates in the area. In 2005, 21% of total sand and gravel output from Derbyshire was used within Derbyshire, with 73% being exported to other counties within the East Midlands Region and the majority of the remaining 6% being used within the Yorkshire and Humber and West Midlands Regions.^{cxxxviii}

Contribution to the Economy

The extraction of sand and gravel provides benefit to the economy in terms of the supply of the material from the region and the direct employment at the quarry as well as indirect employment mainly through the use of haulage contractors. The mining, energy and water supply industries provide employment for 1.5% of Derbyshire's residents^{cxxxix}.

^{cxxxvii} EMAWP 2005 Report

^{cxxxviii} EMAWP 2005 Annual Report

^{cxxxix} 2001 Census Atlas of Derbyshire

11 SILICA SAND EVIDENCE

Introduction and Background

Silica (industrial) sand is a fine sand that has been processed by washing and cleaning of the grains, sizing to remove coarse and very fine fractions, and physical and chemical processes to remove iron, chromite and other deleterious impurities such as clay. The sand contains a high proportion of silica in the form of quartz. After processing, the sand may be dried and some applications require it to be ground in ball mills to produce very fine material.

Unlike construction sands which are used for their physical properties, silica sands are valued for a combination of physical and chemical properties. Consistency in quality is critical as for most applications silica sands have to accord to closely defined specifications. As a result different grades of silica sand are usually not interchangeable in use.

Silica sands are produced from loosely consolidated sands and weakly cemented sandstones. Although sandstone and sand deposits are numerous in the UK only a small proportion of these possess the valued physical and chemical properties for potential sources of silica sand.

National and Regional Policy

National Planning Policy

Minerals Planning Guidance 15: Provision of Silica Sand in England was published in 1996, providing advice to provide an adequate and steady supply of silica sand while ensuring extraction is consistent with social, economic and environmental sustainability.

Regional Planning Policy

The East Midlands Regional Plan was adopted in March 2009. Regional Plan Policy 37: Regional Priorities for Minerals does not specifically refer to silica sand but states that Local Development Frameworks should identify sufficient environmentally acceptable sources to maintain an appropriate supply of minerals of regional or national significance. The policy also states that minerals should be safeguarded from development that would sterilise future exploitation, including those required to maintain historic buildings and monuments or new construction that reflects local character.

Derby and Derbyshire Minerals Local Plan

The Derby and Derbyshire Minerals Plan (2000) considers silica sand as an 'Other Mineral' in paragraph 14.37. The text states that reserves of such are unlikely to be worked in Derbyshire on a significant scale in the future because of their limited occurrence in the county and/or the abundance of easily worked deposits elsewhere in the UK.

Demand

Silica sands are essential raw ingredients in glassmaking and a wide range of industrial and horticultural applications. An important market was for foundry sand, but demand has declined with the foundry industry. In 2004, silica sand used for glass production accounted for 53% of all silica sand sales in Great Britain, only 11% for foundry sand and the remainder for other industrial, horticultural and leisure uses (source: Silica Sand Factsheet, BGS, 2006). Glass products using silica sand include food and drink receptacles, light bulbs, television screens, glass fibre etc. Increasing amounts of silica are being recovered from recycled glass, known as cullet.

For foundry casting demand is mainly for high silica washed sands to which a binding agent such as resin or clay is added. Uniform narrow size high sphericity particles are required in the specification. Low iron silica sands are heat treated (calcined) to convert the quartz to cristobalite and used in ceramics such as sanitary ware, table ware, tiles etc. Silica sand is also the beginning of products such as silicone sealants.

The water industry uses silica sand as the principal filtration medium to extract solids from water. This is a relatively coarse grade sand in comparison to other uses. Other uses include top dressings for sports surfaces, equestrian surfaces, play sand etc.

International trade in silica sand is small. The UK is self-sufficient in silica sand. Small quantities of water filtration sand and resin coated foundry sand are exported. Silica sand sales were worth approximately £67 million in 2004 (source: Silica Sand Factsheet, BGS, 2006).

Production

Derbyshire County Council granted planning permission in January 2009 for the removal of an existing foundry waste tip at Callywhite Lane, Dronfield and the re-use of the material as aggregates. (DCC planning application ref. CM4/0308/252). William Lee Ltd., a foundry casting business, had tipped waste foundry sand on its premises for over 30 years. Historically the used

sand taken from the foundry works was deposited at the landfill as there was no outlet for its further use at that time.

The material to be extracted consists of fine silica sand which will be taken to a blending site in West Yorkshire where it will be used in manufacturing breeze blocks. The site will realise up to 130,000 tonnes of aggregates material in total. Average extraction will be 20,000 tonnes per year. All transportation of the material will be via lorry.

There are no other silica sand extraction operations of any kind in Derbyshire, including working of 'virgin' reserves. Oakamoor, Staffordshire provides silica sand from the Carboniferous Millstone Grit Group. After hot acid leaching to remove impurities this type of silica sand is used for ceramics and colourless glass manufacture. Nottinghamshire produces silica sand from the Triassic period. Silica sand resources of the Pleistocene period in Cheshire, and those of Lower Cretaceous age in Southern and Eastern England are the most important, accounting for 40% of the total output from England (source: Silica Sand Factsheet, BGS, 2006).

Nationally, silica sand production has declined since the 1970's. For example in 1977 the UK produced 6,283,000 tonnes. In 1994 the yearly production was 4,038,000 tonnes (source: MPG15: Provision of Silica Sand in England, CLG, 1996).

Available figures for silica sand extractors sales by end use and area of origin are more up to date. The Office for National Statistics (ONS) lists national production for 2007 as 4,909,000 tonnes, of which 134,000 tonnes originated in the East Midlands (source: Mineral Extraction in Great Britain Business Monitor PA1007, ONS, 2007). The British Geological Survey, in their 2006 factsheet on silica sand, states that average yearly production in the UK has been 4 million tonnes.

Mineral Planning Guidance 15: Provision of Silica Sand in England (CLG, 1996) recommends that Mineral Planning Authorities should aim for at least a 10 year landbank at individual sites.

Transportation

The BGS Factsheet on Silica Sand (2006) recognises that most silica sand is transported via lorry and bulk tanker. There is one silica sand operation in Norfolk with a rail link where glass sand is sent via rail to a glass container factory in Yorkshire and a flat glass works near Goole.

Dried foundry sand must be delivered within a certain temperature range or its setting time in the foundry may be affected.

Restoration

MPG15 states in Annex F that planning applications for extraction of silica sand need to include information which demonstrates that the site will be restored satisfactorily.

Where possible, working and reclamation should be undertaken in a progressive manner. It is recognised in MPG15, however that in some cases different grades of sand are worked from different parts of a single quarry which may hinder progressive restoration. There may also be the need for settling lagoons and mixing/ blending plant. Silica sand deposits are often thick and below the water table, which may make restoration to agricultural land impractical. The overall aim should be to minimise the area open and disturbed at any one time and, where possible, secure progressive restoration of the site.

Conclusion

It is considered unlikely that silica sand will be worked on a significant scale in the future. General policies for controlling mineral development will apply to proposals related to this material.

Bibliography

Derby and Derbyshire Minerals Local Plan, Derbyshire County Council, 2000

East Midlands Regional Plan, Communities and Local Government, 2009

Factsheet – Silica Sand, BGS, 2006

Minerals Planning Guidance 15: Provision of Silica Sand in England, Communities and Local Government, 1996).

Mineral Extraction in Great Britain, Business Monitor PA1007, Office for National Statistics, 2007

12 VEIN MINERALS

Introduction and Background

Mineralised veins running through the Carboniferous Limestone of the Peak District and parts of Derbyshire have been of economic importance for centuries. Lead has historically been the major mineral worked, but currently the primary interest is in fluorspar. Barytes is also likely to be obtained from fluorspar workings, in varying proportions, as secondary materials. Calcite is a common rock forming mineral and is the principal constituent of all limestones.

Within Derbyshire the majority of vein mineral deposits occur within the Peak District National Park. In the remaining part of Derbyshire, many vein mineral deposits lie within areas of attractive landscape.

Fluorspar

Fluorspar is the commercial name for the mineral fluorite. It is the only UK source of fluorine. Fluorspar occurs in only two places in the UK, the Northern and Southern Pennines. The Southern Pennines ore deposits are mainly in the Peak District National Park. The primary economic source of fluorspar is in vein deposits. These are minerals infilling cracks in the rock mass produced as a result of volcanic activity. Fluorspar production in the Northern Pennines (Durham) ceased in 1999.

Fluorspar is graded according to quality and specification into acid grade, ceramic grade and metallurgical grade. Metallurgical grade fluorspar was used extensively in the steel industry, but new production technology and the overall running down of the British steel industry has negated the demand for this. Fluorspar ore dug from the ground in England is processed to produce acid-grade fluorspar (over 97% CaF_2), and reserves in the ground are accounted for in terms of the amount of acid-grade fluorspar they can supply.

Resources are found exclusively in mineralised veins and related deposits in Carboniferous limestones. The veins are linear in form and can extend over considerable distances. The limestones tend to form attractive scenery with high amenity value and ecological significance.

Barytes

Baryte is used as a commercial source of barium and many of its compounds. Ground baryte is used as a filler in the manufacture of linoleum, oilcloth, paper and textile manufacturing, rubber, and plastics. Finely ground barite is used to make a thixotropic mud for sealing oil wells during drilling. Prime white, a bleached baryte, is used as a pigment in white paint.

The largest international producer of baryte is China with approximately 4 million tonnes per annum (source: Paragraph 1.2.1, Mineral Profile – Barytes, BGS, 2005)

World production was 6.3 million tonnes in 2004. Some 88% worldwide is used as a weighting agent for drilling fluids in oil and gas exploration (source: Mineral Profile – Barytes, BGS, 2005). Other uses are in added-value applications which include the car, electronics, TV screen, rubber, and glass ceramics and paint industry, radiation shielding and medical applications (barium meals). Barytes is supplied in a variety of forms and the price depends on the amount of processing; filler applications commanding higher prices following intense physical processing by grinding and micronising, and there are further premiums for whiteness and brightness and colour (source: Barytes Association website).

Calcite

Vein calcite, or calcspar and ‘Derbyshire Spar’ has its own distinctive character and used to supply a small decorative market in the UK for building finishes, incorporation into reconstituted stone, terrazzo tiles, drive surfacing etc. The Peak District was traditionally the most important source of vein calcite for the UK market with production starting in the 19th century (source: Mineral Planning Factsheet – Calcite, BGS, 2004). There was some extraction in the Peak District (north of Bradwell village) until relatively recently, however, this has ceased (source: Conversations with Minerals Planning Officers, Peak District National Park Planning Authority, January 2010).

National and Regional Policy

National Planning Policy

There is no national policy specifically on the working of fluorspar, barites or calcite. General policies of MPS1: Planning and Minerals apply. MPS1 requires exceptional circumstances to justify major mineral working in the Peak District and includes one policy on supply which seeks to source mineral supplies indigenously, to avoid exporting potential environmental damage,

whilst recognising the primary role that market conditions play (source: Paragraph 15, Planning and Minerals Practice Guide, Communities and Local Government, 2006).

The national need for fluorspar was confirmed in an appeal decision by the Secretary of State in November 1999 (T & T Broadhurst (Minerals) Mor Cop Appeal M9496).

Regional Planning Policy

The East Midlands Regional Plan was adopted in March 2009. Regional Plan Policy 37: Regional Priorities for Minerals does not specifically refer to vein minerals but states that Local Development Frameworks should identify sufficient environmentally acceptable sources to maintain an appropriate supply of minerals of regional or national significance. The policy also states that minerals should be safeguarded from development that would sterilise future exploitation, including those required to maintain historic buildings and monuments or new construction that reflects local character.

Derby and Derbyshire Minerals Local Plan

Policy MP33 Vein Minerals states that proposals for the working of vein minerals will be permitted only where:

The duration and scale of operations is limited to the minimum necessary to meet a proven need for the vein mineral and the development can be carried out in an environmentally acceptable way and the least damaging means of production are employed.

The Minerals Local Plan acknowledges the national importance for the working of vein minerals in paragraph 14.12

Production

There are permitted resources of fluorspar which can be worked by underground mining and there is potential for further deposits to be identified at depth. Given the greater costs of underground mining, however, higher ore grades are required to sustain this method of production. As such, continued mining from low cost surface operations is required to offset the higher costs of underground operations. Different grades of ore can also be blended to provide appropriate specifications.

In England, fluorspar extraction contributes £4.5 million to the economy. The down-stream fluorochemical sector contributes £35 million to the economy. The English fluorochemical sector

is highly dependent on indigenous fluorspar resources. Approximately 61,000 tonnes of acid grade fluorspar was produced in England in 2005 (source: The Need for Indigenous Fluorspar Production in England, BGS, 2008).

China is the dominant producer in the world market, accounting for in excess of 50% of production. Since the 1980s UK produced fluorspar is less competitive in price terms in comparison with countries having cheap labour costs and less stringent environmental regulations as in the UK. The UK imports metallurgical grade fluorspar from Mexico and China, and imports acid grade fluorspar from Spain.

All fluorspar operations in the Peak District are controlled by Glebe Mines Ltd., which operates the country's only processing plant at Cavendish Mill near Stoney Middleton. Fluorspar ore to supply the mill is mainly from Glebe's own operations but some ore comes from smaller 'tributer' producers. In addition, fluorspar is produced as a secondary product at a number of other limestone quarries on the Carboniferous limestone and sent to Cavendish Mill for processing, notably from the site serving the Hope Cement Works.

The ore varies in physical character and grade and requires blending to ensure a homogenous feed to the plant. Blending also allows higher quality ore gained from underground extraction to be mixed with lower quality ore from surface operations. Processing involves crushing, washing, separation and froth flotation to produce high acid grade fluorspar (source: Mineral Planning Factsheet – Fluorspar, BGS, 2006).

Demand

Significant production of fluorspar in England began at the beginning of the 20th century for use in the steel industry. With the demise in steelmaking, demand has increased for fluorine-bearing chemicals derived from fluorspar and production for this peaked at 235,000 tonnes in 1975 (Paragraph 1.2, The Need for Indigenous Fluorspar Production in England, BGS, 2008). All English output is of acid grade fluorspar which is a raw material for the domestic chemicals industry.

Most fluorspar is consumed by the international INEOS Fluor conglomeration, which took over ICI in 2001. It owns a large chemical facility at Runcorn which manufactures a range of fluorochemicals. In 2007, INEOS Fluor acquired Glebe Mines Ltd. in 2007 from Laporte Industries and thus secured supply to the UK's only source of acid grade fluorspar. All output is

processed into hydrofluoric acid, which in turn is used in fluorocarbon production. Historically this was for chlorofluorocarbon (CFC) production. This was banned in developed countries in 1996. CFCs were replaced by hydrochlorofluorocarbons (HCFCs), and then with hydrofluorocarbons (HFCs).

Fluorocarbons are also used in the plastics and electronics industries, metals processing, processing crude oil into fuel, and medical, pharmaceutical and agricultural applications.

Current Permissions

A small amount of vein mineral (mainly barytes) is supplied from Slinger Top Quarry, Cromford in Derbyshire. This amounts to approximately 20 tonnes a month (source: notes of meeting between Glebe Mines Ltd. and Peak Park Planning Officers, April 2009).

There was some calcite extraction north of Bradwell village in the Peak District until relatively recently at Moss Rake East. Operations have ceased but the operator could resume extraction in the future. There was some calcite extraction at Moss Rake West nearby but this is now worked out and is still pending restoration requirements (source: Conversations with Minerals Planning Officers, Peak District National Park Planning Authority, January 2010).

There are currently no active fluorspar operations outside the Peak District. Balleye Quarry, Cromford, has extant planning permission for vein working although this is restricted by the extant planning permission for limestone extraction which requires that any vein mineral extraction follows the limestone faces. There is some existing limestone extraction at Balleye Quarry. The site owner has stated that the site is rich in fluorspar although no drilling to test for the presence of fluorspar has been undertaken.

There are also some dormant vein mineral extraction sites locally i.e. Ashover, Brassington, Matlock, and some areas with revoked planning permissions i.e. Cromford and Milltown. Some areas of historical extraction have been worked out, yet are still covered by extant planning consents and some vein mineral deposits may simply be uneconomic to extract. Given the untried potential resources of these sites and the uncertainty over their future planning status, these sites haven't been considered in the overall picture of supply.

Within the Peak District the principal permitted reserves of fluorspar ore available are from Milldam Mine (over 2 million tonnes). Milldam Mine is an underground mine with an extant

planning permission from 1999 to 2013 which hasn't been worked for some time. The Peak District National Park wish to encourage underground working rather than surface working and are presently discussing this with the operator.

In addition, there remain permitted reserves of at least half a million tonnes from Watersaw Mine, the underground mine on Longstone Edge where operations have recently ceased but nevertheless remain available for working until 2015, when the current planning permission expires. Tearsall Farm, near Wensley, is expected to supply about 121,000 tonnes of fluorspar ore per annum (over a six year extraction period). At the time of writing this paper this planning application is approved in principle subject to a Section 106 agreement. Glebe Mines Ltd. is the applicant and the Slinter Mining Co. owns the site.

There are inferred resources of fluorspar within the 1952 planning permission area on the eastern end of Longstone. The reprocessing of tailings arising from the operation at Cavendish Mill may be able to provide about 300,000 tonnes of fluorspar ore, though permission will be required to gain access to this material (source: Minerals Planning Officers, Peak District National Park Planning Authority, January 2010).

Main fluorspar operations recently have been on Longstone Edge near Bakewell, with both opencast workings and underground mining. Working of the opencast sites on the western end of Longstone Edge (Arthurton West (Extension), High Rake and Bow Rake) is nearly complete. Another major resource over the years, Dirlow Rake on Bradwell Moor, has also largely been worked out (by a series of operators and sites along its length). Glebe Mines is at an advanced stage of reopening the major underground reserve contained in the vein structures below Hucklow Edge, Bretton Edge and Eyam Edge, accessed via Milldam Mine at Great Hucklow: this will take over from underground mining at Watersaw on Longstone Edge. Due to difficulties of availability, the world price of fluorspar doubled in the five years to 2007, and may well continue rising after the recession. This has underpinned the scope for deep mining once again to be economic. Fluorspar has also been obtained by reworking the material in tailings lagoons close to Cavendish Mill, making better use of what was previously waste material.

Glebe Mines Ltd. purchases fluorspar and other vein minerals from small-scale 'tributers'. These are operations which target modest veins in the limestone on a short term basis. However, these are running down, as Glebe seeks to phase out these supplies in favour of extracting mineral itself. Prolonged efforts to control damaging operations at other sites through negotiation, planning enforcement action and the Courts has also brought to a halt highly

contentious workings at Backdale and Wagers Flat on Longstone Edge *and Smalldale Head on Bradwell Moor*, where in each case the proportions of limestone and fluorspar sold was at issue (source: Minerals Planning Officers, Peak District National Park Planning Authority, January 2010).

INEOS Fluor has been unable to supply from Cavendish Mill the full quantity of fluorspar it needs. As a result it has imported modest quantities of fluorspar.

There are inactive underground sites at Hazelbadge and Netherwater Mines (between Great Hucklow and Bradwell, to the northwest of the Milldam deposit), though these are thought to have virtually no potential. The only quarry in the Derbyshire County Council area actively contributing a very small amount of mineral is Slinter Top, noted above.

Transportation

Transport of ore in Derbyshire and the Peak District National Park is via road. There are no rail facilities within, between or outside relevant sites serving this industry. It may be difficult to encourage operators to invest in rail freight facilities given the tonnage of material involved compared to bulk loads, such as building stone.

Restoration

Extraction operations are small, generally, with a short operational life compared with other mineral workings and are often easier to integrate back into the landscape. Restoration is undertaken progressively wherever possible. Most sites can typically be restored close to original ground level and to a high ecological standard (source: Page 23, *The Need for Indigenous Fluorspar Production in England*, BGS).

Wider View

Almost all the output from Cavendish Mill is sent to INEOS Fluor's facility at Runcorn to manufacture hydrofluoric acid. This comprises an average 50,000 tonnes of acid-grade fluorspar each year. Cavendish Mill is unable to supply the full quantity of fluorspar that Ineos Fluor needs and modest quantities of fluorspar have had to be imported to fill the gap. In 2008 INEOS Fluor needed to buy 6,000 tonnes on the world market, and 5,000 tonnes in 2009. The

world market price for fluorspar also doubled in 2002-2007 (source: notes of meeting between Glebe Mines Ltd. and Peak Park Planning Officers, April 2009).

Importing fluorspar from other countries is not without difficulty. There needs to be sufficient material on the open market to meet the demand. Most sources of fluorspar globally have been acquired by producers to guarantee their sources. A good example of this is the purchase of Glebe Mines Ltd. by INEOS Fluor in 2007 to ensure its supply. The biggest exporter, China, has reduced foreign sales to supply domestic demand. European fluorspar, mainly from Germany and Spain, is not available in sufficient quantities to meet the needs of the Runcorn facility, and South African and Mexican fluorspar contains high levels of arsenic, the removal of which would make the product uneconomic.

The transportation of fluorspar from abroad incurs costs as with any bulk commodity. Producers are responsible for delivering the material to the transport mode i.e. a ship, and then the buyer must pay for the freight charges, insurance, loading/unloading costs at dockside and transport from the docks to the end-use customers.

Taking these factors into account the fluorspar industry doubts that imports can meet domestic demand (source: Page 15, The Need for Indigenous Fluorspar Production in England, BGS).

Large quantities of fluorspar are not available on the open international market in the short term e.g. the 50,000 tonnes the Runcorn facility would have to find if Cavendish Mill ceased production.

This is the experience of elsewhere. In 2006 domestic fluorspar production in France and Italy ceased. The French deposits ran out while in Italy there were no guaranteed markets. France then relied on imports from South Africa which became uneconomic. This resulted in the closure of a major hydrofluoric acid works in France in 2007 (source: Peak National Park Planning Authority, Preferred Options for Core Strategy, 2009).

A lower level of supply from Cavendish Mill than the 50,000 tonnes of acid grade fluorspar to the facility at Runcorn, over a length of time, may threaten the fluorochemical industry. INEOS Fluor commissioned a study in 2007 (Roskill) which concluded that if fluorspar supplies cannot be supplied by the Southern Pennines Orefield, there is the likelihood that the fluorochemical industry in England will reduce in size or cease altogether, due to the difficulty and cost of obtaining imports.

As fluorspar is worked out, and lower quality grades of mineral are targeted, there is a challenge to seek this quantity of resource and extract it in a manner that meets the needs of the environment and sustainability.

Fluorspar is a nationally important vein mineral and is the basis of the national fluorocarbon market which is an integral part of Britain's plastics, oil, electronics, and pharmaceutical industries among others. The loss of this industry would have negative knock-on effects nationally.

Vein minerals extraction in the Peak District and Derbyshire provides employment and related income generated benefits to rural communities including support for local services and small businesses.

Transportation of material at existing workings and processing facilities is via haulage vehicles. This can have some negative impact on the local area, particularly the Peak District National Park. However, demand for drivers and haulage vehicles does provide an important source of employment for local people as drivers or owner/drivers.

Given that vein minerals deposits generally occur in areas of attractive countryside, i.e. the carboniferous limestone deposits of the Peak District, there are bound to be conflicts between policies that seek to protect attractive and important landscape character, sites of ecological importance (and in some cases archaeological importance) and the recognised national need for an important vein mineral, the needs of the local economy and local communities. A balance needs to be struck between the sometimes conflicting aims of national, regional and local policies which for example seek to support the national economy, protect special landscapes and open countryside and support the local community, when considering proposals for working new deposits or reworking old sites.

INEOS Fluor is the world leader in the production of 1348 (the replacement for CFCs) having plants in the USA, Japan and its UK plant at Runcorn. It has no fluorspar production capacity other than at Cavendish Mill. World prices for fluorspar have reduced slightly in the present recession, however Glebe Mines Ltd. expect the European shortage to return (source: notes of meeting between Glebe Mines Ltd. and Peak District National Park Planning Officers, April 2009). The cost of re-establishing fluorspar processing in France or Italy is prohibitive, as it would be if Cavendish Mill ever closed and then needed to reopen.

There may be merit in policies for safeguarding that are more closely tailored to the future viability of the resource.

In February 2010 the world's largest producer of fluorspar, Mexichem (Based in Mexico) bought INEOS Fluor from the INEOS Group. Mexichem has not bought Glebe Mines, even though they are owned by INEOS. Glebe Mines are still owned by the petrochemical giant INEOS Group and the public statement says quite clearly that " the fluorochemicals business no longer fits within the INEOS group portfolio as it focuses its attention on its large-scale petrochemicals businesses". So, Glebe Mines faces an uncertain future. We understand they will continue supplying ore for the rest of 2010 and beyond that we do not know what will happen (source: Web Blog of Chief Executive, Peak District National Park Authority, February 2010).

Conclusion

Proposals for vein mineral extraction must be considered in respect of need, both locally and nationally, the availability of alternative sources, and the environmental impact of extraction. There is a recognised national need for fluorspar and Derbyshire is an important source for this mineral.

The environmental impact of extraction is a major factor in assessing proposals for vein mineral workings within high landscape quality areas bordering the National Park. The national need for this important mineral must be balanced against the environmental effect of working them in such sensitive locations.

The world market for fluorspar and barytes is difficult to plan for as the market fluctuates widely. The variable nature of the deposit makes it problematic to assess reserves. Vein minerals are a hydrothermal deposit within rock. Because vein minerals occur in association with limestone in Derbyshire and the Peak District National Park, extraction can involve the necessary production of limestone. Proposals for the working of vein minerals must be assessed having regard to the existing overprovision of permitted reserves of limestones aggregates.

The existing policy in the Minerals Local Plan (Policy MP33: Vein Minerals) requires decision-makers to take into account the need for the mineral to be worked and the need to minimise both the scale and duration of the working. In seeking to minimise environmental impact, the least damaging methods of working and arrangements for waste disposal need to be employed

and, where underground methods are used, the danger of landslips or subsidence must be taken into account.

Bibliography

Barytes Association Website www.barytes.org/

Derby and Derbyshire Minerals Local Plan, Derbyshire County Council, 2000

Discussions with Minerals Planning Officers, Peak District National Park Planning Authority

East Midlands Regional Plan, Communities and Local Government, 2009

Fluorspar, BGS, 2005

Industrial Minerals: Issues for Planning, BGS, 2004

INEOS Fluor: An Evaluation of the Strategic Requirement for Fluorspar Mining in the UK, Roskill Consulting Group Ltd., 2007

Mineral Planning Factsheet – Calcite, BGS, 2004

Mineral Planning Factsheet – Fluorspar, BGS, 2006

Minerals Policy Statement 1: Planning and Minerals, Communities and Local Government, 2006

Notes of Meeting Between Glebe Mines Ltd. and Peak District National Park Planning Officers, April 2009

Planning and Minerals Practice Guide, Communities and Local Government, 2006

Preferred Options for Core Strategy, Peak National Park Planning Authority, 2009

The Need for Indigenous Fluorspar Production in England, British Geological Survey, 2008

Web Blog of Chief Executive, Peak District National Park Authority, February 2010

13 MINERALS SAFEGUARDING AREAS

Introduction and Background

Minerals provide essential raw materials for developing and sustaining our society – whether this is for construction, manufacturing, agriculture or energy. Mineral resources are finite, however, and can only be worked where they occur. In the interests of sustainable development, therefore, these valuable resources must be conserved for the long term by avoiding their sterilisation by other development being built on top of them, such as housing, retail or industry.

The concept of safeguarding minerals is not new, but latest government policy in MPS1 has now put the preservation of mineral resources on a more equal footing with the protection of other natural assets. Government policy now, therefore, requires all mineral planning authorities to define minerals safeguarding areas (MSAs).

A MSA is an area of known mineral resources that is of sufficient economic or conservation importance to warrant protection for generations to come.

The designation of MSAs does not imply that mineral extraction is acceptable and neither do they preclude other development – their purpose is, simply, to ensure that mineral resources are taken into account when they are at risk from being lost to other forms of non-mineral development. There is also no presumption against mineral extraction in areas that are not safeguarded, as MSAs may not necessarily capture every viable resource.

This paper covers all minerals except deep mined coal and oil, where safeguarding issues will not normally apply. Safeguarding strategic mineral transport facilities and other infrastructure is also considered.

The British Geological Survey published a “Guide to Mineral Safeguarding in England” in October 2007. This interprets how current mineral safeguarding policy in MPS1 can be complied with. It provides advice and a step by step methodology on how to define MSAs and to prevent the unnecessary sterilisation of minerals, as required by MPS1. It explains that it is up to individual MPAs to determine the most effective way of achieving the objectives of MPS1

as a result of local physical, environmental and planning considerations. This guide is currently being updated and should be re-published in 2010.

It is most likely that we will seek to safeguard minerals of strategic importance and which are of economic importance, i.e. the Carboniferous Limestone, Permian Limestone, alluvial sand and gravel, Sherwood Sandstones and surface mined coal. Resource data for these deposits is generally good. This data will be obtained from the British Geological Survey resource maps.

Sources of building and roofing stone for use in the repair of historic buildings and buildings/structures in conservation areas are also likely to be identified. Information is less good for this resource. The National Stone Centre and English Heritage are undertaking a study on behalf of Derby City and Derbyshire County Councils to help determine the best way of identifying and safeguarding sources of building/roofing stone in Derbyshire.

PART 1: STRATEGIC POLICY CONTEXT

National Policy on Safeguarding

Minerals Policy Statement 1 sets out the requirement for MSAs to be defined in policy documents to ensure that proven resources are not needlessly sterilised by non-mineral development. County authorities should define Mineral Consultation Areas (MCAs) based on their MSAs and these should be shown on District LDF Proposals Maps. Where a planning application is made for non-mineral development within an MCA, the district should consult the county on the application. It states that district councils should not normally include policies and proposals in their policy documents for non-mineral development in these areas, where such policies would affect the potential for future extraction of minerals.

It encourages the prior extraction of minerals if it is necessary for non-mineral development to take place in MSAs.

It states that existing and planned rail heads and wharfage facilities for transport by rail and inland waterways and facilities for the handling of minerals (including recycled aggregates) should be safeguarded.

The Regional Policy Approach to Safeguarding

The East Midlands Regional Spatial Strategy was adopted in March 2009. Policy 37 of this Plan refers to the issue of minerals safeguarding, as follows:

“Local Development Frameworks should:

.....indicate areas within which sites needed for land won minerals should be safeguarded from development that would sterilise future exploitation, including those required to maintain historic buildings and monuments or new construction that reflects local character.

.....identify and safeguard opportunities for the transportation of minerals by rail, water or pipeline, where appropriate to do so, including the maintenance of existing railhead and wharfage facilities, the provision of new facilities and the safeguarding of access to them.”

This is effectively repetition of national policy regarding safeguarding and does little to further our understanding of how safeguarding should be implemented at a local level. As a result, it is considered appropriate to rely on national policy for guidance.

PART 2: DERBYSHIRE'S MINERAL RESOURCES

Derbyshire is one of the richest counties in terms of its range and variety of mineral resources. These include limestone, sandstone, sand & gravel, coal and vein minerals. The county has for many years been one of the country's largest producers of minerals.

For the purposes of safeguarding, Derbyshire has seven distinct mineral resources. These are as follows:

- | | |
|----------------------------|--|
| 1. Sand & Gravel | 4. Permian Limestone |
| 2. Sherwood Sandstone | 5. Coal – surface mined |
| 3. Carboniferous Limestone | 6. Namurian (Carboniferous) Sandstones |
| | 7. Clays |

Sand & Gravel

Sand and gravel of mainly glaciofluvial origin (i.e. deposited by glacial meltwaters at the end of the ice age) is concentrated in the river valleys of the Trent, Dove and Derwent, in the south of the county. Deposits are generally of high and consistent quality. There are currently four active workings in this area. They are used mainly in the manufacture of concrete and as a fill material by the construction industry.

Sherwood Sandstone

The Sherwood Sandstones contain resources mainly of sand in solid hard rock formations. These were formed by a major fluvial event in the Triassic period, around 230 million years ago. This deposit is much more limited in extent than the river valley sand and gravel. It is concentrated in an area around Mercaston between Ashbourne and Derby. Production is limited to one operation.

Carboniferous Limestone

This resource is concentrated in the areas around Matlock/Wirksworth and Buxton. It was laid down around 350 million years ago. The rock tends to be very pure in chemical composition, and for this reason is used in a number of chemical or industrial processes. Less pure varieties, generally, are used as fill material (aggregate) by the construction industry, particularly in road construction and repair.

Permian (Magnesian) Limestone

This resource is limited to an area in the north east of the county, in the area around Bolsover and Whitwell. Dolomitisation (natural addition of magnesian) has formed a high grade dolomite in the area around Whitwell. This is an important and nationally scarce mineral that is used in the steel making industry. Less chemically important forms of the limestone are prized for their tough physical properties and are generally used as constructional fill material (aggregate).

Surface Mined Coal

Formerly referred to as opencast coal. The main outcrop of coal is in the east of the county. Large scale coal production ceased in Derbyshire in 1993 with the closure of the last deep mined coalfield. However, with coal once again becoming a profitable mineral to extract, this may result in an increase in the number of surface mines in the county.

Namurian (Carboniferous) Sandstones

Also commonly referred to as Millstone Grit, this deposit is widespread in the central part of the county. It is used for building and roofing purposes. A small proportion in the north west of the county is quarried for aggregate.

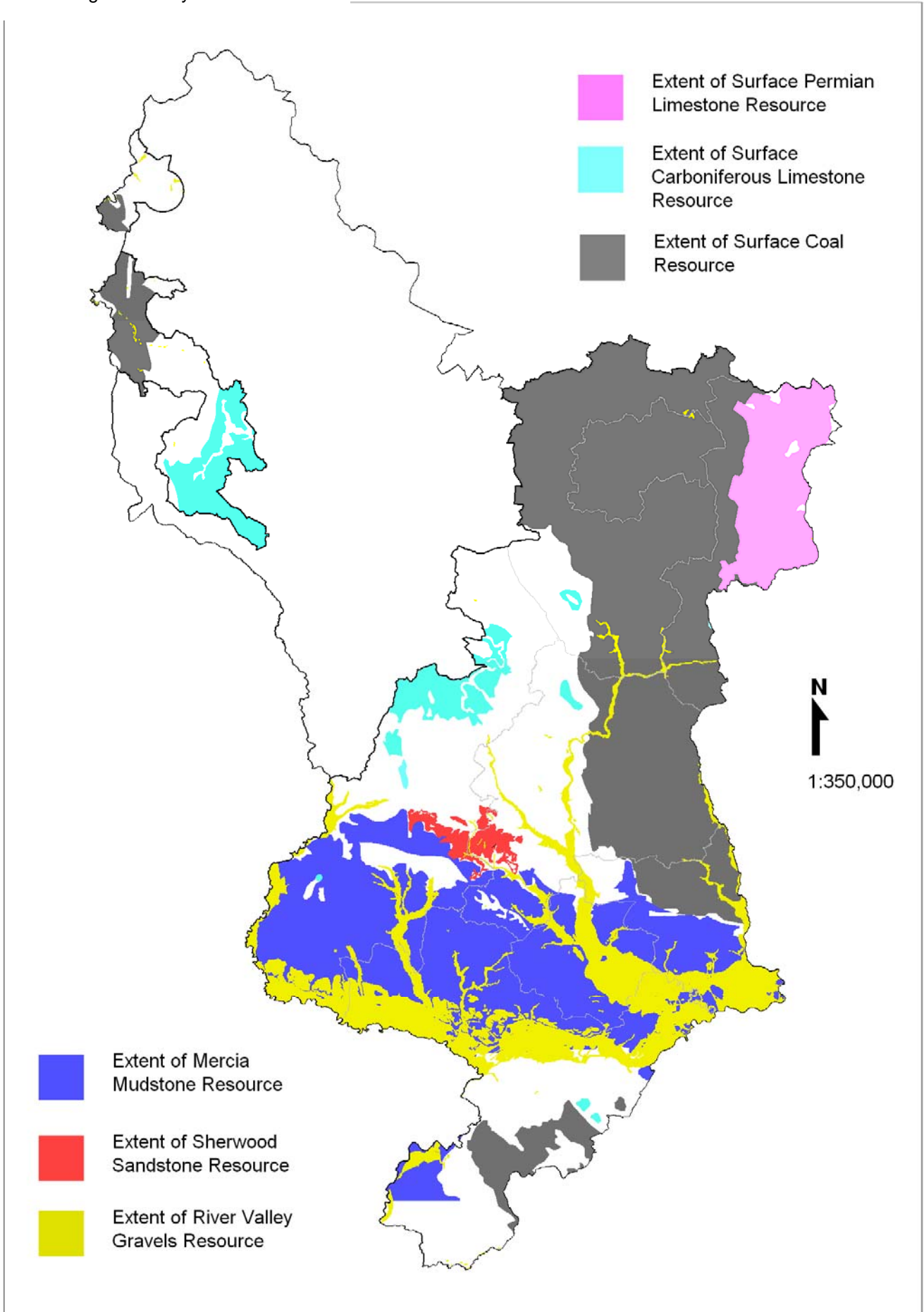
Clays

Brick Clay sources in Derbyshire are found within the Carboniferous Clays (found within the coal measures) mainly in the east of the county. Given their relatively high iron content, they are used to produce red bricks. Safeguarding options for this mineral include:

- safeguarding the whole resource
- safeguarding current workings
- safeguarding potential extensions and known prospects

Fireclays are sedimentary mudstones found under the coal measures and are a by product of surface mined coal operations. They are used mainly in the production of buff coloured bricks and clay pipes. As they are found in association with coal measures, they will not need to be safeguarded separately.

Mercia Mudstones were laid down in the Triassic period and are widespread in the south of the county. They can be used as a source of clay but have not been exploited to any great extent in the past.



Map 1: Derbyshire's Mineral Resources

PART 3: SAFEGUARDING OPTIONS

Table 1: Safeguarding options - Preliminary Conclusions

Minerals where it is recommended that all of the resource should be safeguarded:

- Glaciofluvial Sand & Gravel
- Carboniferous Limestone (aggregate and industrial grades)
- Permian Limestone (Industrial grade)
- Coal (surface mined)

Minerals where it is recommended that safeguarding should be limited to existing workings, potential extensions and sites identified by operators:

- Namurian Sandstone (building stone)
- Sherwood Sandstone
- Permian Limestone (aggregate grade)
- Brick Clay

Minerals where no safeguarding appears to be justified:

- Namurian Sandstone (aggregate)
- Mercia Mudstone

Table 2: Preliminary Safeguarding Options for each mineral - Reasons

MINERAL	SUMMARY OF REASONS
Glaciofluvial sand & gravel (Trent, Dove & Derwent valleys)	Strategic mineral, limited in extent with relatively high extraction rates. Significant pressure for future working. Good resource data available. All known resource should be safeguarded.
Carboniferous Limestone	Strategic mineral, resource limited in extent, (particularly high purity element) but extensive relative to rates of extraction. Significant pressure for future working. All known resource should be safeguarded.
Permian Limestone (industrial grade)	Part of nationally strategic resource, relatively scarce and important commercially. Significant pressure for future working. All known resource should be safeguarded.
Permian Limestone (aggregate grade)	Resource limited but extensive relative to likely future rates of extraction. Current extraction limited to one operation. Safeguarding should be limited to this operation and its immediate area.
Sherwood Sandstone	Extensive resource. Limited extraction but still important resource. Safeguarding should be limited, therefore, to the existing operation and potential extensions.
Namurian Sandstone (building stone)	Extensive resource. Limited extraction but important resource where extracted. Safeguarding should be limited, therefore, to the existing operation and potential extensions.
Namurian Sandstone (aggregate grade)	Extensive resource. Very limited rates of extraction. Not necessary to safeguard any of the resource.
Mercia Mudstone	Very extensive resource relative to rates of extraction. Limited detailed data available but mineral quality uncertain. Not necessary to safeguard any of the resource.
Surface mined coal	Part of nationally strategic resource and should be safeguarded. Long term depletion a possibility. Resource well understood. All known resource should be safeguarded.
Carboniferous Brick Clay	Extensive resource relative to rates of extraction. Given this, it should be sufficient to safeguard existing workings.

PART 4: MAPPING SAFEGUARDING AREAS

This section will consider factors which will determine how the detailed extent and boundaries of mineral safeguarding areas are defined.

It is proposed that the BGS Mineral Resource Maps and the Coal Authority Resource Maps are used as the basis when identifying MSAs. These show the broad location of mineral deposits. They will then be refined, taking into account factors (set out below) such as the quality of the deposit, the economic viability of extracting the deposit, worked out areas, risk of depletion, the geographical extent of the deposit, its value in conserving historic buildings/structures and those in conservation areas, environmental constraints (designated areas), accessibility (remoteness, proximity to transport links). These more refined boundaries will show the deposits which we consider to be of sufficient economic or conservation value to warrant their protection for use by future generations. These factors are set out below:

Quality of Deposit

The depth, thickness, level of overburden, dipping of strata, composition and structure of the deposit will be important factors in determining whether the mineral is economically viable and thus, whether it is worth safeguarding.

The importance of the mineral in overall strategic terms will be taken into account and whether the remaining level of deposit could mean that there would be a risk of depletion in the long term if it is not safeguarded.

Geographical Extent

Some of the minerals referred to in Part 1 above, notably the dolomitised area of the Permian Limestone and the sand and gravel resource are relatively scarce and thus resource depletion is a real risk in the foreseeable future, whilst other minerals, such as the Carboniferous sandstones, are so extensive that only a fraction of the resource is ever likely to be worked. This means that a range of safeguarding options has to be explored, depending on the particular mineral.

Worked out Areas

Boundaries will be refined to exclude areas that have been worked out or are currently being worked.

Conservation Value

This will be an issue particularly in respect of the Namurian sandstones and to a lesser extent for the limestones. They are quarried for use as building stone in the repair and restoration of historic buildings/structures and buildings/structures in areas of conservation value. They are extensive through the central swathe of Derbyshire but rates of extraction are low in comparison, so more limited safeguarding possibly site specific may be the most appropriate option. A separate study has been carried out by the National Stone Centre for the safeguarding of building stone resources in Derbyshire.

Environmental Constraints (Designated Areas)

These include local and national nature reserves, sites of special scientific interest, special landscape areas and scheduled ancient monuments. The protection from development given to the landscape by these designations would appear to be sufficient to also protect the underlying mineral resources from sterilisation by surface development. BGS guidance, however, advises against this unless there is sound justification to do so, stating that the definition of MSAs alongside environmental and cultural designations will help to ensure that the impact of any proposed development will be taken into account alongside other planning considerations. There are no local circumstances in Derbyshire to suggest that minerals within designated areas should be exempted from safeguarding.

Urban and Other Built up Areas

BGS guidance advises that significant quantities of mineral can exist beneath major urban regeneration projects which can be won when reclaiming brownfield sites, which may warrant their safeguarding. It also states that, in some instances, definition of MSAs in urban areas may not be necessary when resources occur extensively elsewhere within the plan area.

In urban areas, minerals have effectively been sterilised by development so, given that the majority of planning applications are submitted for urban areas the designation of MSAs in urban areas, would lead to a large amount of unnecessary work. We think, therefore, that urban areas should not be covered by MSAs.

There may be cases, however, when the redevelopment of a site within an urban area provides the opportunity for minerals to be exploited. Given this, it would seem logical to include a policy relating to the prior extraction of important minerals during the redevelopment of a site in an urban area. This strategy would ensure that relatively scarce mineral resources in urban areas, such as surface mined coal, sand & gravel and the dolomitised Permian Limestone around

Whitwell are taken into account in the consideration of large proposals for development in urban areas.

If all development is removed from the safeguarding area, the boundary would become extremely complex and messy, so it is considered appropriate that only the towns and larger villages should be removed, leaving small hamlets and individual properties within the MSA.

Development near Mineral Resources

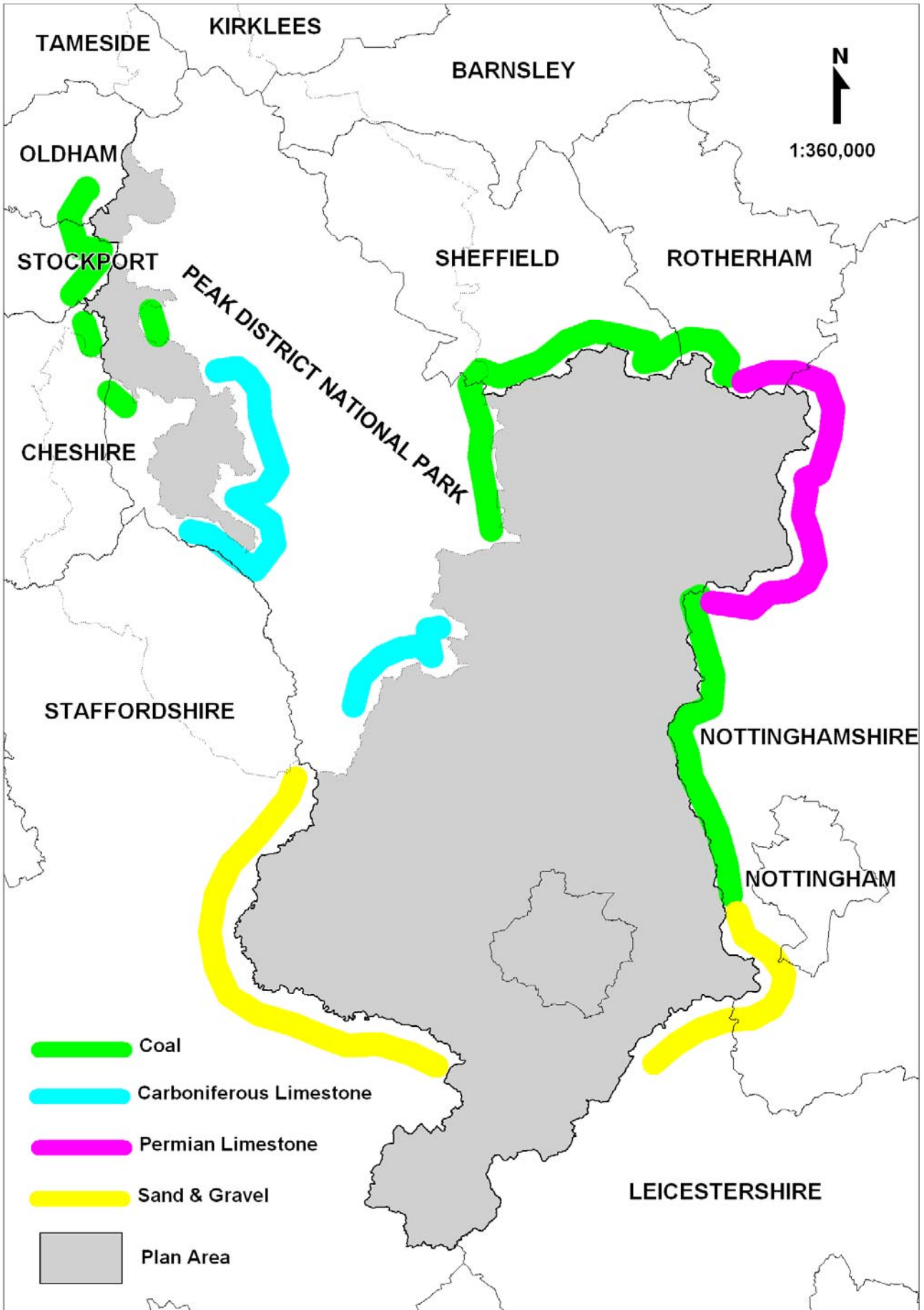
MPS1 refers to the potential for development not only within but close to a mineral resource to lead to its sterilisation. To safeguard a resource in its entirety and to account for the inexact nature of mapped geological boundaries, particularly for more scarce resources, it may be necessary to extend the MSA beyond the actual resource boundary, using a buffer zone. For example, if a house was built in this zone, a quantity of the resource could not be worked as the property would lie within the area that would be affected by quarry blasting to an unacceptable degree. Different types of mineral would require buffers of varying size depending on issues, such as blasting. BGS guidance notes that buffer zones can be as much as 500 metres wide for quarries involving blasting and as little as 50 metres for those that do not use blasting. Blasting has significant impacts at limestone quarries, whereas it is not used at sand and gravel quarries.

Safeguarding Mineral Resources adjacent to the County

Mineral resources do not stop at administrative boundaries, so development close to the boundary of one authority could effectively sterilise minerals in the adjacent authority area. For example, if housing is built on the boundary of one authority, it would mean that the mineral in the adjoining area could not be extracted because of the adverse impact the operation would have on the residential amenity of those newly developed properties.

It is likely in practice that the mineral will straddle the boundary and will be safeguarded by authorities on each side of the boundary so development should not, in theory, take place in these areas. The risk is where this is not the case. In such cases, BGS recommends that buffer zones to protect the margins of mineral resources can extend into neighbouring authorities to protect resources from development. The challenge occurs here because all authorities will be at different stages in developing their safeguarding strategy. Map 2 below shows the mineral resources that occur in adjoining authorities. All straddle the boundary with Derbyshire. It will be important to work closely with adjoining MPAs to ensure coordination and coherence of MSA designations across administrative boundaries.

Map 2: Mineral Resources adjoining Derby and Derbyshire



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Consultation with District Councils

District councils are required to show mineral safeguarding areas on their proposals maps and to consult the County Council on development proposals which fall within a MSA. The County Council can then advise the district on any minerals implications and either object to the development or suggest changes to minimise the loss of mineral, even suggesting an alternative location for the development where mineral resources would not be sterilised. Government policy in MPS1 now states that matters relating to MSAs must be taken into account in the decision making process.

The presence of a MSA does not preclude automatically all development within these areas. The safeguarding policy will indicate which types of development will be acceptable in MSAs. This will probably include developments such as extensions to existing dwellings and advertisements. It is proposed, therefore, that the district councils will not have to consult the County on such applications, in terms of mineral safeguarding.

Safeguarding Mineral Transport and Processing Infrastructure

Government policy also requires mineral planning authorities to safeguard existing or potential future facilities such as wharves and railheads, which are involved in the transport, storage, handling and processing of materials, in particular aggregates, cement and coal. Government policy also states that consideration should be given to combining such sites with those for the processing and distribution of recycled and secondary aggregates.

PART 5: IMPLEMENTATION OF MINERAL SAFEGUARDING AREAS

This section considers how, once defined, MSAs can be safeguarded from other development. There are two opportunities to do this; through the consideration of MSAs when district councils are developing their allocations in their core strategies. The second opportunity is to assess individual proposals when they are submitted as planning applications.

Level of Protection

The quality of resource within MSAs will be variable, with some areas justifying a high level of protection and others, where little protection is likely to be justified. This will only become totally apparent once the underlying geology is assessed fully in response to a risk of the mineral being lost to a non-mineral development. This will require safeguarding policies to be flexible as they will need to deal with a wide range of circumstances.

Government policy and BGS guidance promotes the safeguarding of nationally important resources that are limited in geographical extent, where any surface development would be likely to raise concerns. If this approach is taken, whereby the MSAs are focussed on the most important and scarcest resources, their protection would hold greater weight than simply protecting all known resources where the value of the resource will be extremely variable throughout its extent.

District Council Development Plan Allocations

Government policy in MPS1 states that district councils should not normally include policies and proposals in their development plans which would affect the extraction of minerals in safeguarding areas.

District Council allocations show where future development is likely to take place and will therefore be the most likely place where any mineral safeguarding issues will arise. The best time to consider mineral safeguarding will be when these allocations are put forward for consultation in a draft development plan. This allows mineral safeguarding issues to be considered alongside all other planning issues, in order to reach a balanced decision about whether the allocation should be taken forward. Thus, when allocations are adopted, it can be assumed that any future planning applications that fall within them does not raise any mineral safeguarding issues.

It will obviously take a number of years before all adopted allocations in District LDFs have taken account of mineral safeguarding areas. However, since most major development sites tend to be either within or adjacent to existing settlements the likelihood of one coinciding with land that is underlain by valuable minerals in safeguarded areas is probably quite small. This suggests that, overall, the risk of important minerals being lost to development is relatively small.

Development Control Policy

A development control policy will set out how mineral resources can be safeguarded whilst not preventing other development taking place where this can be justified, after taking account of minerals issues. BGS guidance suggests a model policy as set out below:

Planning permission will not be granted for any form of development within a Mineral Safeguarding Area that is incompatible with safeguarding the mineral unless:

- *the applicant can demonstrate to the satisfaction of the LPA that the mineral concerned is no longer of any value or potential value; or*
- *the mineral can be extracted satisfactorily prior to the incompatible development taking place; or*
- *the incompatible development is of a temporary nature and can be completed and the site restored to a condition that does not inhibit extraction within the timescale that the mineral is likely to be needed; or*
- *there is an overriding need for the incompatible development; or*
- *it is exempt development set out in the paragraph below.*

Exempt Development

Not all proposals for development within or close to an MSA pose a risk to future minerals extraction in terms of sterilising resources and will, therefore, not have to be automatically referred to the MPA. To ensure that consultations are restricted to developments that would have a potential impact on mineral resources, it is proposed to exempt the following categories of development from the MSA consultation process:

- Householder planning applications, except for new dwellings
- Applications for advertisements
- Infill development
- Applications for reserved matters
- Development which is in accordance with adopted development plan allocations.