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NATURAL ENVIRONMENT RESEARCH COUNCIL



OFFICE OF THE  
DEPUTY PRIME MINISTER

# Mineral Resource Information in Support of National, Regional and Local Planning Buckinghamshire and Milton Keynes

Commissioned Report CR/03/77N





BRITISH GEOLOGICAL SURVEY

COMMISSIONED REPORT CR/03/77N

# Mineral Resource Information in Support of National, Regional and Local Planning Buckinghamshire and Milton Keynes

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# 1 Introduction

This report is one of a series prepared by the British Geological Survey for various administrative areas in England for the Office of the Deputy Prime Minister's research project *Mineral Resource Information in Support of National, Regional and Local Planning*.

The accompanying map relates to the county of Buckinghamshire and Milton Keynes and delineates the mineral resources of current, or potential, economic interest in the area and the sites where minerals are or have been worked. It also relates these to national planning designations, which may represent constraints on the extraction of minerals.

Three major elements of information are presented:

- the geological distribution and importance of mineral resources;
- the extent of mineral planning permissions and the location of current mineral workings, and
- the extent of selected, nationally-designated planning constraints.

This wide range of information, much of which is scattered and not always available in a consistent and convenient form, is presented on a digitally-generated summary map on the scale of 1:100 000. This scale is convenient for the overall display of the data and allows for a legible topographic base on which to depict the information. However, all the data are held digitally at larger scales using a Geographical Information System (GIS), which allows easy revision, updating and customisation of the information together with its possible integration with other datasets. The information will form part of a *Summary of the Mineral Resources of the South East Region*.

The purpose of the work is to assist all interested parties involved in the preparation and review of development plans, both in relation to the extraction of minerals and the protection of mineral resources from sterilisation. It provides a knowledge base, in a consistent format, on the nature and extent of mineral resources and the environmental constraints, which may affect their extraction. An important objective is to provide baseline data for the long term. The results may also provide a starting point for discussions on specific planning proposals for mineral extraction or on proposals, which may sterilise resources.

It is anticipated that the maps and report will also provide valuable background data for a much wider audience, including the different sectors of the minerals industry, other agencies and authorities (e.g. The Planning Inspectorate Agency, the Environment Agency, the Countryside Agency and English Nature), environmental interests and the general public.

Basic mineral resource information is essential to support mineral exploration and development activities, for resource management and land-use planning, and to establish baseline data for environmental impact studies and environmental guidelines. It also enables a more sustainable pattern and standard of development to be achieved by valuing mineral resources as national assets.

The mineral resources covered are sand and gravel, chalk, limestone, brick clay and hydrocarbons.

## 1.1 RESOURCES AND RESERVES

Mineral resources are natural concentrations of minerals, or bodies of rock that are, or may become, of potential economic interest as a basis for the extraction of a commodity. They will exhibit physical and/or chemical properties that make them suitable for specific uses and be present in sufficient quantity to be of intrinsic economic interest. Areas that are of potential

economic interest as sources of minerals change with time as new uses are developed, product specifications change, recovery technology is improved or more competitive sources become available.

That part of a mineral resource, which has been fully evaluated and is commercially viable, to work is called a mineral reserve. In the context of land-use planning, the term mineral reserve should strictly be further limited to those minerals for which a valid planning permission for extraction exists (i.e. permitted reserves). Without a valid planning consent, no mineral working can take place and consequently the inherent economic value of the mineral resource cannot be released and resulting wealth created. The ultimate fate of a mineral reserve is to be either physically worked out or to be made non-viable by changing economic circumstances.

Mineral resources defined on the map delineate areas within which potentially workable mineral may occur. These areas are not of uniform potential and also take no account of planning constraints that may limit their working. The economic potential of individual sites can only be proved by a detailed evaluation programme. Such an investigation is an essential precursor to submitting a planning application for mineral working. Extensive areas are shown as having no mineral resource potential, but some isolated mineral workings may occur in these areas. The presence of these operations generally reflects local or specific situations.

## **1.2 ENVIRONMENTAL DESIGNATIONS**

The map shows the extent of selected, nationally-designated planning constraints as defined for the purposes of this study. These are defined on a common national basis and therefore represent a consistent degree of constraint across the country. No interpretation should be made from the map with regard to the relative importance of the constraints, either in relation to mineral development proposals or in relation to each other. Users should consult policy guidelines issued by the relevant Government department, statutory agency or local authority.

The constraints shown on the map are:

- Part of the Chilterns Area of Outstanding Natural Beauty (AONB)
- National nature conservation designations – National Nature Reserves (NNR) and Sites of Special Scientific Interest (SSSI)
- International nature designations – Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar sites
- Scheduled Monuments

Mineral development may also be constrained by many other factors not shown on the map, including local landscape designations, considerations relating to the protection of other resources, such as groundwater, and local amenity or environmental concerns, such as noise, traffic and visual impact. These have been excluded because the constraint is not defined on a national basis or the information is not generally available. The extent or degree of relevance of such constraints can be ascertained from the relevant statutory agency or the appropriate Mineral Planning Authority

## **2 Sand and gravel**

Sand and gravel are defined on the basis of particle size rather than composition. In current commercial usage, the term ‘gravel’ is used for material that is coarser than 5 mm, with a maximum size of 40 mm, and the term sand for the material that is finer, but coarser than 0.075 mm. Most sand and gravel is composed of particles that are rich in silica (quartz, quartzite and flint), but other rock types may occur locally.



The principal uses of sand are as fine aggregate in concrete, mortar and asphalt. The main use of gravel is as coarse aggregate in concrete. Substantial quantities of sand and gravel may also be used for construction fill.

Buckinghamshire produced just over 1.4 million tonnes of sand and gravel in 2001 and has estimated permitted reserves of 19.5 million tonnes (source: AM2001 survey). Recent production figures are shown in Figure 1 below.

Sand and gravel resources occur in a variety of geological environments. In Buckinghamshire these resources occur within the category of superficial or 'drift' deposits, subdivided into glaciofluvial deposits, river terrace deposits, and sub-alluvial deposits.

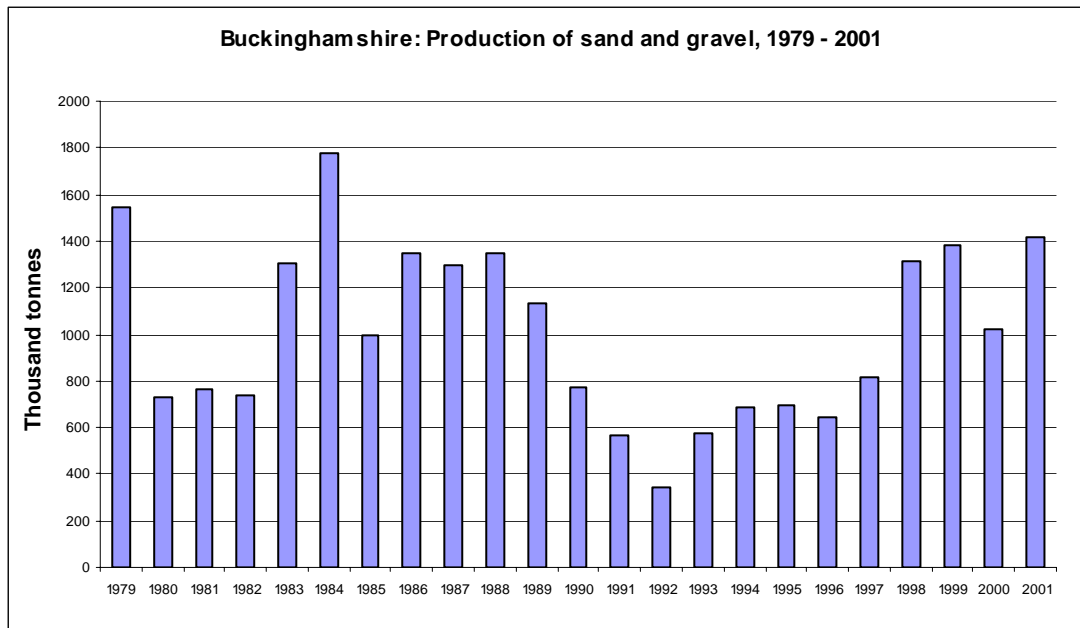


Figure 1. Production of sand and gravel for Buckinghamshire only between 1979-2001 (source Annual Mineral Raised Inquiry, Office for National Statistics)

## 2.1 SUPERFICIAL DEPOSITS

Parts of the area assessed for sand and gravel by BGS resource surveys are identified on the map. Resources shown here are taken from these maps where available. In these areas, the possible extent of sand and gravel concealed beneath till (formerly Boulder Clay) and/or other material is shown. These indicated resources were defined by overburden to mineral ratios. Outside these areas, available data are more limited. Generally, only exposed sand and gravel is defined, although sub-alluvial resources of sand and gravel occurring beneath modern river flood plains may be extensive in some places. In addition, narrow (< 200 m) spreads of sub-alluvial deposits are mainly excluded from the map. Their limited width is likely to preclude economic working of any sand and gravel present.

### 2.1.1 GLACIOFLUVIAL DEPOSITS

This category comprises waterlain sands and gravels deposited in close proximity to the Anglian ice-sheet that covered most of the northern half of Buckinghamshire. The deposits occur as irregular sheets or bodies, below, within and above the till. The thickness of the deposits is highly variable and rarely exceeds 5 m in eastern parts of Buckinghamshire except within

channels. However, thicker deposits occur in north-western parts where deposits can reach 18 m or more.

Glaciofluvial deposits of sand and gravel are widespread throughout northern Buckinghamshire. They are mainly poorly sorted flint-rich gravels but many deposits also contain significant proportions of chalk, quartzite, limestone and sandstone, which reflect their source areas, together with high proportions of clay. This makes the deposits of limited use for concreting purposes and of more potential use for hoggin – clayey sand and gravel used as constructional fill for low-grade purposes such as paths. Quarrying of sand and gravel has occurred in the past near Stewkley where mixed sand, gravel and clay units were found to be from 10 – 20 m thick. Small-scale workings have also been noted around Wing. More extensive and thicker deposits of this type are present in the northern part of the district, such as in Stowe Park, where 18 m of poorly sorted gravel, containing cobbles and boulders up to 0.7 m in diameter, are exposed in a gravel pit in this area.

### 2.1.2 RIVER TERRACE DEPOSITS

River terrace deposits occur at several levels in most of the major valleys in the county flanking their present-day floodplains, and also occur in extensive deposits in southern Buckinghamshire as well as along river valleys in the north of the county. They are generally dry in their upper parts but can be saturated at their bases. These deposits comprise sequences of sands and gravels with sheet-like geometry and sub-horizontal upper surfaces. They range from < 1 m to > 10 m in thickness (averaging 5-6 m thick) in the south of Buckinghamshire to a maximum of 5 m thick in the north of the county.

Compositionally, the main component of the gravels is flint, although they may locally contain a significant percentage of quartz and quartzite, especially those deposits occurring in the south of the county along the banks of the River Thames.



Sand and gravel workings near Beaconsfield, in deposits laid down by an ancestral River Thames.

The river terrace gravels in the north of the county typically also contain variable amounts of limestone, though this is generally absent near the surface because of weathering. Although they contain some debris derived directly from the bedrock of the catchment, the river terrace gravels are composed largely of reworked glacial deposits (glaciofluvial deposits) and may therefore be similar in composition to the latter. However, they are generally better sorted, with a smaller proportion of fines and fewer non-durable clasts such as chalk or mudstone. It is for these reasons the gravels make excellent resources of aggregate.

The quartz-rich gravels are river terraces deposited by an ancestral River Thames in successive phases as the river flowed in a north-easterly direction through the southern tip of

Buckinghamshire and onwards into Hertfordshire and Essex. Many of these quartz-rich river terrace deposits are equivalent to similar deposits in other counties, for example the Kesgrave Sand and Gravel of Essex. The highest, and therefore oldest, river terrace deposit in the district is the Westland Green Gravel. Below this level the Chorleywood Gravel, Beaconsfield Gravel, Gerrards Cross Gravel and Winter Hill Gravel occur at successively lower levels between 115 m OD and 65 m OD. All of these river terrace gravels contain significantly high quantities of quartz vein pebbles (ranging from 13 to over 28 % on average respectively), thought to be sourced from the West Midlands area. Figure 2, below, illustrates the distribution of these relatively quartz-rich river terrace deposits.

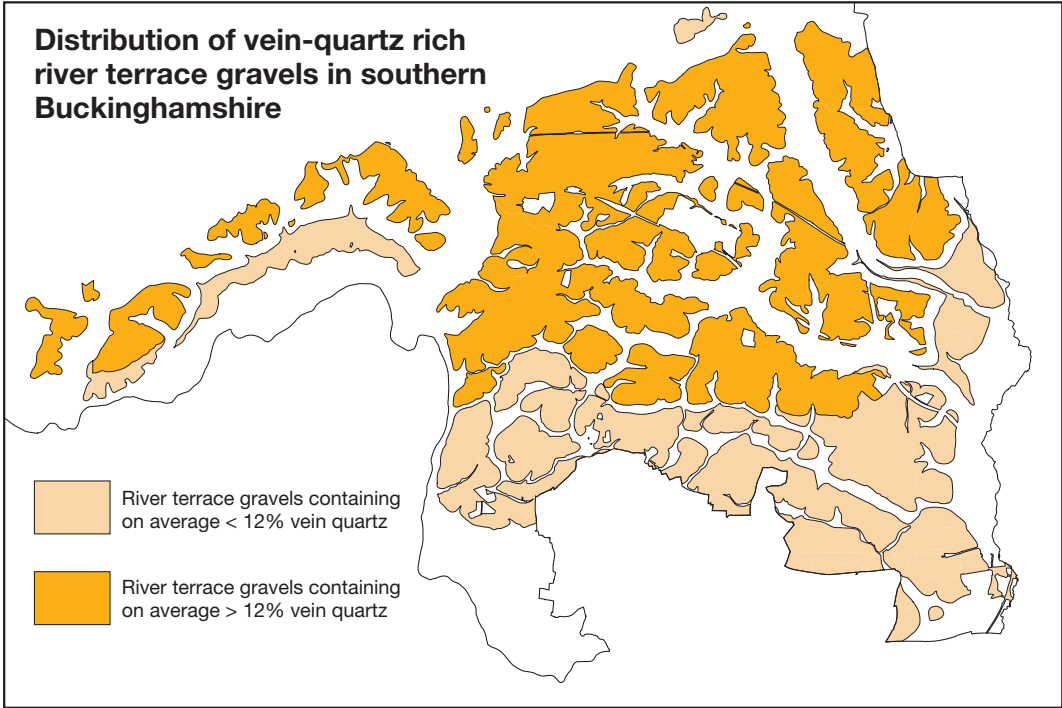


Figure 2. Distribution of quartz-rich river terrace gravels in southern Buckinghamshire.

2.1.3 SUB-ALLUVIAL GRAVEL

Sub-alluvial gravels occur beneath the alluvium of the major valleys throughout the county. They were mainly laid down during periods of falling river velocity and increased sediment load. The gravels rest on an irregular channelled surface and are thus of very variable thickness, locally 5-10 m of deposits are present but they are commonly thinner. These deposits are generally similar in composition to river terrace gravels, however, they are saturated and would require wet working if they were exploited. Deposits of sub-alluvial gravels occur within the valley of the rivers Wye, Misbourne and Chess in the south of the county, and also in the valley of the River Great Ouse in the Milton Keynes and Newport Pagnell area. Gravels have been extensively worked in the Colne and Thames valleys and resources have in many cases already been exhausted. Many minor areas of sub-alluvial gravel have been excluded from the map since their small size would preclude economic extraction.

Coombe Deposits and Head Gravel deposits, mainly consisting of pebbly clay-like deposits, have been locally worked in places. However, the quality and quantity of the deposits is such that they do not constitute a resource that is likely to be exploited. They have, therefore, been excluded from the map.

## 3 Bedrock sand deposits

### 3.1 WOBURN SANDS FORMATION

A small area of the Woburn Sands Formation (Lower Greensand Group) occurs in east Buckinghamshire, where it forms the most westerly part of an extensive outcrop that extends north-eastwards through Bedfordshire and into Cambridgeshire. The formation rests with marked unconformity on strata of Upper Jurassic age and in Buckinghamshire it forms a prominent northerly-trending escarpment. The sediments that comprise the Woburn Sands are generally quartz sands of variable quality and grain-size distribution, although they are devoid of gravel.

The Woburn Sands are a very important source of construction sand (building and concreting sand) and also silica (industrial) sand just across the county boundary in Bedfordshire and particularly in the area to the north and south of Leighton Buzzard. Here the sands are more variable in grain size and locally are of high purity. However, with the exception of a few very localised pits, there are currently no workings in the Woburn Sands in Buckinghamshire where the deposit is thinner and the outcrop also has a prominent position. The vertical and areal distribution of the different qualities of sand within the Woburn Sands is poorly known. However, there are indications that the sands are finer grained to the north of the main concentration of workings in Bedfordshire, which would make them less attractive as a source of construction sand. The outcrop of the Woburn Sands is shown on the map.

There is one example of a quarry that reportedly produced silica sand, at Eythrope Road in Stone. This quarry worked part of the Whitchurch Sand Formation, however, this is not considered to represent a current resource due to its limited extent and better suitability of alternative materials from elsewhere.

## 4 Chalk

Chalk is a relatively soft, fine-grained, white limestone, consisting mostly of the calcareous debris of planktonic algae. It occurs as bedrock throughout most of the southern half of the county with an outcrop trending from the north-east to south-west.

The Grey Chalk Subgroup (formerly Lower Chalk) varies from 48 m to about 73 m thick in southern Buckinghamshire. It occurs south of a line stretching approximately from Princes Risborough in the south-west to just north of Drayton Beauchamp in the north-east, although much of it is covered by superficial deposits. The Grey Chalk crops out over a width of approximately 20 km following this north-easterly trend, with the White Chalk Subgroup (formerly Middle and Upper Chalk) cropping out south of this line. The Grey Chalk generally contains more interbedded calcareous mudstone than the overlying White Chalk and is of lower purity (generally <93% CaCO<sub>3</sub>). The clay to lime ratio of the Grey Chalk formerly made it an ideal raw material for cement manufacture, and it was formerly worked for this purpose at Pitstone quarry near the Hertfordshire border.

The White Chalk Subgroup varies from 105 m to about 131 m thick in southern Buckinghamshire and comprises higher purity material (93-98% CaCO<sub>3</sub> excluding flint) than the underlying Grey Chalk. Layers of large flint nodules are common in the White Chalk Subgroup and they have been widely used in the past for building purposes. Flint nodules are not considered to represent a resource in the county, as they are unlikely to be worked in the future for anything other than very local purposes.

The White Chalk of the district has been worked to extract chalk for agricultural lime, as a source of flints for building and as low-grade aggregate and fill. Large disused quarries can be found in the valley sides near Harefield and Taplow. Only one working chalk quarry remains in Buckinghamshire, which is in the Ivinghoe/ Pitstone area near Tring. The Chalk is a major aquifer and is an important source of groundwater in the county.

## 5 Limestone

A variety of hard rocks are, when crushed, suitable for use as aggregates. Their technical suitability for different applications depends on their physical characteristics, such as crushing strength and resistance to impact and abrasion. Higher quality aggregates are required for coating with bitumen for road surfacing, or for mixing with cement to produce concrete. For applications, such as constructional fill and drainage media, with less demanding specifications, lower quality materials are acceptable. Buckinghamshire has very limited resources of rock suitable for use as crushed rock aggregate.

The Great Oolite Group consists of limestones, mudstones and calcareous mudstone units. Within the Great Oolite Group the White Limestone Formation, Blisworth Limestone Formation and the Cornbrash Formation have the most significant resource potential. Where these units have not been separately mapped, the outcrop is shown as Great Oolite Group (undivided).

The Great Oolite Group does not constitute a resource everywhere, since some sequences contain more mudstone than others. Generally speaking, the White Limestone Formation in the north-west of the county is most suitable for aggregate use, as it becomes more clayey to the north-east where it is termed the Blisworth Limestone.

## 6 Brick Clay

‘Brick clay’ is the term used to describe clay and mudstone used predominantly in the manufacture of bricks and, to a lesser extent, roof tiles and clay pipes. These clays may sometimes be used as a source of constructional fill, for lining and sealing landfill sites and for cement manufacture. The suitability of a clay for the manufacture of bricks depends principally on its behaviour during shaping, drying and firing. This will dictate properties of the fired brick such as strength and frost resistance and, importantly, its architectural appearance.

Most facing bricks, engineering bricks and related clay-based building products are manufactured in large automated factories. These represent a high capital investment and are increasingly dependent, therefore, on raw materials with predictable and consistent firing characteristics in order to achieve high yields of saleable products. Blending different clays to achieve improved durability and to provide a range of fired colours and textures is an increasingly common feature of the brick industry. Continuity of supply of consistent raw materials is of paramount importance.

### 6.1 PETERBOROUGH MEMBER

The Peterborough Member of the Oxford Clay (formerly the Lower Oxford Clay) was an important resource for brick making in Buckinghamshire. It is worked in the neighbouring county of Bedfordshire. Its surface outcrop trends in a north-east to south-west direction across the northern half of the county and the member has a thickness of between 23 and 26 m in Buckinghamshire. The Peterborough Member consists mainly of a greenish grey mudstone with an organic (carbonaceous) content of between 5 and 7%. This material acts as a fuel during firing

and reduces the costs of brick production. The weathered mantle ('callow') of the Peterborough Member, the more calcareous upper members of the Oxford Clay, and any overlying deposits are generally unsuited for brick production and so are removed where present as overburden. The clays of the Peterborough Member were worked for bricks at Calvert and Newton Longville (Bletchley) for up to a century, prior to closure in 1991. Other former brick-making pits occur in the area around Milton Keynes, some of which are of importance as voids for landfill.

The base of the Peterborough Member has been mapped throughout the county but the top has not been completely mapped throughout Buckinghamshire and in places the boundary has been inferred from borehole information; this is shown as a stippled line on the map.

The Middle and Upper Oxford Clay has previously been worked in the county, however, it is no longer considered to represent a resource and for this reason it is excluded from the map.

## **6.2 CLAY-WITH-FLINTS**

In Chiltern District, clay from the Clay-with-Flints is used for the manufacture of high quality bricks, typical of the buildings in the south of the county. Although there are moderate deposits of Clay-with-Flints in the Chilterns, those that are suitable for brick making only occur in relatively small areas. At present there are two active brickworks each served by nearby pits, one at Dundridge Manor Farm is within the AONB, the other is at Meadhams Farm, Chesham. The works provide a source of locally made materials for buildings and walls within and beyond the AONB, ensuring compatibility with those traditionally used.

The clay deposits tend to be variable in quality and of a localised nature. However, in the area of the Chilterns to the east of High Wycombe they represent a resource that is locally important. This is used for producing bricks that fit the distinctive architectural character of the area.

## **7 Fuller's Earth**

A number of clays have been referred to as 'fuller's earth' in the past. In Britain the term is used to describe clays composed essentially of the clay mineral Ca-smectite, which exhibits a unique combination of properties on which the mineral's industrial applications are based.

Fuller's earth has been produced for many years from a single bed up to 3.5 m thick in the Woburn Sands Formation between Woburn and Woburn Sands, just over the county boundary in Bedfordshire. The bed is lenticular and there is no evidence to suggest that fuller's earth in commercial quantities extends into Buckinghamshire. Fuller's earth has not been recorded elsewhere in the county.

## **8 Building Stone**

The rocks of the county range from Jurassic to Palaeogene in age and have provided a range of stones for local building purposes. Limestone from the Middle Jurassic succession is still quarried at the only remaining limestone quarry in Buckinghamshire at Weston Underwood near the Northamptonshire border. Purbeck and Portland limestones from the Upper Jurassic were formerly quarried extensively in the Vale of Aylesbury for building purposes at many places, including Long Crendon, Hartwell, Dinton and Cuddington. Ferruginous Lower Greensand Group rocks ('carstone') have been very locally used along the eastern border of the county, and Palaeogene quartz cemented sandstones or 'sarsen' stones were also commonly used as a building stone in the Chilterns.

There are no major resources of building stone in Buckinghamshire.

## 9 Hydrocarbons

### 9.1 CONVENTIONAL OIL AND GAS

The county of Buckinghamshire lies to the north of the Variscan Front, on the southern flanks of the ancient London-Brabant Massif where Variscan Basement lies at shallow depths. Across this area thin Mesozoic sequences were deposited, impacting on the quality and extent of the potential reservoir and source rock facies found in the Wessex Basin to the south. Any source rocks present will be neither thick enough nor likely to have been buried deep enough for the generation of commercial hydrocarbons in these parts. The early 20<sup>th</sup> Century saw exploration for concealed Coal Measures in Buckinghamshire with the Charndon (Dunsty Hill) and Calvert East boreholes drilled in 1911 and 1912, respectively. Both failed to encounter Coal Measures, although significant gas shows and pressures were recorded in the former.

Few seismic reflection lines have been acquired in the county, the exceptions being a small number in the southwest of the county. In the early 1960s, BP drilled a series of exploration wells at Twyford, immediately west of the coal exploration boreholes. Twyford No.1 (1960) briefly produced gas from the Lower Lias at a rate of 900,000 cuft/day. Gas shows were subsequently encountered in the Twyford No. 2 and 3 wells, but Twyford No.4 did not produce when tested. To date, no producing oil or gas fields have been discovered in the county, with the last hydrocarbon well drilled at Tring on the border with Hertfordshire in 1965. However, as recently as 1998, the Twyford area was covered by the PEDL 15 license, operated by CANUK, although this appeared to have been relinquished by the 10<sup>th</sup> Onshore Licensing Round in 2002.

The county thus appears to have limited oil and gas prospectivity, although the possibility for the discovery of (small) gas accumulations may still exist.

The Department of Trade and Industry grants licences for exclusive rights to explore and exploit oil and gas onshore within Great Britain. The rights granted by landward licences do not include rights of access, and the licensees must obtain any consent under current legislation, including planning permissions. Licensees wishing to enter or drill through coal seams for coalbed methane and abandoned mine methane must seek the permission of the Coal Authority.

### 9.2 COALBED METHANE (CBM) POTENTIAL

The basement rocks to the Mesozoic-Tertiary rocks of Buckinghamshire comprise strata of Cambrian, Devonian and Carboniferous age. No Coal Measure strata have been proved in the county, although they form the concealed Oxfordshire-Berkshire Coalfield just to the west.

Consequently, it is thought that little or no potential exists in the county for coal bed methane development.

## 10 Aims and limitations

The purpose of the maps in this series is to show the broad distribution of those mineral resources that may be of current or potential economic interest and to relate these to selected nationally-recognised planning designations. The maps are intended to assist in the consideration and preparation of development plan policies in respect of mineral extraction and the protection

of important mineral resources against sterilisation. They bring together a wide range of information, much of which is scattered and not always available in a convenient form.

The maps have been produced by collation and interpretation of mineral resource data principally held by the British Geological Survey. Information on the extent of mineral planning permissions has been obtained from the relevant Mineral Planning Authority (MPA). Some of these permissions may have lapsed or expired. The status of individual areas can be ascertained from the appropriate MPA. Location information on national planning designations has been obtained from the appropriate statutory body (Countryside Agency, English Nature and English Heritage). For further information the relevant body should be contacted.

The mineral resource data presented are based on the best available information, but are not comprehensive and their quality is variable. The inferred boundaries shown are, therefore, approximate. Mineral resources defined on the map delineate areas within which potentially workable minerals may occur. These areas are not of uniform potential and also take no account of planning constraints that may limit their working. The economic potential of specific sites can only be proved by a detailed evaluation programme. Such an investigation is an essential precursor to submitting a planning application for mineral working. Extensive areas are shown as having no mineral resource potential, but some isolated mineral workings may occur in these areas. The presence of these operations generally reflect very local or specific situations.

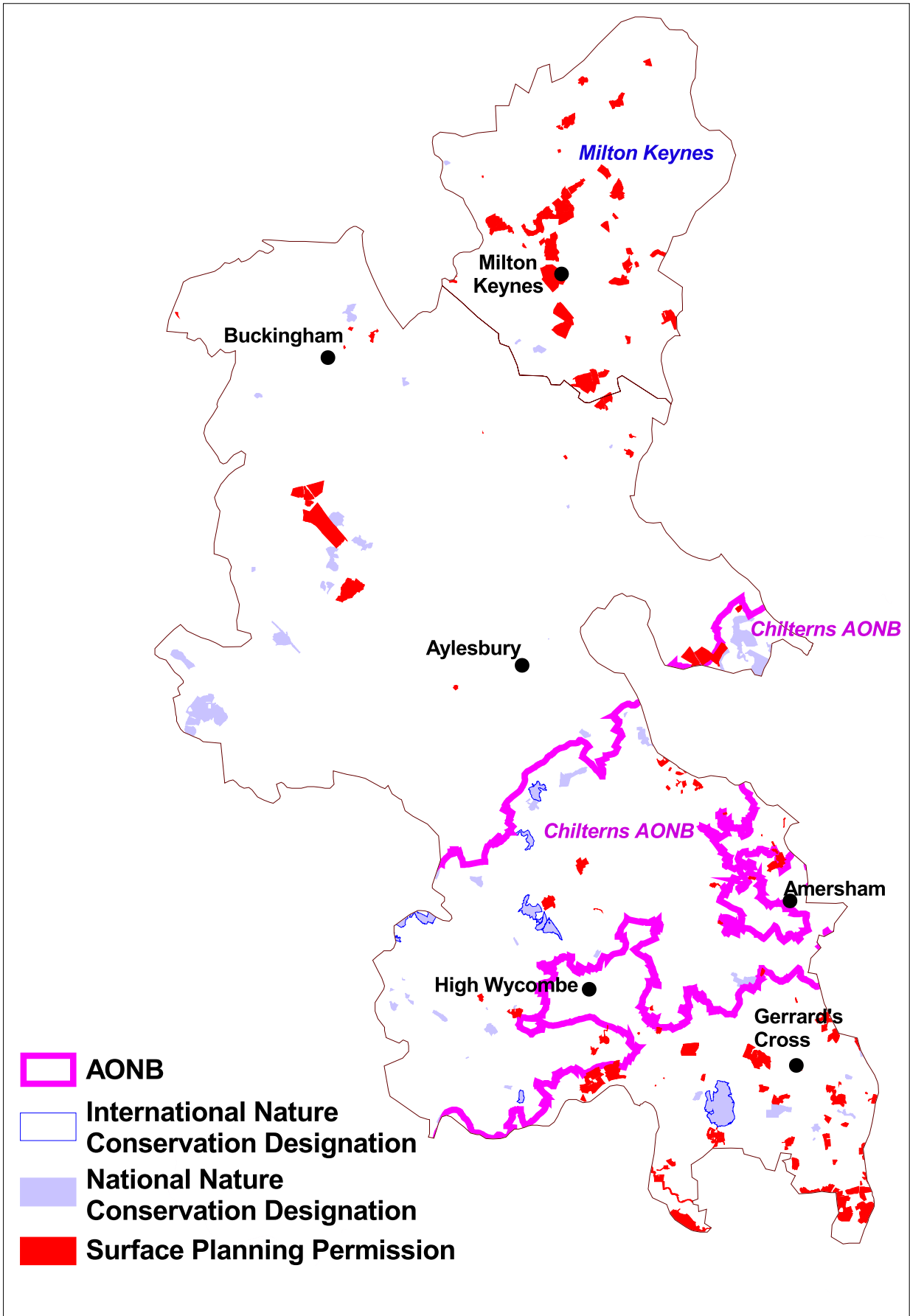
The maps are intended for general consideration of mineral issues and not as a source of detailed information on specific sites. The maps should not be used to determine individual planning applications or in taking other decisions on the acquisition or use of a particular piece of land, although they may give useful background information which sets a specific proposal within context.

## 11 Planning permissions for mineral extraction

The extent of all known extant and former planning permissions for mineral working is shown on the map, irrespective of their current planning or operational status. The polygons were digitised from plotting sheets and other documents supplied by Buckinghamshire County Council and Milton Keynes Council. Any queries regarding the sites shown should be directed to these authorities at the addresses shown below. The polygons cover active, former and restored mineral workings and, occasionally, unworked deposits.

Planning Permissions represent areas where a commercial decision to work mineral has been made, a successful application has been dealt with through the provisions of the Town and Country Planning legislation and the permitted reserve will have been depleted to a greater or lesser extent. The current planning status is not qualified on the map but is available in the underlying database.





Surface mineral planning permissions and landscape and nature conservation designations in Buckinghamshire.

# Appendix

## **CONTACT ADDRESSES:**

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Milton Keynes Council, Development Control, P.O. Box 125, Civic Offices, 1 Saxon Gate East, Milton Keynes, MK9 3ZJ. Tel: 01908 691691, Fax: 01908 252211, web address: <http://www.mkweb.co.uk/>

## Topographic base

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Constraint information published on the accompanying map has been provided from the various agencies listed below, any enquires on this information should be addressed to the relevant agency:

**English Nature** - Digital SSSI and NNR boundaries © English Nature 2003.

*Contact address:* English Nature, Northminster House, Northminster, Peterborough, PE1 1UA, Tel: 01733 455000, Fax: 01733 455103, Web page: [www.english-nature.org.uk/](http://www.english-nature.org.uk/)

**English Heritage** - Positions of Scheduled Monuments at 15<sup>th</sup> August 2002.

The majority of monuments are plotted using a centred NGR symbol. Consequently the actual area and/or length of a monument protected by the legal constraints of scheduling cannot be represented here. Monuments scheduled since that date are not accounted for. © Copyright English Heritage.

*Contact address:* English Heritage, 23 Savile Row, London, W1S 2ET, Tel: 020 7973 3132, Web page: [www.english-heritage.org.uk/](http://www.english-heritage.org.uk/)

**Countryside Agency** - Digital AONB boundaries © Countryside Commission 1986.

*Contact address:* Countryside Agency, John Dower House, Crescent Place, Cheltenham, Gloucestershire, GL50 3RA, Tel: 01242 521381, Fax: 01242 584270, Web page: [www.countryside.gov.uk/](http://www.countryside.gov.uk/)

**The Coal Authority** - Coal Licence Areas © The Coal Authority 2001.

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