

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

LINCOLNSHIRE

Mineral Resource Information in Support of National, Regional and Local Planning
Mineral Resources (South)
Scale 1:100 000

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Digital cartography by N.A. Spencer, British Geological Survey, Published 2002.

This map comprises part of a summary of the 'Mineral Resources of the East Midlands Region'.
For more information see www.mineralsUK.com

BIBLIOGRAPHIC REFERENCE
Harrison, D.J. and others, 2002. Mineral Resource Information for National, Regional and Local Planning, Lincolnshire. British Geological Survey Commissioned Report CR020/2002.

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SAND & GRAVEL

Superficial deposits

- Sub-alluvial: Inferred resources
- Sub-alluvial: Indicated resources in areas assessed by BGS
- River terrace deposits
- Glaciofluvial deposits
- Glaciofluvial deposits: Concealed (only in areas assessed by BGS)
- Blown sand
- Blown sand: Concealed
- Shore/Beach deposits
- Boundary of area assessed for sand and gravel at the indicated resource level

PEAT

- Peat

LIMESTONE

- Lincolnshire Limestone

COAL LICENCE AREAS (as at 01.08.00)
SOURCE: The Coal Authority

- Deep mine (withdrawn)

MINERAL PLANNING PERMISSION (as at 01.01.02)
SOURCE: Mineral Planning Authorities

- Surface planning permission (valid and expired)
- Planning permission for ironstone and overlying minerals

MINERAL WORKINGS

- South Witham Active site
- Great Ponton Inactive (including yet to be worked), worked-out and/or restored site

Mineral commodity

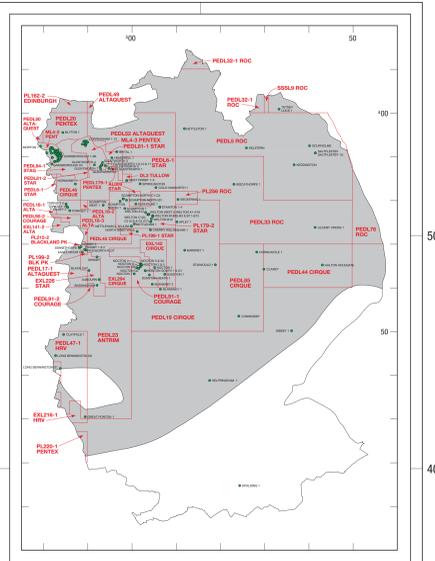
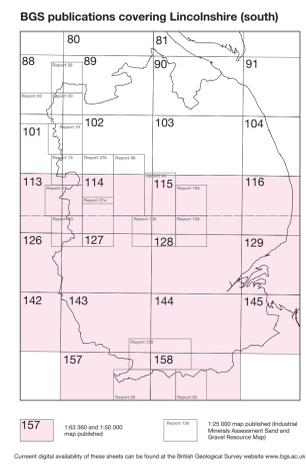
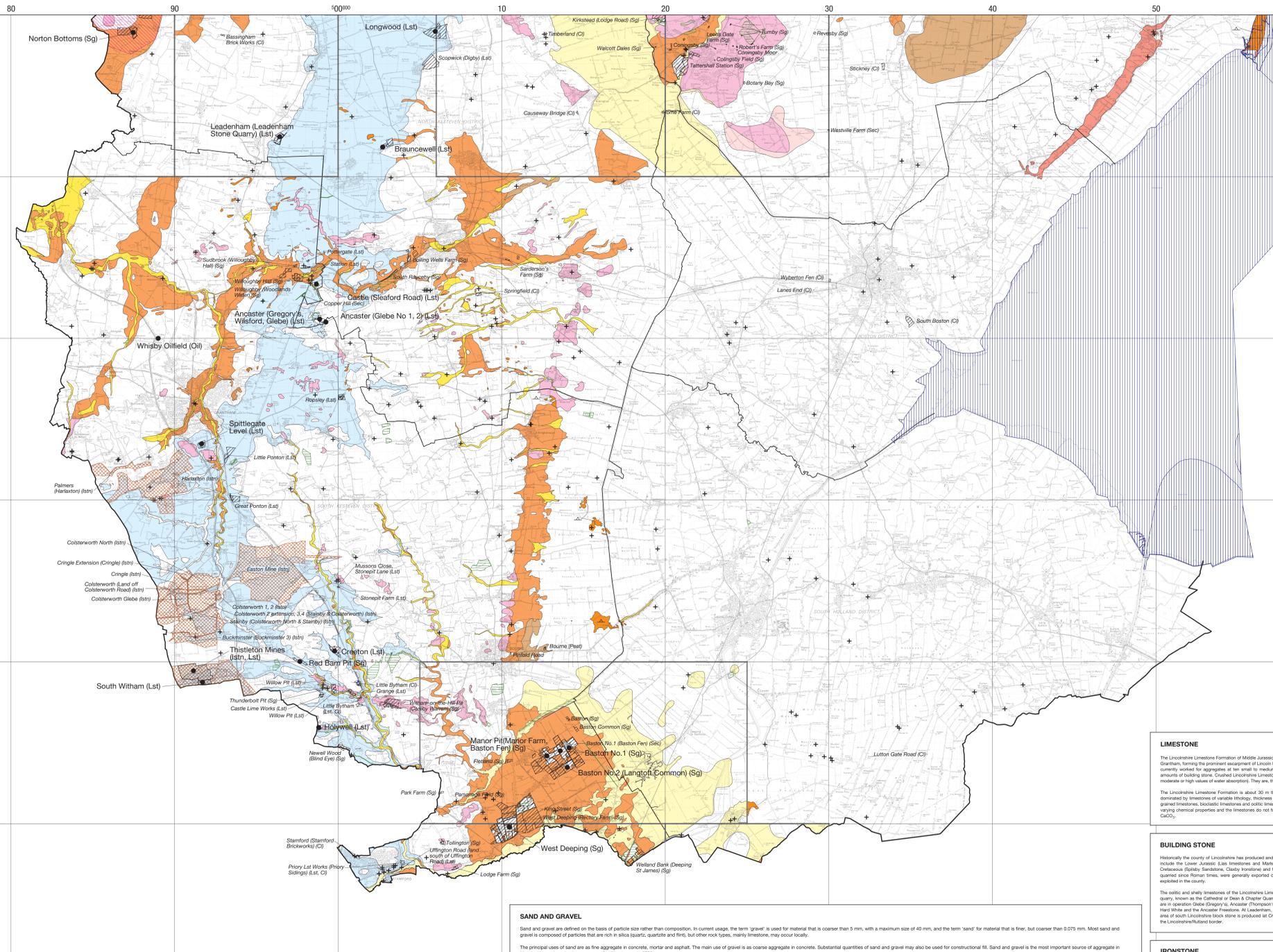
Lst	Limestone	lain	Ironstone	Sec	Secondary Aggregates
Oil	Oil	Sg	Sand and Gravel		
Gas	Natural Gas				

ENVIRONMENTAL DESIGNATIONS

- National nature conservation designations (SSSIs and NNRFs)
- International nature conservation designations (SACs, SPAs and Ramsar sites)
- Scheduled Monument

ADMINISTRATIVE AREAS

- Mineral Planning Authority
- District



HYDROCARBONS

Conventional Oil and Gas

The significant number of exploration wells (see inset map) and the existence of a dense network of seismic reflection surveys, particularly in some areas, Lincolnshire has been intensively explored for oil and gas since before the Second World War. This has led to many discovery wells and the development of a number of producing oilfields in the county. To date, 17 oil fields and a major gas condensate field have been developed, with eleven of fields known to be still producing. The total production for each field is shown in the table below.

Name of Oilfield	Field Type (oil or gas)	Operator at time of discovery	Current operator	Discovery Date	Production started	Production ceased	Total production to 2000
Beckingham	Oil	Shell Gas	Star Energy	1990	No details available		No details available
Beckingham extends into Notts	Oil	BP	Pentax	1959	1964	1984	Free details - total production to end of 1997 was 20,385,000
Cold Hamworth	Oil	Candoco	Star Energy	Sept-1997	Sept-1998	Still producing	5,000
Corringham	Oil	BP	Pentax	1958	1959	7 ceased	Free details - total production to end of 1997 was 45,287,000
Cosby Warren	Oil	Edinburgh Oil & Gas	Edin Oil	May-1988	Oct-1987	Still producing	78,000
East Gleanthorpe	Oil	Pentax	BP	Mar-1987	Feb-1993	Still producing	10,000
Fiskerton Airfield	Oil	Cirque	Cirque	Nov-1997	Aug-1998	Still producing	43,000
Gainsborough	Oil	BP	Pentax	1959	1959	Still producing	Free details - total production to end of 1997 was 45,287,000
Gleanthorpe	Oil	BP	Pentax	1961	1961	Still producing	Free details - total production to end of 1997 was 45,287,000
Kiddington	Oil	Candoco	ROC Oil (UK) Ltd	Jan-1998	Sept-1998	Still producing	10,000
Netherham	Oil	BP	Star Energy	Mar-1983	Oct-1985	Still producing	191,000
Newton-on-Trent	Oil	Transwaco	AtaQuest	Apr-1998	Sept-1998	Suspended	3,000
Saffellby	Gas	Candoco	ROC Oil (UK) Ltd	Oct-1997	Dec-1999	Still producing	Free details - total production to end of 1997 was 418,000
Scampton	Oil	BP	ROC Oil (UK) Ltd	Nov-1995	Apr-1996	7 Still producing	4,000
Scampton North	Oil	BP	Star Energy	Oct-1986	Feb-1989	Still producing	175,000
Stanton	Oil	BP	Star Energy	Jan-1964	Jan-1967	Still producing	23,000
Turkey	Oil	BP	Star Energy	1962	1963	Still producing	Free details - total production to end of 1997 was 418,000
West Firsby	Oil	Tullow	Jan-1988	Aug-1991	Still producing	146,000	
Whitby	Oil	East Midlands Oil & Gas	BP	Jan-1985	May-1990	Still producing	32,000
Total							3,427,000

Exploration to date indicates that the best potential for the discovery of oilfields lies in central parts of the county. In recent years exploration in the East Midlands has been dominated by operators such as ROC Oil (UK) (formerly Candoco), who developed a large acreage in the county that has led to large fields of the county being currently licensed for oil and gas exploration. They have enjoyed significant success with the identification of small, stable oilfields around the larger fields such as Whiston. However, the major gas condensate field by ROC Oil (UK) Ltd at Saffellby has diverted attention to the north eastern part of the county and it is likely that there will be other small oil and gas discoveries in the future. There appears to be limited oil and gas prospectivity in the south and southeastern parts of the county.

Coalbed Methane

The term coalbed methane is used here to refer to the extraction of methane via boreholes from coal seams other than in abandoned or active coal mines. This includes the extraction from unmined areas, or coal seams above or below abandoned or working mines. The levels of coalbed methane in the coal seams of Lincolnshire are relatively low (1.5-5.5 m³ methane/tonne), with average measurements in the case of West Witham of 0.19 and 1.71 m³ methane/tonne respectively. In the USA, most coalbed methane production is from coals containing 7 or more m³ methane/tonne. Thus coalbed methane development from high coal seams in Lincolnshire are not economic at the moment, a point illustrated by the fact that no coalbed methane wells have been drilled in the county to date. Future coalbed methane potential will depend upon favourable changes in the economic situation and in such circumstances the Coal Measures beneath the Val of Trent provide the best prospects. Future potential might exist in the north of the county if the coals are present at depth. The concealed Coal Measures of the Vale of Witham prospect and those in the east of the county probably represent poor potential.

Licensing

The Department of Trade and Industry grants licences for exploring rights to explore and exploit oil and gas offshore within Great Britain. The rights granted by licences do not include any rights of access, and the licensee must also obtain any consent under current legislation, including planning permission.

COAL

Little more coal resources have been identified by UK Coal on the Nottinghamshire/Lincolnshire border, the so-called Witham Prospect Area. However, a deep mine licence has been withdrawn.

LIMESTONE

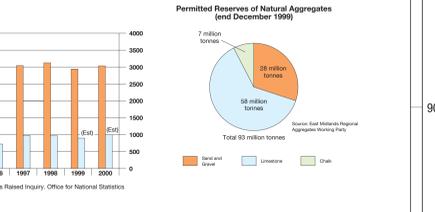
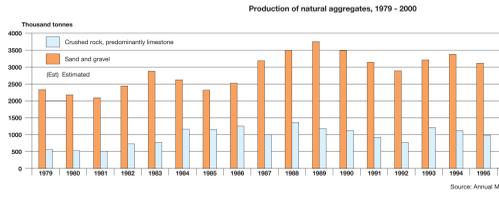
The Lincolnshire Limestone Formation of Middle Jurassic age (Hemlock Oolite) is a major limestone unit in Lincolnshire. Its outcrop runs north to south through Lincoln and Grantham, forming the prominent escarpment of Lincoln Edge. It has long been a source of building stone, but it is also a valuable resource of crushed rock aggregate. It is currently used for aggregate at ten small to medium sized quarries, mainly between Stamford and Lincoln, and several also produce agricultural lime and small amounts of building stone. Crushed Lincolnshire Limestone produces aggregates which are of relatively low strength and with poor resistance to frost damage (they have moderate to high values of water absorption). They are, therefore, generally only suitable for use as construction fill or as a sub-base for roadways.

BUILDING STONE

Historically the county of Lincolnshire has produced and used a wide range of indigenous stone for building purposes. Former sources of building stone in the county include the Lower Jurassic Eels Ironstone and Marston Rock Formation (sandy ironstone), the Middle Jurassic Lincolnshire Limestone, the Lower Cretaceous (Sibley Sandstone, Chalky Ironstone) and the Upper Cretaceous (Fenny Chalk). However, only the ironstones of the Lincolnshire Limestone Formation, quarried since Roman times, were generally exported outside the county. The ironstones of Lincolnshire Limestone now form the only building stone resource still exploited in the county.

IRONSTONE

The Jurassic Marston Rock Formation consists principally of iron-rich, fossiliferous limestone which weathers to a deep brown colour. It is relatively resistant to erosion and it erodes where the formation has a high iron content it has been quarried away as a source of ironstone. It has also been worked on a small scale for building stone and lime. Relatively large scale iron ore extraction took place from around 1870 to about 1930. The ironstone bed is about 2-3 m in thickness. The ore was of variable quality with a relatively low iron content (around 52 per cent).



SAND AND GRAVEL

Sand and gravel are defined on the basis of particle size rather than composition. In current 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 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, mainly ironstones, 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. Sand and gravel is the most important source of aggregate in Lincolnshire and production was some 3 million tonnes in 2000.

Sub-alluvial and River Terrace deposits

The main source of these materials in Lincolnshire are Quaternary and Recent age deposits in the valleys of the Trent, Great Ouse and Witham, where generally clean, well bedded sands and gravels rest on well sorted bedrock. Resources occur in both raised river terrace sequences flanking the modern floodplains and in flood plain terrace deposits associated with, and underlying, present day alluvium. This sequence of deposits is best developed along the River Trent with a succession of terrace deposits formed at heights up to 20 m above OD, representing accumulations of sand and gravel in response to falling sea level in post-glacial times. Thickness varies from between less than 1 m up to maximum values of around 10 m. The gravel content is highly variable and medium grained sand generally forms at least 50 per cent of the deposits. Individually massive units include, going from west to east, the Balgobain, Fulbeck, Doleton and Sleaford sands and gravels. The Balgobain deposits are mostly between 5 and 7 m thick and have roughly equal proportions of gravel and sand. The gravel consists mainly of quartz and quartzite pebbles with minor flint which the sand is dominantly quartz, akin to the lithologies in the Trent Valley. The Fulbeck and Sleaford deposits are generally much finer (1 to 2 m), the sand to gravel ratio is more variable and the pebbles consist mainly of finely and coarsely ironstone together with minor amounts of sandstone and siltstone. The Sleaford deposits are generally sandy with only about 5 per cent gravel, again composed mainly of ironstone fragments. Resource assessment data suggest that the Fulbeck sand and gravel has little mineral potential compared to the Sleaford and Balgobain deposits which are considered to be more promising. Some of these types of deposits are known as the Fen Gravels. This deposit, up to 1.8 m thick, consists of pebbly sands and gravels composed of local ironstone with flint and other lithologies. It forms a discontinuous spread at the edge of the fen and extends up to the present day valleys. The sand and gravels were deposited as coarsening fans laid down by streams draining from the uplands to the west and are largely of late Quaternary age. The basal surface size eastward under the younger superficial deposits, and towards the North Sea, they become finer grained, containing less gravel, and pass into deposits containing marine shells.

Glaciofluvial sand and gravel

These are deposits mapped as the products of deposition by glacial meltwaters and are reworked more commonly indicated on BGS maps as glaciofluvial deposits, a more accurate description of their origin. The sequence of these deposits is complex with mappable units commonly exhibiting intricate relationships. Bodies of sand and gravel may occur as sheet or delta fan layers above ill deposits, irregular bodies of wholly concealed, and thin ironstone, bodies of sand and gravel may occur under deposits of ill and other ill deposits. These deposits include the individually mapped Eagle Moor sand and gravel which caps hillocks and high plateaus land north to north-west of Newark and which can reach thicknesses of up to 5 m. Borehole logs show that this deposit comprises about 60 per cent gravel, consisting of fine to medium grained, sub-rounded to well rounded quartz and quartzite with 30 per cent sand of similar composition and 10 per cent silt. The gravel component also includes mudstone fragments, sub-angular flint and ironstone.

Blown sand

These deposits are generally composed of fine to medium grained sand with a mean fines (<75 micron) content of around 6 per cent. The sand comprises sub-rounded to well rounded quartz grains. The deposits are believed to be largely of late Quaternary age resulting from aeolian reworking of fluvial and glaciofluvial sands. The most favourable sites for blown sand deposits are along the lower slopes of major west-facing escarpments. Deposits are generally thin (notly less than 2 m thick) and occur as both recognizable dunes and as thin linear spurs of sand, mainly in northern and eastern Lincolnshire. These deposits are important as a source of minor sands.

Shore/Beach deposits

Included in this category are deposits marked on BGS maps as 'Shoreface and Beach Deposits', 'Storm Beach Deposits' and a variety of raised beach deposits. Typically these occur as accumulations of sand and gravel restricted to the modern coast and a relatively narrow belt of country adjacent to a locally extensive deposits of this type are found mainly to the south of Gainsborough and between Boston and Gainsborough.

CRUSHED ROCK AGGREGATES

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. Lincolnshire has limited resources of rock suitable for use as crushed rock aggregate.

PLANNING PERMISSION FOR MINERAL EXTRACTION

The extent of mineral, and former, planning permission for the extraction of minerals is shown on the map, irrespective of their current planning or operational status. The polygons were either supplied digitally by Lincolnshire County Council or were digitized by BGS from Planning Orders and other documents supplied by Lincolnshire County Council. Any queries regarding the data shown should be directed to the 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 reserves will have been declared to a greater or lesser extent. Current planning status is not updated on the map but is available in the underlying information. Details of planning permission are held on the Planning Registers which are kept at the District Councils.

Contact addresses:
Boston Borough Council, Municipal Buildings, Boston PO1 2QR, Tel: 01535 414000, Fax: 01535 564034
East Lindsey District Council, Towler Hill, Mabley LN11 6UR, Tel: 01507 601111, Fax: 01507 600206
Lincoln City Council, City Hall, Beaumont Park, Lincoln LN1 1DN, Tel: 01522 881188
North Kesteven District Council, PO Box 3, Kesteven Street, Sleaford NG34 7EF, Tel: 01529 414155, Fax: 01529 413966
South Holland District Council, Priory Road, Spalding PE11 2AE, Tel: 01775 761161, Fax: 01775 712533
South Kesteven District Council, St Peter's Hill, Grantham NG31 6PZ, Tel: 01474 406000
West Lindsey District Council, 26 Spittle Terrace, Gainsborough DN21 2HQ, Tel: 01427 615411, Fax: 01427 619023

AIMS AND LIMITATIONS

The purpose of the map in this series is to show the broad distribution of mineral resources which may be of current or potential economic interest and to indicate those to selected nationally-recognized 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 disturbance. They bring together a wide range of information, much of which is outdated 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 bodies (County/Region Agency, English Nature and English Heritage). For further information on 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 viable resources 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 step in submitting a planning application for mineral working. Extensive areas are shown as containing mineral resources, but some isolated mineral workings may occur in these areas. The presence of these formations generally reflect very local or sporadic 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 may be a specific planning constraint.

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Postcodes of Scheduled Monuments as 10th August 2001 as supplied by English Heritage.
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Countryside Agency, John Dower House, Crescent Place, Cheltenham, Gloucestershire, GL50 3RA, Tel: 01242 521381, Fax: 01242 542770, Web page: www.countryside.gov.uk

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