



**British
Geological Survey**
NATURAL ENVIRONMENT RESEARCH COUNCIL



OFFICE OF THE
DEPUTY PRIME MINISTER

Mineral Resource Information in Support of National, Regional and Local Planning

Essex (comprising Essex, Southend-on-Sea, Thurrock and the London Boroughs of Barking and Dagenham, Havering, Redbridge and Waltham Forest)

British Geological Survey Commissioned Report CR/02/127N

**A J Bloodworth, S J Mathers, A J Benham, M A Shaw, D G Cameron,
N A Spencer, D J Evans, G K Lott and D E Highley.**



Keyworth, Nottingham 2002

BRITISH GEOLOGICAL SURVEY
TECHNICAL REPORT CR/02/127N
Mineral Resources Series

**Mineral Resource Information for Development
Plans:
Essex (comprising Essex, Southend-on-Sea,
Thurrock and the London Boroughs of Barking
and Dagenham, Havering, Redbridge and
Waltham Forest)**

A J Bloodworth, S J Mathers, A J Benham,
M A Shaw, D G Cameron, N A Spencer,
D J Evans, G K Lott and D E Highley.

This report accompanies the 1:100 000 scale map:
Essex (comprising Essex, Southend-on-Sea, Thurrock
and the London Boroughs of Barking and Dagenham,
Havering, Redbridge and Waltham Forest)

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Front cover photo:

Kesgrave Formation sand being worked at
Martell's Quarry near Colchester.

BRITISH GEOLOGICAL SURVEY

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The British Geological Survey is a component body of the Natural Environment Research Council.

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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 Essex, together with Southend-on-Sea, Thurrock and the London Boroughs of Barking and Dagenham, Havering, Redbridge and Waltham Forest, 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 East of England 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 map 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, clay, hydrocarbons, chalk, silica sand and building stone.

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 mineral reserves 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.

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:

- Dedham Vale Area of Outstanding Natural Beauty (AONB)
- National nature conservation designations – National Nature Reserves (NNR) and Sites of Special Scientific Interest (SSSI)
- International nature conservation 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 maps, 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.

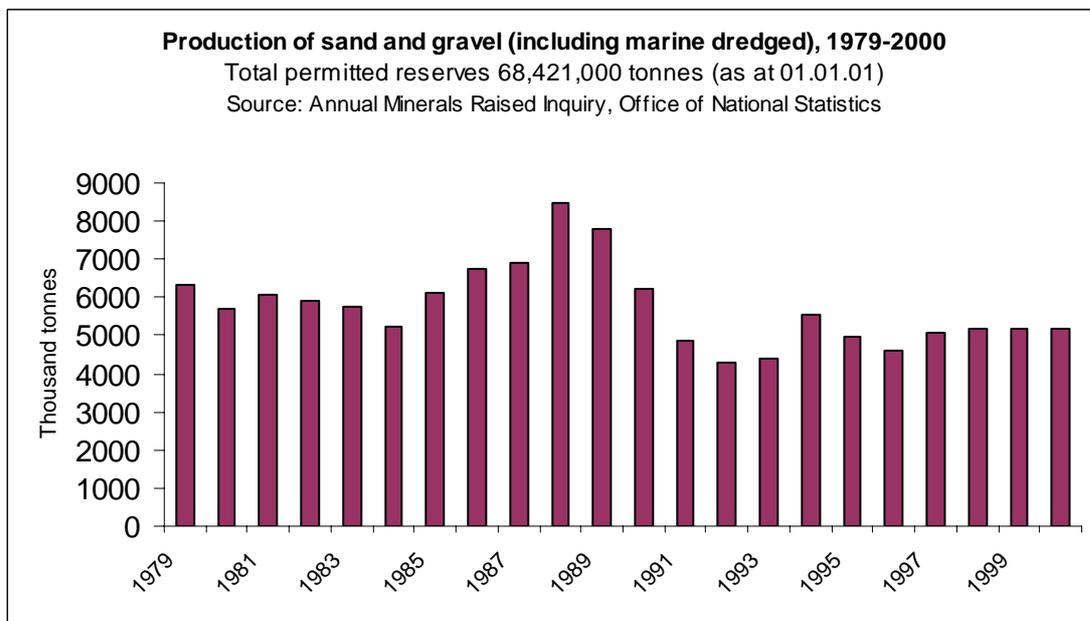
SAND AND GRAVEL

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 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 aggregates 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. Land-won sand and gravel production in Essex was some 4 million tonnes in 2001.

Sand and gravel resources occur in a variety of geological environments. In Essex, these resources fall into two broad categories:

- superficial or 'drift' deposits, subdivided into glaciofluvial sand and gravel, glacial sand and gravel, river terrace deposits, sub-alluvial deposits and head gravels and;
- bedrock or 'solid' deposits represented by the Thanet Sand Formation and Crag.



Superficial deposits

The areas 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 (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.

Glaciofluvial sand and gravel

These deposits broadly correspond to the Kesgrave Formation and are the most widespread. The Kesgrave Formation is commonly referred to as the 'Essex White Ballast' and forms a regionally-important aggregate resource. At the base of the unit unfossiliferous marine sands of the Norwich Crag Formation may locally have been included within the unit during surveying. It is also probable that in parts of the area the upper part of the unit has been reworked by meltwaters issuing from the Anglian ice-sheet but such reworking has not significantly modified the composition of the deposits.

The deposits were laid down during successive cold phases between about 1.5 and 0.5 million years BP (up to the beginning of the Anglian glaciation) in braided rivers; the main swathe represents ancestral deposits of the River Thames which formerly flowed north-east across the area. Those of the Dengie Peninsula belong to a proto River Medway that flowed northwards to meet the ancient Thames trunk river. These deposits contain more flint and chert, reflecting their derivation from the Weald.

The deposits form a semi-continuous sheet across the county comprising 5-15 m of clean pale coloured sands and pebbly sands with subordinate gravels. The clasts present are rounded quartz, quartzite and well-rounded flint in sub-equal proportions together with small amounts of angular-nodular flint and rare volcanic lithologies. The sand fraction is sharp; predominantly medium angular to sub angular quartz with flint, although locally, the incorporation of significant quantities of sand from the underlying more mature marine Crag deposits increases the content of rounded and coarse sand grains.

The dashed blue line shown on the map divides two distinct areas in which the unit occurs. To the north-west, the deposits are overlain by substantial thicknesses (up to 20 m, average 8 m) of Anglian glacial deposits (mainly till) and here the Kesgrave Formation forms a ribbon-like outcrop along the sides of the valleys that cut through these glacial deposits as along the valley sides of the Colne, Pant-Blackwater, Brain and Ter.

South-east of the dashed line the Kesgrave deposits are largely exposed at the surface comprising hill-top remnants and plateau. In the area north-east of Colchester this pattern is complicated by the presence of a thin 1-2 m overburden of silt with a loessic component. The upper parts of the Kesgrave Formation generally lie above the water table but at depth the deposits may be saturated especially where they rest directly on impermeable Palaeogene ('Tertiary') clays.

Glacial sand and gravel

This category comprises waterlain sands and gravels deposited in close proximity to the Anglian ice-sheet which was the most extensive of the Quaternary glaciations in East Anglia and covered most of the northern half of Essex; its limit broadly corresponds to the dashed blue line on the map. In Suffolk, these deposits have been termed the Barham Sands and Gravels.

These deposits mainly occur on top of the sheet of till (boulder clay) and on the shoulders of the existing valleys. The deposits tend to form as discrete patches and channel infills, they are best developed in the north-west of the county especially where chalk bedrock is present. The deposits locally reach 15 m in thickness where they infill channels on the sides of the modern valleys but generally they are less than 5 m thick. Gravel predominates and is variably clayey and sandy. The deposits are commonly very variable in grain size, poorly sorted and can contain interbeds of glacial silt and clay and till. An abundance of oxidised clay leads to

orange-red coloration to most deposits. The clasts are predominantly angular-nodular flint and chalk.

River terrace deposits

River terrace deposits occur at several levels in most of the major valleys in the county flanking the present floodplain. The most extensive deposits are fringing the northern side of the Thames estuary and on the Dengie Peninsula, other important tracts occur in the Stort, Chelmer, Blackwater and Stour valleys.

Terrace deposits are commonly dry in their upper parts and saturated towards the base. They post-date the Anglian glaciation, although they were mostly deposited under cold periglacial climatic conditions.

The deposits commonly comprise sequences of sand and gravels commonly 3-6 m in thickness with a sheet-like geometry. The basal contact is usually gently scalloped but locally, the deposits infill deep channels as in the Dengie Peninsula, on Mersea Island and at Clacton. The upper surface is generally sub-horizontal. Compositionally, the deposits reflect their derivation from Glacial and Glaciofluvial deposits up stream and upslope. They are overlain by fine-grained alluvial and loessic deposits (brickearth) along the northern edge of the Thames estuary.

Sub-alluvial gravel

Sub-alluvial gravels are encountered beneath the alluvium of the major valleys throughout the county and are compositionally similar to the river terrace deposits. They were mainly laid down during periods of deep downcutting during the last major glaciation (Devensian) when sea-levels fell to at least 100 m below the present level. The subsequent rise in sea-level enabled silting up of these river channels producing the thick overlying alluvial deposits (silty clays, peat). The deposits 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 saturated and require wet working.

HEAD GRAVEL

These comprise lobe or fan shaped 3-4 m thick gravelly deposits that have been involved in mass movement downslope to their present position. Such movement commonly takes place under cold climatic conditions when vegetation is sparse and frozen ground leads to increased run off. The gravel is commonly mixed with other lithologies present on the slope and so the resulting lithologies are very variable, most contain significant clay contents and many deposits have been worked in the past as 'hoggin'. The clast composition reflects that of the parent material. Head gravel is only shown on the map where it has been assessed as an indicated resource by BGS.

Bedrock deposits

Thanet Sand Formation

The Thanet Sand lies unconformably on the eroded Chalk surface and comprises fine- to medium-fine sandy units with flint and minor clay. The thickest deposits (30 m) are confined to the south of the county (predominantly along the north bank of the Thames) where they have been extracted for use as fill.

Crag

Beds believed to be equivalent to the Chillesford Sand of the Norwich Crag Formation are extracted at Elsenham (north of Stansted Airport). This is an important source of asphaltting sand due to its fine grain size.

COMMON CLAY (INCLUDING BRICK CLAY AND BRICKEARTH)

'Brick clay' is the term used to describe clay and shale used predominantly in the manufacture of bricks and, to a lesser extent, roof tiles and clay pipes. These clays may sometimes be used in cement making, as a source of constructional fill and for lining and sealing landfill sites. The suitability of a clay for the manufacture of bricks depends principally on its behaviour during shaping, drying and firing. This will dictate the 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.

A brick manufacturing site at Marks Tey, west of Colchester, uses Quaternary-age interglacial lake clay blended with clays imported from outside the county to produce facing bricks.

In the Southend area, brickearth formed the basis for a number of brickworks manufacturing distinctive golden yellow 'London Stock' bricks. 'Brickearths' are silty clays which are usually found in association with river gravels in the area around the Thames Estuary. Deposits are generally thin (less than 2 m), but can be persistent, particularly where associated with extensive river terrace and flood plain sediments. Today, only one brickworks remains (near Southend), although this traditional brick is now much in demand, particularly for restoration and conservation work in London. The map shows the distribution of brickearth in the Southend area only.

Although the outcrop area of the Palaeogene ('Tertiary') age London Clay is extensive in Essex, this clay is not shown as a resource since it is generally unsuitable for use in modern brickmaking processes. This is due to the presence of relatively high levels of the clay mineral, montmorillonite. However, this clay is used for brickmaking at a small operation at Bulmer in the north of the county and was formerly used as raw material for the manufacture of lightweight expanded clay aggregate in the Ongar area. London Clay is also worked as a cement raw material in South Ockenden. The clay is mixed with water to form a slurry before being piped under the Thames to the cement plant at Northfleet in Kent. Working of London Clay in this area is likely to cease if, as proposed, the Northfleet plant is replaced by a new cement plant sited elsewhere in Kent.

HYDROCARBONS

Conventional oil and gas

Essex lies on the northern margin of the Wales-Brabant Massif, across which Mesozoic source and reservoir rocks are thin or absent and have not been buried to the depths required for the generation of hydrocarbons. The paucity of exploration wells and the absence of a

network of seismic reflection surveys, illustrates that the county has little or no oil and gas potential. The sketch map shows one current exploration licence, PEDL36 straddling the Essex/Cambridgeshire boundary. This is held and operated by CANUK. Little Chishill 1, drilled in 1966 by BP, remains the only hydrocarbon exploration well in the county of Essex.

Coal Mine Methane, Abandoned Mine Methane and Coalbed Methane (CBM) potential

There is little or no potential for these forms of methane as coal-bearing strata are absent.

SUBSURFACE AGGREGATE POTENTIAL

Carboniferous limestone is the most extensively used crushed rock aggregate in England. It is generally a high quality material which is used for both concreting aggregate and roadstone. Although there are currently no operations in the UK which extract aggregate from underground, this production method remains an option for the future. Between the Wash and north London, boreholes prove isolated areas of Carboniferous Limestone subcropping beneath the Mesozoic unconformity. The sketch map shows one such area of Carboniferous Limestone subcrop which lies in the south-east of Cambridgeshire near the boundary with Essex. The limestone subcrop is poorly constrained and could extend beneath Essex. Subsurface information indicates that across Essex, the base Mesozoic surface dips generally south-east from depths of 150 m below sea level in the north-west of the county to around 400 m around Southend. Given these depths, the most favourable areas for possible underground working of aggregates are likely to be in the north-west of the county, close to the known subcrops of Carboniferous Limestone in Cambridgeshire. However, aggregate potential is low since the limited amount of information available suggests that these limestones are dolomitised and are relatively poor quality aggregate raw materials.

CHALK

Chalk is a relatively soft, fine-grained, white limestone, consisting mostly of the debris of planktonic algae. The White Chalk Subgroup (formerly known as the Middle and Upper Chalk) crops out in the north and the south-east of the county. Much of the Chalk is concealed by a thick covering of glacial deposits. There is currently only one working chalk quarry in Essex, although a number have been active in the past, including extensive workings in the Grays area for cement manufacture.

The White Chalk Subgroup is some 150 m thick in Essex and comprises higher purity material (93-98% CaCO₃) relative to the upper part of the underlying Grey Chalk (formerly known as the Lower Chalk). Flints are common in the White Chalk Subgroup.

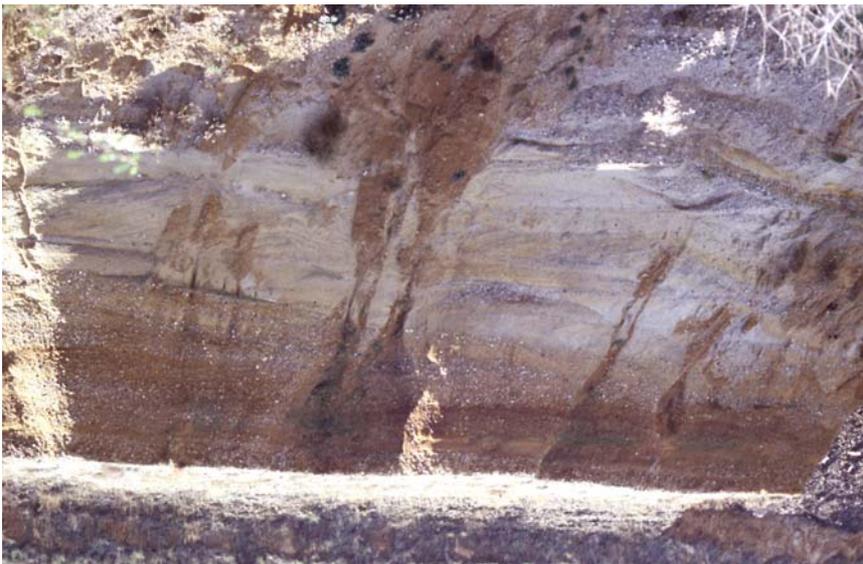
SILICA SAND

Silica (industrial) sands are marketed for a wide range of industrial uses rather than for direct application in the construction industry. They are essential raw materials for glassmaking and foundry casting, as well as a wide range of other products, such as ceramics, chemicals and water filtration.

The distinction between silica sand and construction sand is based principally on application and market specification, rather than a fundamental difference between the two raw materials. Silica sands are valued for their physical and/or chemical properties on which their industrial applications are based. These include high silica contents in the form of quartz, an absence of

deleterious impurities, such as clay and iron oxides, and typically a narrow grain-size distribution (generally in the range 0.5 to 0.1 mm). For most applications silica sands have to conform to very closely defined specifications, specific uses demanding different combinations of properties. Different grades of silica sand are, therefore, often not interchangeable in use. Depending on end use, silica sand processing is of varying degrees of complexity but often requires a high capital investment in plant. The ease with which impurities, such as iron-bearing impurities and clay, together with the level of losses incurred in removing oversize and undersize fractions from the sand, has a major bearing on its possible use as silica sand. Silica sand commands a higher price than construction sand, which allows it to serve a wider geographical market.

Silica sand has been produced in Essex in modest quantities since before the Second World War. Output has been almost entirely from Martell's Quarry at Ardleigh, north-east of Colchester. Here, washed, dried and closely-sized silica sands are produced from Kesgrave Formation material as co-products with sand and gravel. The silica sands have a wide range of applications, the most important being for water treatment. Sands for this application require closely-defined, but coarse, size distribution, 1.0 - 0.5 mm being a common size range, much coarser than most uses of silica sand. Such closely-defined size distributions can only be obtained by processing larger volumes of sand. Water filtration sands are a specialised product that commands a high unit value. They are produced at only a few locations in Britain. Details of the Kesgrave Formation are given in the sand and gravel text box.



Cross-bedded gravel with interbedded silica sand exposed in a face at Martell's Quarry near Colchester

BUILDING STONE

Essex has no commercially significant building stone resources, hence their absence from the face of the map. However, there has been extensive use of a number of local stones for building in the past.

The most commonly used stones for building in the county are the flint cobbles and boulders either quarried *in situ* from the Chalk or gathered from the overlying unconsolidated glacial gravels and beach deposits.

Although sporadically-developed, a quartz-cemented conglomerate composed of rounded flint pebbles known as the 'Hertfordshire Puddingstone' (part of the Palaeocene age Uphor Formation) was once used for building purposes. Also utilised were quartz-cemented sandstones, known as 'Sarsen Stone' (occurring in Palaeocene age Reading and Woolwich formations). The London Clay Formation (Eocene age) yielded hard limestone concretions (or septarian nodules) that were also locally important as building stone.

AIMS AND LIMITATIONS

The purpose of the maps in this series is to show the broad distribution of those mineral resources which 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.

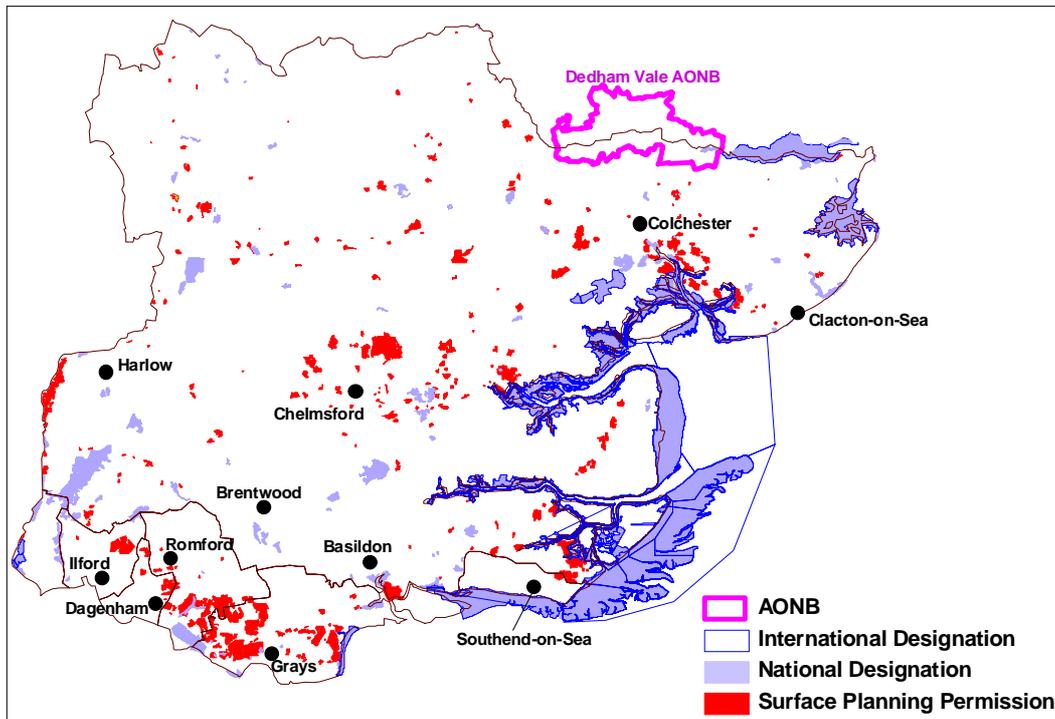
The maps are intended for general consideration of mineral issues and not as a source of detailed information on specific sites. The maps should not be used to determine individual planning applications or in taking other decisions on the acquisition or use of a particular piece of land, although they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

PLANNING PERMISSIONS FOR THE EXTRACTION OF MINERALS

The extent of all known extant, and former planning permissions for the extraction of materials is shown on the map, irrespective of their current planning or operational status. The polygons were supplied as digital files by Essex County Council or digitised by BGS from Plotting Sheets and other documents supplied by Essex County Council, Southend-on-Sea Borough Council, Thurrock Borough Council and the London Boroughs of Barking & Dagenham, Havering, Redbridge and Waltham Forest and 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 may have been depleted to greater or lesser extent. Current planning status is not qualified on the map but is available in the underlying database.



Essex surface planning permissions with Area of Outstanding Natural Beauty (AONB), and other National (Site of Special Scientific Interest [SSSI] and National Nature Reserve [NNR]) and International (Special Area of Conservation [SAC] and Ramsar) designations.

Contact addresses:

Essex County Council, Environmental Services Directorate, E3, E Block, County Hall, Chelmsford, CM1 1QH, Tel: 01245 492211, Fax: 01245 493474, Webpage: www.essexcc.gov.uk/.

Southend-on Sea Borough Council, Technical Services Department, PO Box 65, Civic Centre, Victoria Avenue, Southend-on-Sea, SS2 6ER, Tel: 01702 215000, Fax: 01702 339607, Webpage: www.southend.gov.uk/.

Thurrock Borough Council, Town Planning Department, Civic Offices, New Road, Grays, RM17 6SL, Tel: 01375 652652, Fax: 01375 652787, Webpage: www.thurrock-community.org.uk/.

Barking and Dagenham London Borough, Development and Technical Services Department, Municipal Offices, 127 Ripple Lane, Barking IG11 7PB, Tel: 020 8592 4500, Webpage: www.barking-dagenham.gov.uk/.

Havering London Borough, Environment and Planning Department, Mercury House, Mercury Gardens, Romford, RM1 3SL, Tel: 01708 432848, Fax: 01708 772696, Webpage: www.havering.gov.uk/.

Redbridge London Borough, Planning Services Department, Town Hall, PO Box 2, 128-142 High Street, Ilford, IG1 1DD, Tel: 0208 478 3020, Fax: 020 8478 9372, Webpage: www.redbridge.gov.uk/

Waltham Forest London Borough, Planning and Economic Development Department, Chingford Municipal Offices, 16 The Ridgeway, Chingford, London E4 6PS, Tel: 020 8527 5544, Fax: 0208 524 8960, Webpage: www.lbwf.gov.uk/.

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English Nature - Digital SSSI, NNR, SPA, SAC and Ramsar boundaries © English Nature 2000.

Contact address: English Nature, Northminster House, Northminster, Peterborough, PE1 1UA, Tel: 01733 455000, Fax: 01733 455103, Web page: www.english-nature.org.uk.

English Heritage - Positions of Scheduled Monuments at 15 August 2001.

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. © English Heritage.

Contact address: English Heritage, 23 Savile Row, London, W1S 2ET. Tel: 020 7973 3132, Web page: 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.

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