

HERTFORDSHIRE and NW LONDON BOROUGHS

(comprising Hertfordshire and London Boroughs of Barnet, Enfield, Harrow and Hillingdon)

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

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Digital cartography by N.A. Spencer, British Geological Survey, Published 2003.

This map comprises part of a summary of the 'Mineral Resources of the East of England Region'.
For further information see www.minerals.uk.com

BIBLIOGRAPHIC REFERENCE
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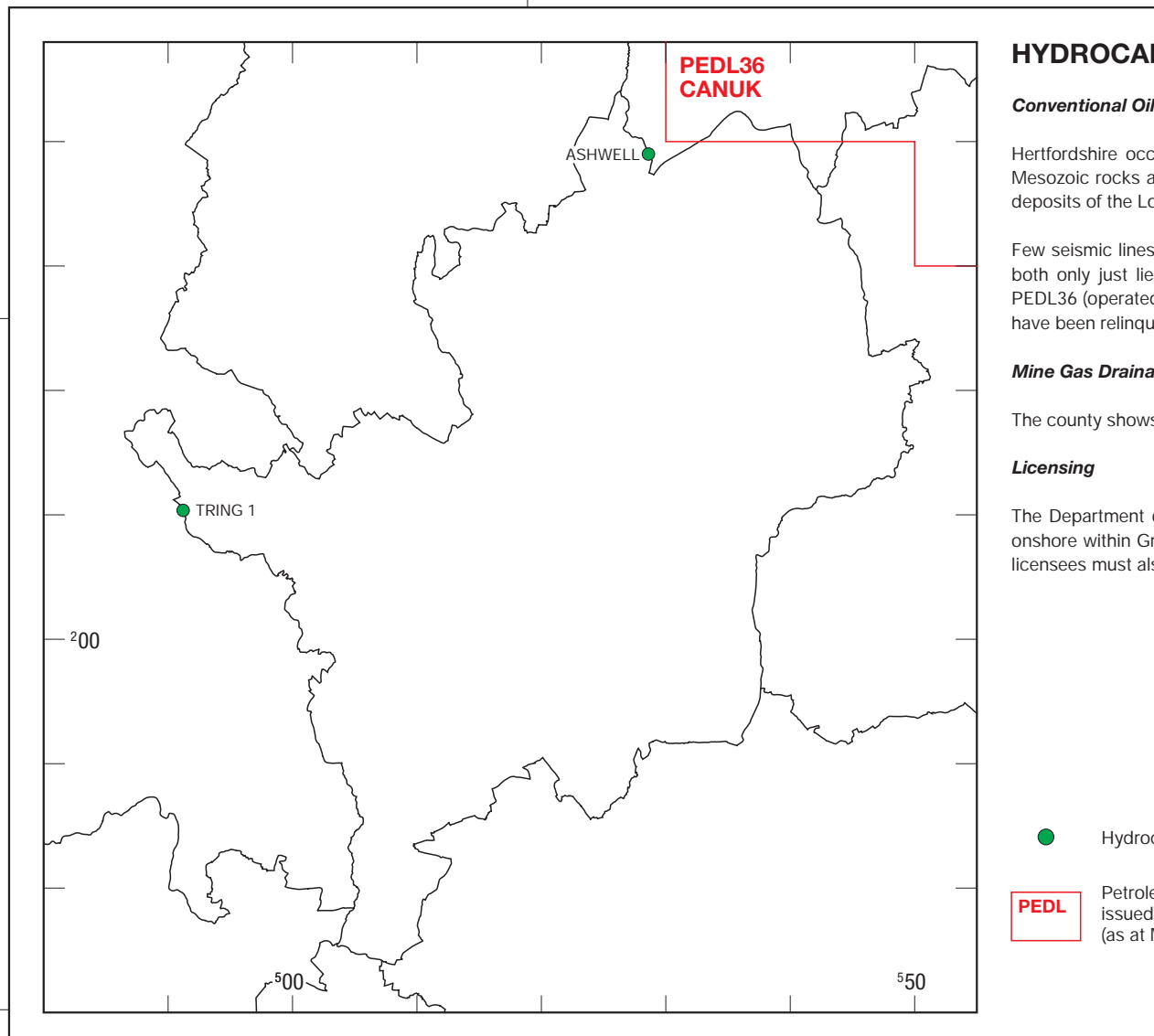
- ### SAND & GRAVEL
- Superficial deposits**
- Sub-alluvial: Inferred resources
 - Sub-alluvial: Indicated resources (only in area assessed by BGS)
 - River terrace deposits
 - River terrace deposits: Concealed (only in area assessed by BGS)
 - Glaciofluvial sand and gravel (including Kesgrave Sand and Gravel)
 - Glaciofluvial sand and gravel: Concealed (only in area assessed by BGS)
 - Glacial sand and gravel deposits
 - Glacial sand and gravel deposits: Concealed (only in area assessed by BGS)
 - Boundary of area assessed for sand and gravel at the indicated resource level
 - Approximate southern/western limit of thick glacial deposits on glaciofluvial and river terrace deposits
- ### CHALK
- Chalk: Higher purity (>93% CaCO₃) } White Chalk Subgroup
 - Chalk: Low purity (<93% CaCO₃) } Grey Chalk Subgroup
- ### BRICK CLAY
- Reading Formation/Clay-with-Flints (Hemel Hempstead area only)

- ### MINERAL PLANNING PERMISSION (as at 01/04/03)
- Source: Mineral Planning Authorities
- Surface planning permission (valid and expired)
- ### MINERAL WORKINGS
- Panshanger Active site
 - Sheehanger Inactive (including sites not yet worked, worked-out and/or restored site)
 - Active rail aggregate depot
- Sg Sand & gravel Fi Flint
Cl Common clay & shale CR Crushed Rock
Ch Chalk

- ### ENVIRONMENTAL DESIGNATIONS (as at 30/04/03)
- National nature conservation designations (SSSIs and NNRS)
 - International nature conservation designations (SACs, SPAs and Ramsar sites)
 - Area of Outstanding Natural Beauty (AONB): Chilterns (part)
 - Scheduled Monument

- ### ADMINISTRATIVE AREAS
- Region
 - Mineral Planning Authority
 - District

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 restoration. They bring together a wide range of information, much of which is scattered and not always available in a consistent form.
The maps have been produced by collation and interpretation of mineral resource data primarily 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 extractable 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 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 provide useful background information which sets a specific proposal within context.



BRICK CLAY
'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 firing and sealing landfill sites. The suitability of clay for the manufacture of bricks depends principally on its behaviour during crushing, 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 salable products. Bricking 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.
The sole remaining brickworks in Hertfordshire is located at Bouvington near Hemel Hempstead. This is a relatively small works that produces mechanically made, 'soft-mud' facing bricks, although about 20 per cent of production is in the form of hand-made stock bricks. The bricks are made from the motled clays of the Reading Formation and Clay-with-Flints. These deposits are broadly similar, although varied in composition, because one Clay-with-Flint is largely derived from the other. They are therefore shown as a single resource. However, the occurrence at Bouvington is exceptional rather than typical. For this reason, and because of their patchy occurrence and variable nature and thickness (up to 2m), these deposits are shown as a resource in the Hemel Hempstead area only.

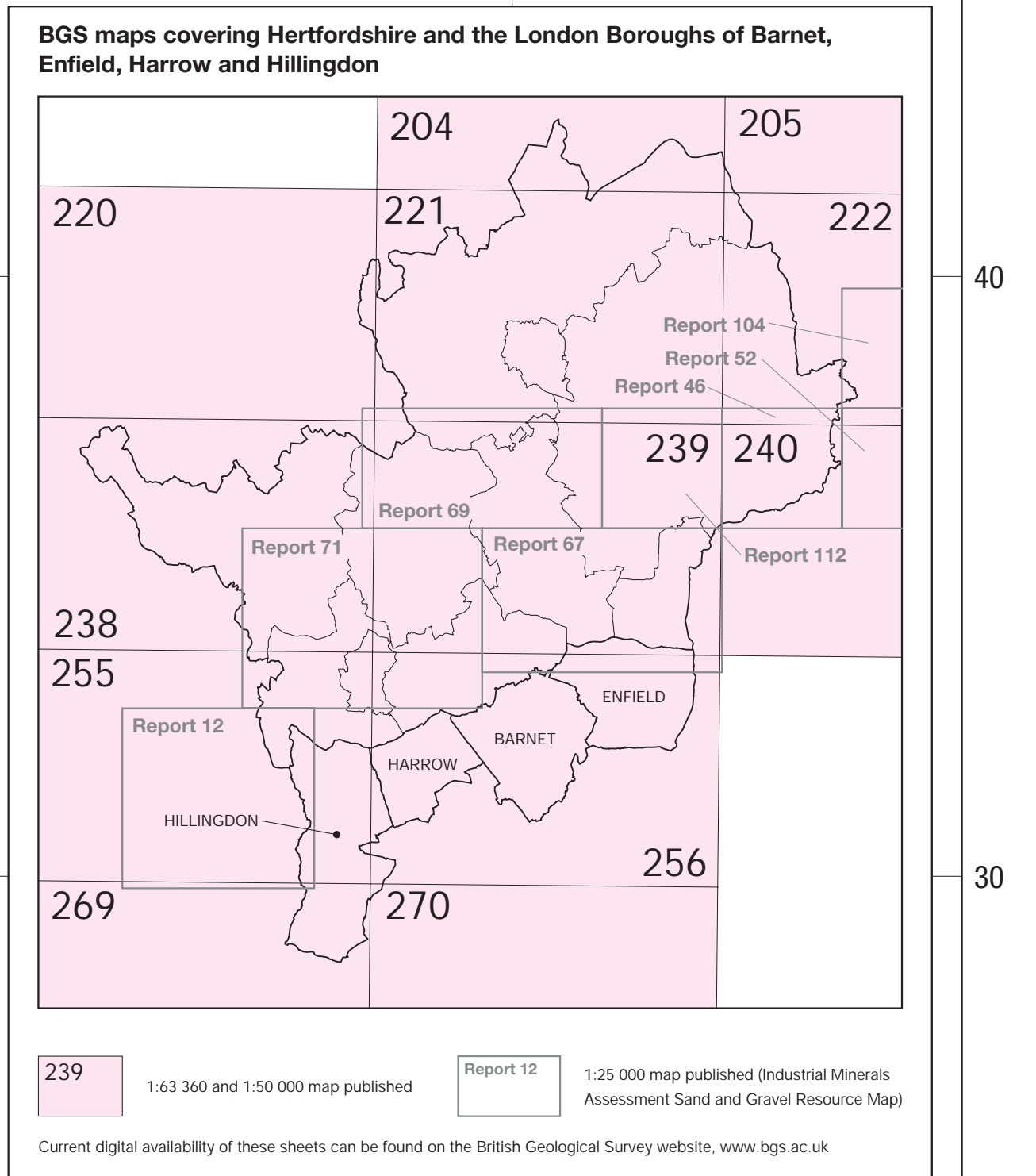
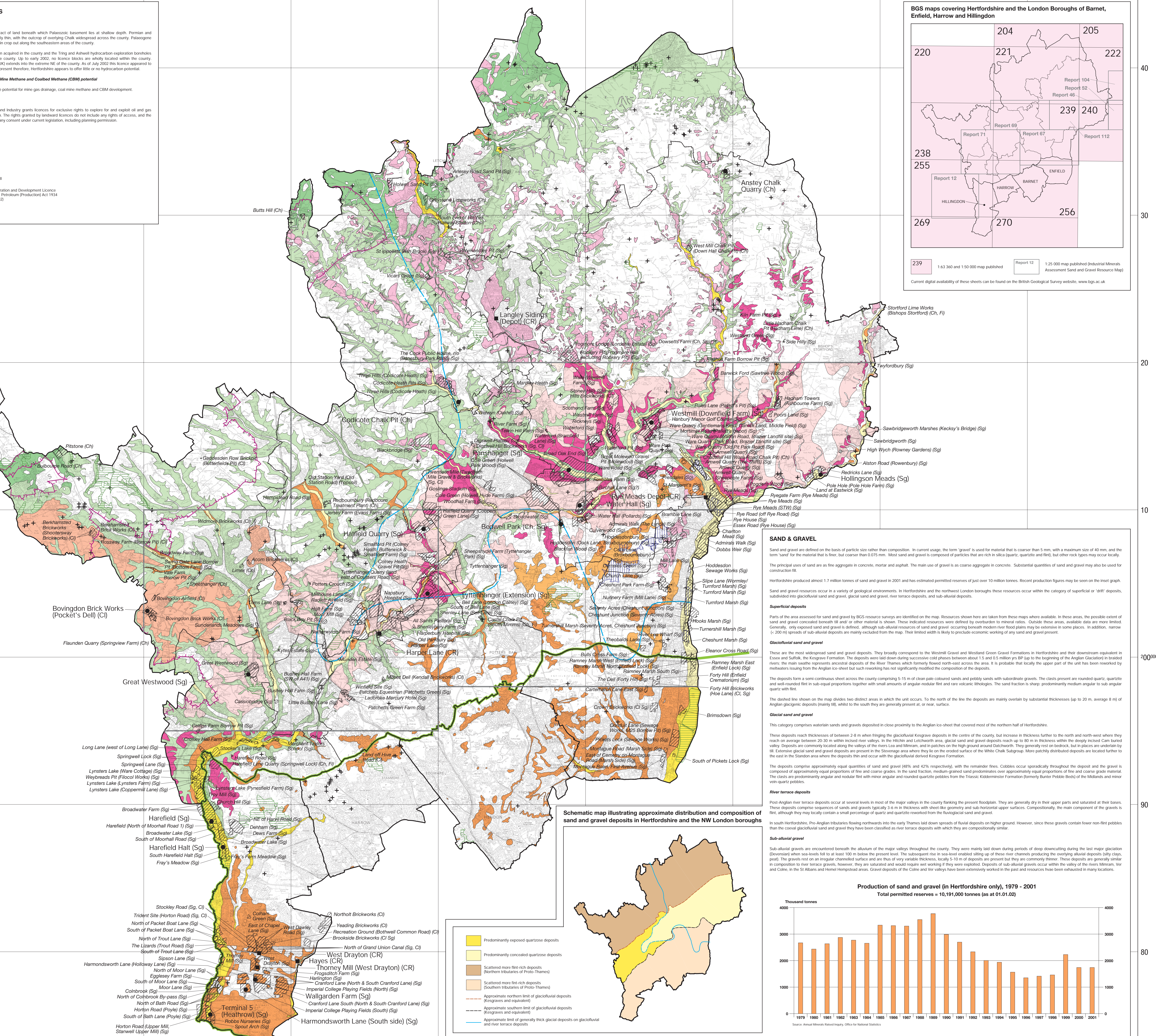
BUILDING STONE
The Cretaceous and Palaeogene successions of Hertfordshire have yielded a limited number of stones for building purposes. Both Chalk and flint nodules from the Upper Cretaceous have been extensively used in the past for local building purposes.
Quartz-cemented sandstones (or Sarum stones), together with the conglomeratic beds of the Palaeogene succession (Hertfordshire Sandstones) were also once widely worked for building materials and are now quarried extensively in other buildings in the county. There are no building stone quarries currently operating.

CHALK
Chalk is a relatively soft, fine-grained, white limestone, consisting mostly of the debris of planktic algae. It occurs as bedrock throughout most of the county and generally crops out above the 50 m contour in the north and north-west of the county, especially in the Chiltern uplands where the land rises to over 100 m. Part of this higher ground falls within the Chiltern Area of Outstanding Natural Beauty (AONB). Elsewhere in the county, younger rocks and superficial deposits conceal the chalk.
The White Chalk Subgroup (formerly Middle and Upper Chalk) varies from 60 m to about 70 m thick in central Hertfordshire and comprises higher purity material (93-98% CaCO₃). Chalk nodules with flint from the underlying Grey Chalk, layers of age and thickness are common in the White Chalk Subgroup. The White Chalk Subgroup occurs as bedrock under most of the county north of a line running through Watford and Hemel Hempstead, although much of it is covered by superficial deposits. South of this line, chalk outcrops only along the valleys of the rivers Lea and Ash near Hemel Hempstead, and the Colne valley.
The Grey Chalk Subgroup (formerly Lower Chalk) outcrops in the north and west of the county. It generally contains more interbedded calcareous mudstones than the overlying White Chalk and is a lower purity (generally <93% CaCO₃). It has been worked in the past as a raw material for cement manufacture.
Although in the past there were many sites working chalk, essentially for local use, there are currently only three working chalk quarries in Hertfordshire: Anstey, Bowdell, and Codicote quarries produced a combined total of 31,000 tonnes of chalk in 2000.
The chalk is a major aquifer and is the most important source of groundwater in the county.

PLANNING PERMISSIONS FOR MINERAL EXTRACTION
The extent of all known existing and former planning permissions for the extraction of minerals is shown on the map. Inspection of their current planning or operational status. The polygons were supplied digitally by Hertfordshire County Council or were subsequently digitized by BGS from Planning Sheets and other documents supplied by Hertfordshire County Council and the London boroughs of Barnet, Enfield, Harrow and Hillingdon and any queries regarding the sites 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 a mineral has been made, a successful application has been submitted with approval from the provisions of the Town and Country Planning legislation and the permitted resource will have been depicted to a degree of lesser extent. Current planning status is not qualified on the map but is available in the underlying database.
Contact addresses:
Hertfordshire County Council, Environment Department, County Hall, Hertford SG13 8BN, Tel: 01992 556245, Fax: 01992 556202, Web page: www.herts.gov.uk
Barnet London Borough, Environmental Services Department, PO Box 53, Civic Centre, Silver Street, Enfield EN1 3XE, Tel: 020 839 2000, Fax: 020 839 4616, Web page: www.barnet.gov.uk
Enfield London Borough, Environmental Services Department, PO Box 53, Civic Centre, Silver Street, Enfield EN1 3XE, Tel: 020 839 3811, Web page: www.enfield.gov.uk
Harrow London Borough, Environment, Planning and Transportation Division, PO Box 31, Civic Centre, Harrow HA1 2JY, Tel: 020 8863 5411, Fax: 020 8424 1551, Web page: www.harrow.gov.uk
Hillingdon London Borough, Planning Services, Civic Centre, Uxbridge UB8 1UW, Tel: 01895 250111, Fax: 01895 556202, Web page: www.hillingdon.gov.uk

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Contact address:
English Nature, Northminster House, Northminster, Peterborough, PE1 1UA, Tel: 01373 455000, Fax: 01373 455103, Web page: www.english-nature.org.uk
Positions of Scheduled Monuments at 15th August 2001 as supplied by English Heritage.
The majority of monuments are plotted using a centred 'NCR' 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 7473 3132, Web page: www.english-heritage.org.uk
Digital AONB boundaries © Countryside Commission 1986 (from Countryside Agency).
Contact address:
Countryside Agency, John Dover House, Crescent Place, Cheltenham, Gloucestershire, GL50 3RA, Tel: 01242 521381, Fax: 01242 548270, Web page: www.countryside.gov.uk
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SAND & 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, granite 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.
Hertfordshire produced almost 1.7 million tonnes of sand and gravel in 2001 and has estimated permitted reserves of just over 10 million tonnes. Recent production figures may be seen in the inset graph.
Sand and gravel resources occur in a variety of geological environments. In Hertfordshire and the north-west London boroughs these resources occur within the category of superficial or 'drift' deposits, subdivided into glaciofluvial sand and gravel, glacial sand and gravel, river terrace deposits, and sub-alluvial deposits.
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 wherever available. In some places, the possible extent of sand and gravel concealed beneath till 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 deposits are present in the Severnage area where they are on the eroded surface of White Chalk Subgroup. More patchy distributed deposits are located further to the east in the St Albans area where the deposits thin and occur with the glaciofluvial derived Kesgrave Formation.
Glaciofluvial sand and gravel
These are the most widespread sand and gravel deposits. They broadly correspond to the Westmill Gravel and Westland Green Gravel Formations in Hertfordshire and their downstream equivalent in Essex and Suffolk, the Kesgrave Formation. The deposits were laid down during successive cold periods between about 1.5 and 0.5 million years BP up to the beginning of the Anglian Glaciation in isolated rivers. The main swathe represents ancestral deposits of the River Thames which formerly flowed north-east across the area. It is probable that locally 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 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 coarse nodular flint and rare volcanic tuffites. The sand fraction is sharp predominantly medium-grained to sub-angular quartz with flint.
The dashed line shown on the map divides two distinct areas in which the unit occurs. To the north of the line the deposits are mainly covered by substantial thicknesses (up to 20 m, average 10 m) of Anglian glaciofluvial deposits (unit IV), which to the south they are generally present at, or near, surface.
Glacial sand and gravel
This category comprises waterlain sands and gravels deposited in close proximity to the Anglian ice-sheet that covered most of the northern half of Hertfordshire.
These deposits reach thicknesses of between 2 m when fringing the glaciofluvial Kesgrave deposits in the centre of the county, but increase in thickness further to the north and north west where they reach on average between 20-30 m within isolated river valleys. In the Hitchin and Letchworth areas, glacial sand and gravel deposits reach up to 80 m in thickness within the deeply incised Cam burial valley. Deposits are commonly located along the valleys of the rivers Lea and Mimram, and in patches on the high ground around Datchworth. They generally rest on bedrock, but in places are underlain by till. Extensive glacial sand and gravel deposits are present in the Severnage area where they are on the eroded surface of the White Chalk Subgroup. More patchy distributed deposits are located further to the east in the St Albans area where the deposits thin and occur with the glaciofluvial derived Kesgrave Formation.
The deposits comprise approximately equal quantities of sand and gravel (48% and 42% respectively), with the remainder fines. Cobbles occur approximately throughout the deposit and the gravel is composed of approximately equal proportions of fine and coarse grades. In the sand fraction, medium-grained sand predominates over approximately equal proportions of fine and coarse-grade material. The clasts are predominantly angular and nodular flint with minor angular and rounded quartzite pebbles from the Triassic Kildersham Formation (formerly Bunter Pebble Beds) of the Midlands and minor vein quartz pebbles.
River terrace deposits
Post-Anglian river terrace deposits occur at several levels in most of the major valleys in the county flanking the present floodplain. They are generally dry in their upper parts and saturated at their bases. These deposits comprise sequences of sands and gravels typically 3-6 m in thickness with sheet-like geometry and sub-horizontal upper surfaces. Compositionally, the main part of the gravels is flint, although they may locally contain a small percentage of quartz and quartzite twinned from the fluvio-glacial sand and gravel.
In south Hertfordshire, the Anglian tributaries flowing northwards into the early Thames laid down spreads of fluvial deposits on higher ground. However, since these gravels contain fewer non-flint pebbles than the coarse glaciofluvial sand and gravel they were classified as river terrace deposits, with which they are compositionally very similar.
Sub-alluvial gravel
Sub-alluvial gravels are encountered beneath the alluvium of the major valleys throughout the county. They were mainly laid down during periods of deep dissection during the last major glacial (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 overlying alluvial deposits (silt/clay). 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 valleys of the rivers Mimram, Ver and Colne. In the St Albans and Hemel Hempstead areas, Gravel deposits of the Colne and Ver valleys have been extensively worked in the past and resources have been exhausted in many locations.

