

The sand and gravel resources of the country around Stansted, Mountfitchet, Essex

Description of 1:25 000 resource sheet TL 52

P. M. Hopson

The first twelve reports on the assessment of British sand and gravel resources appeared in the Report Series of the Institute of Geological Sciences as a subseries. Report No. 13 and subsequent reports appear as Mineral Assessment Reports of the Institute.

Details of published reports appear at the end of this Report.

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PREFACE

National resources of many industrial minerals may seem so large that stocktaking appears unnecessary, but the demand for minerals and for land for all purposes is intensifying and it has become increasingly clear in recent years that regional assessments of the resources of these minerals should be undertaken. The publication of information about the quantity and quality of deposits over large areas is intended to provide a comprehensive factual background against which planning decisions can be made.

Sand and gravel, considered together as naturally occurring aggregate, was selected as the bulk mineral demanding the most urgent attention, initially in the south-east of England, where about half the national output is won and very few sources of alternative aggregates are available. Following a short feasibility project, initiated in 1966 by the Ministry of Land and Natural Resources, the Industrial Minerals Assessment Unit (formerly the Mineral Assessment Unit) began systematic surveys in 1968. The work is now being financed by the Department of the Environment and is being undertaken with the cooperation of the Sand and Gravel Association of Great Britain.

This report describes the sand and gravel resources of the country around Stansted Mountfitchet, Essex, shown on the accompanying 1:25 000 resource sheet TL 52. The survey was conducted by Mr P. M. Hopson, assisted by Mr. C. W. Thomas during the drilling and sampling programme. Mr Hopson compiled the report. The work is based on a geological survey at the 1:10 560 and 1:10 000 scale by Mr R. D. Lake and Dr. D. Millward in 1979 and 1980.

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The sand and gravel resources of the country around Stansted Mountfichet, Essex **in pocket**

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The sand and gravel resources of the country around Stansted Mountfitchet, Essex

Description of 1:25 000 resource sheet TL 52

P. M. HOPSON

SUMMARY

The geological maps of the Institute of Geological Sciences, pre-existing borehole information, and 102 boreholes drilled for the Industrial Minerals Assessment Unit form the basis of the assessment of the sand and gravel resources of the country around Stansted Mountfitchet, Essex.

All the deposits in the district that might be potentially workable for sand and gravel have been investigated and a simple statistical method has been used to estimate the volume. The reliability of the volume estimates is given at the symmetrical 95 per cent probability level.

The 1:25 000 map is divided into four resource blocks, containing between 7.9 and 13.7 km² of sand and gravel. For each block the geology of the deposits is described, and the mineral-bearing area, the mean thickness of overburden and mineral and the mean gradings are stated. Detailed borehole data are also given. The geology, the position of the boreholes and the outlines of the resource blocks are shown on the accompanying map.

Notes

Each borehole registered with the Institute is identified by a four-element code (e.g. TL 52 NW 73). The first two elements define the 10-km square (of the National Grid) in which the borehole is situated; the third element defines a quadrant of that square, and the fourth is the accession number of the borehole. In the text of the report the borehole is normally referred to by the last two elements alone (e.g. NW 73).

All National Grid references in this publication lie within the 100-km square TL unless otherwise stated. Grid references are given to eight figures, accurate to within 10 m for borehole locations (In the text, four- and six-figure grid references are used for more extensive locations, for example for farms).

Bibliographical reference

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INTRODUCTION

The survey is concerned with the estimation of resources, which include deposits that are not currently exploitable but have a foreseeable use, rather than reserves, which can only be assessed in the light of current, locally prevailing, economic considerations. Clearly, neither the economic nor the social factors used to decide whether a deposit may be workable in the future can be predicted; they are likely to change with time. Deposits not currently economically workable may be exploited as demand increases, as higher-grade or alternative materials become scarce, or as improved processing techniques are applied to them. The improved knowledge of the main physical properties of the resource and their variability, which this survey seeks to provide, will add significantly to the factual background against which planning policies can be decided (Archer, 1969; Thurrell, 1971, 1981; Harris and others, 1974).

The survey provides information at the 'indicated' level "for which tonnage and grade are computed partly from specific measurements, samples or production data and partly from projection for a reasonable distance on geologic evidence. The sites available for inspection, measurement, and sampling are too widely or otherwise inappropriately spaced to permit the mineral bodies to be outlined completely or the grade established throughout" (Bureau of Mines and Geological Survey, 1948, p. 15).

It follows that the whereabouts of reserves must still be established and their size and quality proved by the customary detailed exploration and evaluation undertaken by the industry. However, the information provided by this survey should assist in the selection of the best targets for such further work. The following arbitrary physical criteria have been adopted:

- a The deposit should average at least 1 m in thickness.
- b The ratio of overburden to sand and gravel should be no more than 3:1.
- c The proportion of fines (particles passing the No. 240-mesh B.S. sieve, about 1/16 mm) should not exceed 40 per cent.
- d The deposit should lie within 25 m of the surface, this being taken as the likely maximum working depth under most circumstances. It follows from the second criterion that boreholes are drilled no deeper than 18 m if no sand and gravel has been proved.

A deposit of sand and gravel that broadly meets these criteria is regarded as 'potentially workable' and is described and assessed as 'mineral' in this report. As the assessment is at the indicated level, parts of such a deposit may not satisfy all the criteria.

Pre-Pleistocene rocks, which are usually consolidated and devoid of potentially workable sand and gravel, are referred to as 'bedrock'; 'waste' is any material other than bedrock or mineral; 'overburden' is waste that occurs between the surface and an underlying body of mineral.

For the particular needs of assessing sand and gravel resources, a grain-size classification based on the geometric scale $\frac{1}{8}$ mm, $\frac{1}{4}$ mm, 1 mm, 4 mm, 16 mm, 64 mm has been adopted. The boundaries between fines (that is, the clay and silt fractions) and sand, and between sand and gravel material, are placed at 1/16 mm and 4 mm respectively (see Appendix C).

The volume and other characteristics are assessed within resource blocks, each of which, ideally, contains

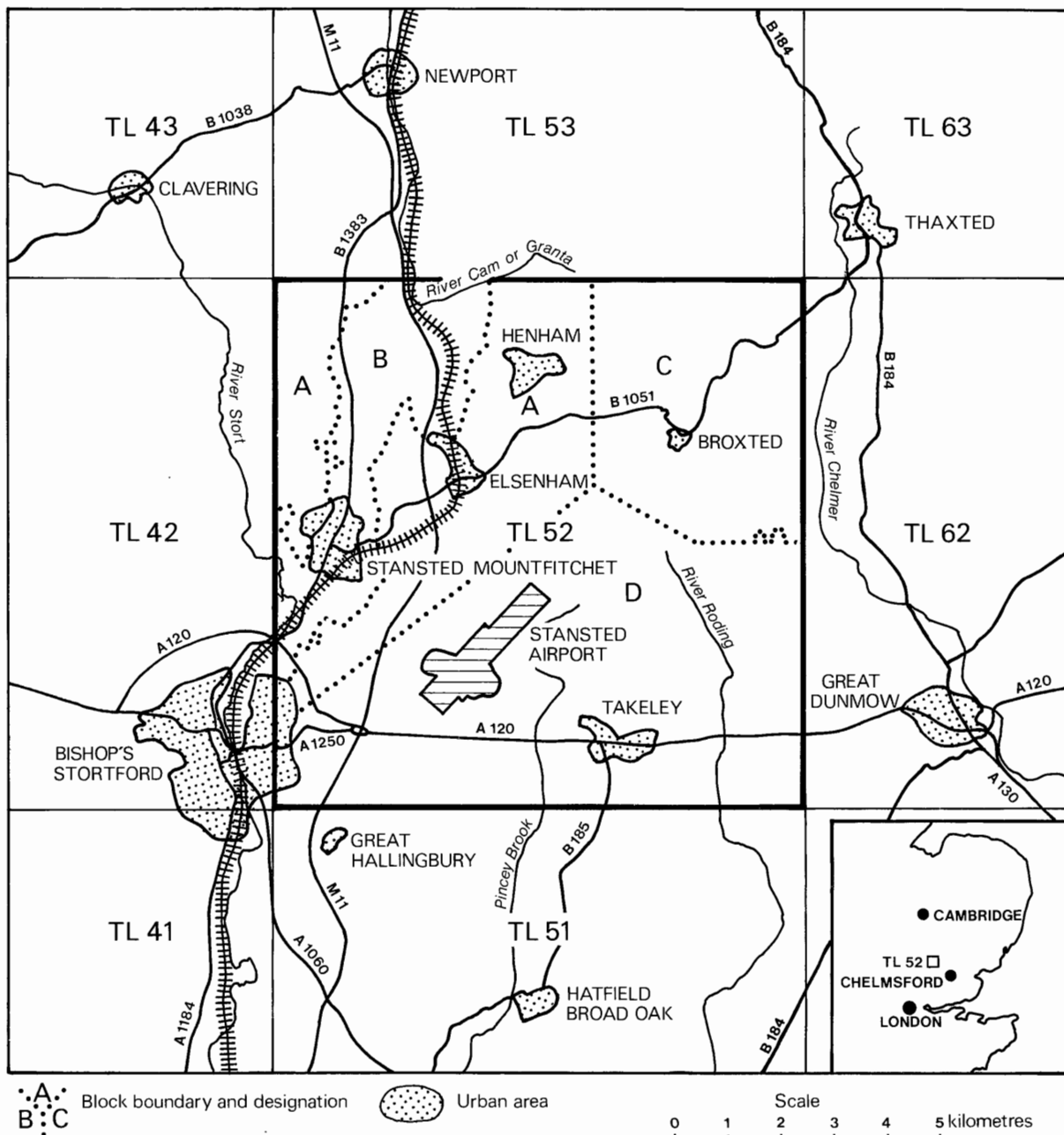


Figure 1 Sketch map of the location of sheet TL 52, showing the resource block boundaries.

approximately 10 km² of sand and gravel. No account is taken of any factors, for example roads, villages or land of high agricultural or landscape value, which might stand in the way of sand and gravel being exploited, although towns are excluded. The estimated total volume therefore bears no simple relationship to the amount that could be extracted in practice.

It must be emphasised that the assessment applies to the resource block as a whole; valid conclusions cannot be drawn about mineral in parts of a block, except in the immediate vicinity of the actual sample points.

DESCRIPTION OF THE RESOURCE SHEET

The resource sheet TL 52 covers 100 km² of country around Stansted Mountfitchet, Essex, and includes a small part of Bishop's Stortford, Hertfordshire in the south-west. Stansted Mountfitchet is situated 50 km north-east of central London and some 25 km north-west of Chelmsford, the county town of Essex (Figure 1); Cambridge lies 35 km to the north.

This part of Essex and Hertfordshire forms part of the London 'commuter-belt' and is well served with road

and rail communications; both the M11 motorway and the main-line London to Cambridge railway traverse the western part of the sheet.

The remainder of the resource sheet area is largely rural, with the exception of Stansted Airport [53 22] in the south-west quadrant; the major occupation is arable farming with some market gardening and forestry.

The area has for some time been a source of aggregate, and deposits of both sand and sandy gravel are currently being worked around Elsenham [535 263] and Ugley [520 287].

TOPOGRAPHY

The area is largely covered by Boulder Clay which forms a gently undulating plateau; it typically ranges in elevation from 100 m to 110 m above OD (Figure 2). Exceptionally, the plateau rises above 115 m in the north around Chaureth Green [576 297], Spring Gate [561 289] and Henham Lodge [550 292]; it has a maximum elevation of 125 m north of Sibleys [565 297].

The plateau is dissected by numerous streams rising in the vicinity of Molehill Green [564 248], Broxted

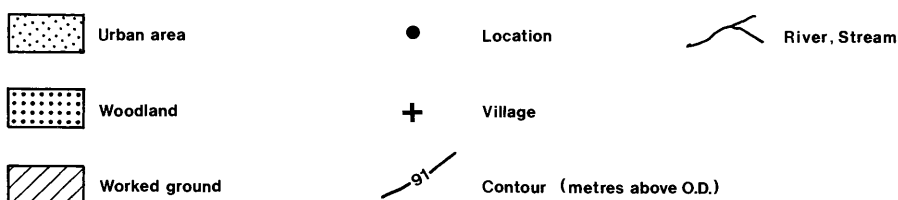
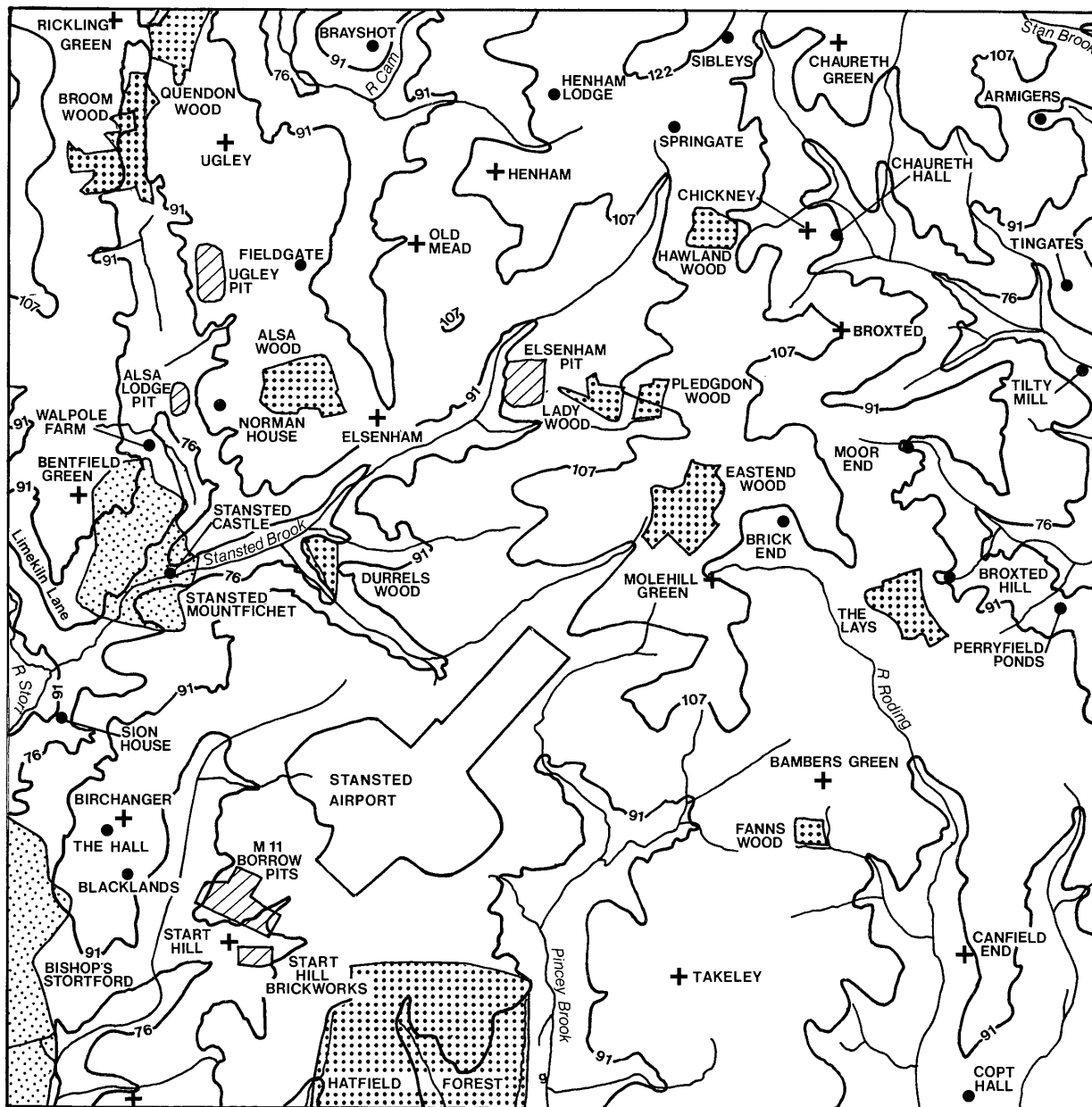


Figure 2 The topography of the area of sheet TL 52, showing the places mentioned in the text.

[578 272] and Henham [546 285]. The Pincey Brook and an unnamed tributary of the River Stort drain the area in the south and west around Takeley [562 232], Great Hallingbury [510 200] and Hatfield Forest [540 205]; the River Roding flows southwards from Woodgates [570 253] to Copt Hall [588 201]. Two unnamed streams and Stan Brook which flow south-eastwards from near Broxted and Chickney [574 230] and join the River Chelmer in the area of sheet TL 62 to the east. In the west the River Stort and its tributary Stansted Brook drain the ground around Stansted Mountfitchet and Elsenham. In the vicinity of Brayshot [534 297] the headwaters of the River Cam flow northwards from Old Mead [532 277].

GEOLOGY

The resource sheet area is largely covered by deposits of Pleistocene and Recent age, underlain by the London Clay and Lower London Tertiaries and, in the north and west, by the Upper Chalk. These solid formations, which have a low regional dip of a few degrees towards the south-south-east, have been deeply eroded in the north and west along the lines of tunnel valleys (Woodland, 1970). These tunnel valleys follow the present-day rivers Stort and Cam (Figure I on the Resource Map).

These tunnel valleys are filled with a complex of glacial deposits. Elsewhere a simpler picture of Boulder Clay resting on and, on occasion, cutting through sands

and gravels of pre-Anglian age has been demonstrated by the present investigation.

A list of formations proved in the resource sheet area is shown in Table 1; a more comprehensive description of the deposits on TL 52 is given by Millward (1980) and Wilson and Lake (1981).

Table 1 List of formations proved in the area of the resource sheet.

Formation/ deposit	Lithology
Pleistocene and Recent	
Alluvium	Silt and silty fine sand with varying amounts of clay, and some seams of fine gravel and organic debris, yellowish brown
First Terrace	'Clayey' gravel and sandy gravel, predominantly angular flint, yellowish brown
Head	Locally derived, variable, soliflucted silty sandy clay with pebbles, brown
Boulder Clay	Silty clay with some fine sand, with chalk and flint pebbles, dark grey, weathering to ochre brown
Glacial Silt	Laminated sandy silt and silty fine sand, with some chalk pellets, pale grey
Glacial Sand and Gravel	'Clayey' sandy gravel, predominantly of flint and hard chalk
Kesgrave Sands and Gravels	Sand and 'clayey' sand, and sandy gravel; predominantly angular and well rounded flint and quartz, yellowish brown
?Red Crag	Sand and pebbly sand; predominantly well rounded flint, orange brown and reddish brown (proved in boreholes only)
Eocene	
London Clay	Silty, fine-sandy clay, dark bluish grey and olive green
Palaeocene	
Lower London Tertiaries	
Woolwich and Reading Beds	Stiff, waxy, vividly colour-mottled clay overlying pale greenish grey fine sand
Thanet Beds	Silty olive-green fine sand with a nodular flint pebble bed (Bullhead Bed) at the base
Cretaceous	
Upper Chalk	Soft, white, well jointed limestone with some seams of nodular flint

Solid

Upper Chalk

The Upper Chalk is a soft, white, well jointed limestone with seams of nodular and tabular flints. It is mapped at outcrop in the north and west of the district from Sion House [505 235] to Henham, and is exposed in two disused chalk quarries near Stansted Castle [516 250] and north of Limekiln Lane [505 245]. In both localities the pit faces are considerably degraded and the latter has been extensively backfilled with household refuse.

North of Stansted Mountfitchet, the Upper Chalk is exposed in Ugley Pit [517 278], where the junction with the overlying Thanet Beds can be seen, and farther south the Chalk may be observed in the base of the abandoned Alsa Lodge sand and gravel pit [515 264]. Here a deep

excavation in the floor of the pit shows up to 12.0 m of well jointed, white and grey chalk with flint nodules. The upper surface of the Chalk is deeply pitted by solution pipes. These pipes are up to 6.0 m deep and their sides are coated with a veneer of green glauconitic sand. They contain nodular flint and yellowish brown stony waxy clay.

In boreholes, the upper 0.5 m or so of the Chalk is commonly weathered. The weathered product consists of angular flint and chalk fragments set in a matrix of white to cream chalk of putty-like consistency.

Lower London Tertiaries

The Lower London Tertiaries comprise two formations: the Thanet Beds and the Woolwich and Reading Beds above. A summary of the succession present in the resource sheet area is given below. Fuller details have been published by Prestwich (1850, 1852, 1854) and other work has been comprehensively reviewed by Hester (1965). A short communication (Hopson *in press*) deals with the Lower London Tertiaries of the Harlow (TL 41) sheet, south-west of Stansted Mountfitchet. Broadly similar relationships obtain between the deposits in this district, in that the Woolwich and Reading Beds overlap the Thanet Beds towards the north-west. In the present survey these deposits are indivisible in some cases and have been designated Lower London Tertiaries (LLT) and indicated as such on the Resource Map.

The Lower London Tertiaries thin towards the north and west: for example, borehole SE 11 [5630 2108] at Takeley proved 22.7 m of deposits, whereas in borehole NE 6 [5754 2794] at Chickney Hall 17.7 m was proved and yet only 10.7 m was present in borehole SW 63 [5035 2169] south of Blacklands.

Thanet Beds This formation rests disconformably on the eroded surface of the Chalk. Its base is marked by a well developed pebble bed of green-coated flints with a matrix of glauconitic sand (the Bullhead Bed). A uniformly dark olive green, glauconitic, micaceous fine and medium sand overlies the Bullhead Bed.

Although the Thanet Beds are not shown as outcropping on the map, they are exposed in the bottom of the gravel pit at Ugley, as previously mentioned; they have been proved in numerous boreholes, of which SW 57 [5422 2417] is an example.

Woolwich and Reading Beds These deposits comprise stiff waxy clays, silty sandy clays and 'clayey' fine sands. They correspond, respectively, to the Reading (fluvial) Type, the Woolwich (estuarine) Type and the Woolwich Marine Bottom Bed as described by Hester (1965). The Reading and Woolwich 'types' interdigitate and overlap the Woolwich Marine Bottom Bed. Consequently, only deposits of Reading and Woolwich 'types' crop out in the district. Pale green and grey 'clayey' sands attributable to the Woolwich Marine Bottom Bed have been recognised, however, in some boreholes, as, for example, in borehole NW 89 [5334 2971].

The Woolwich and Reading 'types' are both vividly mottled in pale and dark green, but some occurrences are characterised by dark red and dark green colours. They crop out extensively between Birchanger and Stansted Mountfitchet and in the valley of Stansted Brook towards Elsenham. North and north-west of Stansted Mountfitchet only limited outcrops at the head of small valleys have been mapped; exposures are rare. Two metres of silty, sandy, brown and red mottled clay occur in a roadside section 300 m south of Sion House [507 232].

London Clay

The London Clay forms rock-head over much of the resource sheet area and rests with no apparent break upon the Woolwich and Reading Beds.

The Basement Bed of the London Clay, which is commonly between 4.0 m and 5.0 m thick, character-

istically comprises dark greyish green clayey, silty, pyritic fine-grained sand. A discontinuous pebble bed containing black and brown well rounded flints marks the base. It is recorded, for example, in borehole SE 11 [5630 2108] (not shown on the map).

Higher beds of the London Clay are firm, often fissured, bluish grey and dark grey clays, which frequently contain pyrite nodules, and when weathered, selenite crystals and 'race' (concretionary calcium carbonate) nodules.

The uppermost beds crop out extensively around Start Hill [522 215], where they are dug for the manufacture of bricks, and between Birchanger and Elsenham. In the east, from Chickney Hall [576 279] to Tilty Mill [599 267], and from Moor End [583 261] to Perryfield Ponds [596 245], London Clay of silty, sandy clay lithology crops out on the flanks of the valleys.

?Red Crag

Hitherto the Red Crag has not been recorded in this area. However, medium with fine and coarse pebbly sands, often iron-stained reddish brown, and containing ironstone and phosphatic nodules, have been proved at depth beneath Kesgrave Sands and Gravels in the north-east around Broxted and in the vicinity of Elsenham. The sands have a bimodal or broadly unimodal grain-size distribution with subequal (30-35 per cent) proportions of medium and fine sand, and between 10 and 15 per cent of coarse sand.

The basal metre or so of sand exposed at Elsenham Pit [550 265] is strongly iron-stained and also has a bimodal grain-size distribution and is considered to be part of the same deposit.

Although the pebbly sands contain no fossil material, their grading and compositional characteristics strongly suggest that they are likely to be part of the Red Crag. On sheet TL 62 to the east (Thomas, *in press*), pebbly sands of comparable lithology but containing considerable quantities of comminuted shell material are regarded as undoubted Red Crag.

In the north-west around Rickling Green [509 299], near Norman House [520 263] and Bentfield Green [505 255], and in the south-west from Church House [521 241] to the Hall [508 227], sandy gravels up to 4.9 m thick have been proved in boreholes. These are also considered to be of ?Red Crag age. They contain phosphatic nodules and have a low (5-10 per cent) quartz and quartzite content in the +8-16 mm fraction. However, they do not possess the characteristic reddish brown iron-staining noted in Red Crag of other localities. Leaching may well have removed the colouration since the contained phosphatic nodules are highly weathered.

These occurrences of ?Red Crag are discrete and appear to fill local hollows in the bedrock surface. Where it can be differentiated, the ?Red Crag is shown separately from Kesgrave Sands and Gravels in the borehole logs, but on the Resource Map (at outcrop) and in the sections the two deposits are grouped together as a single potentially workable bed of mineral.

Drift

Kesgrave Sands and Gravels

The Kesgrave Sands and Gravels can be divided into two lithological types. In the north, around Rickling Green, Henham and Broxted, strongly unimodal sands (i.e. between 60 and 80 per cent of the material is within the fine- or medium-sand size-ranges) with some thin sandy gravel seams, have been proved in assessment boreholes. Boreholes in the south, from Start Hill to Canfield End [587 213] and north to Broxted Hill [590 249], have encountered sandy gravels and gravels with typically 30 to 35 per cent of quartz and quartzite pebbles.

The unimodal sands are exposed at Elsenham Pit, where up to 6.8 m of planar- and cross-bedded fine and medium sand with gravel stringers underlies up to 4.7 m of pale grey Boulder Clay.

The southern gravels and sandy gravels are exposed at Start Hill brickworks [522 212], where up to 2.7 m of quartz- and quartzite-rich gravel with lenses of planar- and cross-stratified sands are seen. These deposits contain traces of very highly weathered pale green igneous clasts. North of Start Hill [520 217], up to 2.5 m of sandy gravel was worked for a time to provide aggregate for the construction of the M11 motorway. These shallow borrow pits have been completely back-filled.

Both deposits are considered by Rose and Allen (1977) to be of Beestonian age and to have been deposited by a former braided river, the proto-Thames, but the evidence from this and other resource-sheet areas nearby (Hopson, *in press*; Marks, 1981; Thomas, *in press*) suggests that only the gravels and sandy gravels in the south are of proto-Thames origin.

The sands, which when pebbly have a composition akin to that of the Red Crag, are not here considered to be of Beestonian age. They may well be shallow-marine deposits of earlier age, with a closer affinity in composition and grain-size distribution to the Red Crag. However, confirmation of this hypothesis is beyond the scope of this report and is the subject of continuing research.

Glacial Sand and Gravel

The Glacial Sand and Gravel is of two distinct modes of occurrence, but both modes have broadly similar grading and compositional characteristics. One appears to be of glaciofluvial origin and is found in the 'spillway' (see Figure I on the Resource Map) that lies between Ugley and Birchanger and in patches north of Tingates Farm [599 276]; the other is probably a proximal outwash gravel intimately associated with the Boulder Clay and is found sporadically across the resource sheet area.

The glaciofluvial deposits of gravel and sandy gravel are rich in clasts of hard chalk and contain many cobbles and boulder-sized (>256 mm diameter) fragments of flint, sandstone and Hertfordshire Puddingstone. However, the upper two to three metres of this deposit is clay-enriched, cryoturbated and leached of chalk, presumably as a result of periglacial action. The exact relationship of these deposits to the Boulder Clay is not clear, but in general they appear to have been laid down in shallow troughs cut into the Kesgrave Sands and Gravels and into bedrock (see, for example, Sections on the Resource Map).

Elsewhere in the resource sheet area, 'clayey' to 'very clayey' gravels with soft chalk pebbles are associated with the Boulder Clay. They appear to be true proximal glacial gravels laid down from 'dead ice' which was incorporated within the till sheet. They appear to be lensoid in form and to occur at different levels within the Boulder Clay. These deposits are not seen in section, but crop out in a number of small patches; they have been proved at depth in several boreholes, notably in the buried tunnel valley north of Elsenham.

Glacial Silt

This deposit forms part of the complicated glacial sequence, which also includes Glacial Sand and Gravel and Boulder Clay, infilling the buried tunnel valleys (see Figure I on the Resource Map). In the north-west of the district the Glacial Silt crops out around Bedwell Common [527 274] and east of Ugley; it has also been proved in borehole NW 84 [5266 2932], where it consists of interlaminated 'clayey' silt, silt and silty sand. The silty fine sand contains fine-sand- to fine-gravel-sized chalk pellets.

Boulder Clay

The Boulder Clay crops out over much of the sheet area and is thickest on the interfluvial and in the buried tunnel valleys; it gives rise to the heavy clay soils typical of much of the district.

This deposit consists of dark grey and bluish grey silty, sandy clay containing many clasts of various rock types up to cobble grade; boulders are rare. The clay matrix is derived mainly from the pyrite-rich dark bluish grey and black mudstones and clays of the Lias, Oxford Clay, Ampthill Clay, Kimmeridge Clay and Gault, over which the ice moved on its way south. Pebbles constitute up to 40 per cent of the deposit and are predominantly of rounded chalk, angular and well rounded flint, with some quartzite, quartz, limestone, black paper shale and a trace of fossil debris.

In the buried tunnel valleys which extend from Bray-shot to Old Mead and from Durrells Wood [528 250] beneath Stansted Airport to Hatfield Forest, the Boulder Clay contains a larger proportion of silt and fine sand and is pale grey in colour. The pebbles here are commonly in the fine-gravel size-range (+4 -16 mm), and, where silt and fine-sand seams become predominant, the deposit is typically wet and soft.

Weathering greatly affects the constitution and colour of the Boulder Clay; generally the uppermost three or four metres have been largely decalcified, as shown by the progressive leaching of chalk with depth, and the originally pyritous clay matrix has been oxidised to impart an overall characteristic pale brown or yellowish brown colour.

Head

This solifluxion deposit is found in all the major river and stream valleys in the resource sheet area. It is a heterogeneous deposit whose lithology varies widely with the source of material from silty clay through sandy, pebbly, silty clay to sandy gravel. The occurrences of sandy gravel are thin, impersistent, and often 'clayey', and are not in consequence considered to be potentially workable. The Head is usually of the order of two to three metres in thickness.

First Terrace

The only occurrence of river terrace deposits lies south-west of Limekiln Lane [502 243]. Borehole SW 75 [5015 2431] proved 'clayey' gravel interbedded with a thick (2.3 m) carbonaceous silt, resting on Upper Chalk.

Alluvium

Alluvium, consisting mainly of silty sandy clay, forms sinuous belts bordering the present day streams. In places it contains carbonaceous debris together with some thin seams of chalky sand. The Alluvium contains no potentially workable sand and gravel deposits but it masks fluvial gravels in the valley of the River Stort south of Limekiln Lane.

COMPOSITION OF THE SAND AND GRAVEL DEPOSITS

In addition to the ?Red Crag, three of the drift deposits contain potentially workable sand and gravel deposits: Kesgrave Sands and Gravels, Glacial Sand and Gravel and First Terrace.

The mean grading of the deposits proved in IMAU boreholes is shown in Figure 3 and details of the mean composition by weight in the size-range +8 -16 mm are given in Table 2. Aggregate test results based on bulked samples from each of the deposits are shown in Table 3.

?Red Crag

Deposits referable to this formation were proved in seventeen IMAU boreholes and are probably present in Elsenham Pit, as previously mentioned.

The sampled material is fairly uniform in grading, varying only between pebbly sand and the more sandy part of the sandy gravel category. It rarely contains more than 10 per cent of fines.

The gravel fraction is composed mainly of well rounded with angular flint, and black, brown and some patinated flint, together with some subrounded to rounded white quartz. Tabular ironstone and rod-like phosphatic nodules are present in characteristically small amounts, and traces of quartzite, sandstone, and igneous fragments are found in most samples. Chalk pebbles have been found in some samples but they appear to be the result of contamination from the Chalk bedrock.

The phosphatic nodules found in the west of this resource sheet area are highly weathered and, although they still show concentric banding, they are often broken, soft and pale buff in colour, in contrast with fresh nodules which are typically dark brown and relatively durable.

Table 2 Mean percentage composition by weight in the +8-16 mm size range.

Deposit	Mean percentage composition by weight in the +8-16 mm fraction										
	Flint		Quartz	Quartzite	Sandstone	Chalk	Limestone	Ironstone	Fossil debris	Phosph. nodules	Others ^e
	Ang.	W R									
First Terrace ^a	78	11	5	3	2	trace	0	0	0	0	0
Glacial Sand and Gravel (chalk-free)	78	6	5	3	4	trace	0	2	0	1	1
Glacial Sand and Gravel (chalk-rich)	48	5	3	1	4	31	4	1	1	1	1
Kesgrave Sands and Gravels (gravel)	31	31	22	11	3	1 ^b	trace ^b	trace	trace ^b	trace	1
Kesgrave Sands and Gravels (sand) ^c	44	39	7	1	2	1 ^b	trace ^b	4	0	2	trace
?Red Crag	27	60	6	1	1	trace ^d	0	2	0	2	1

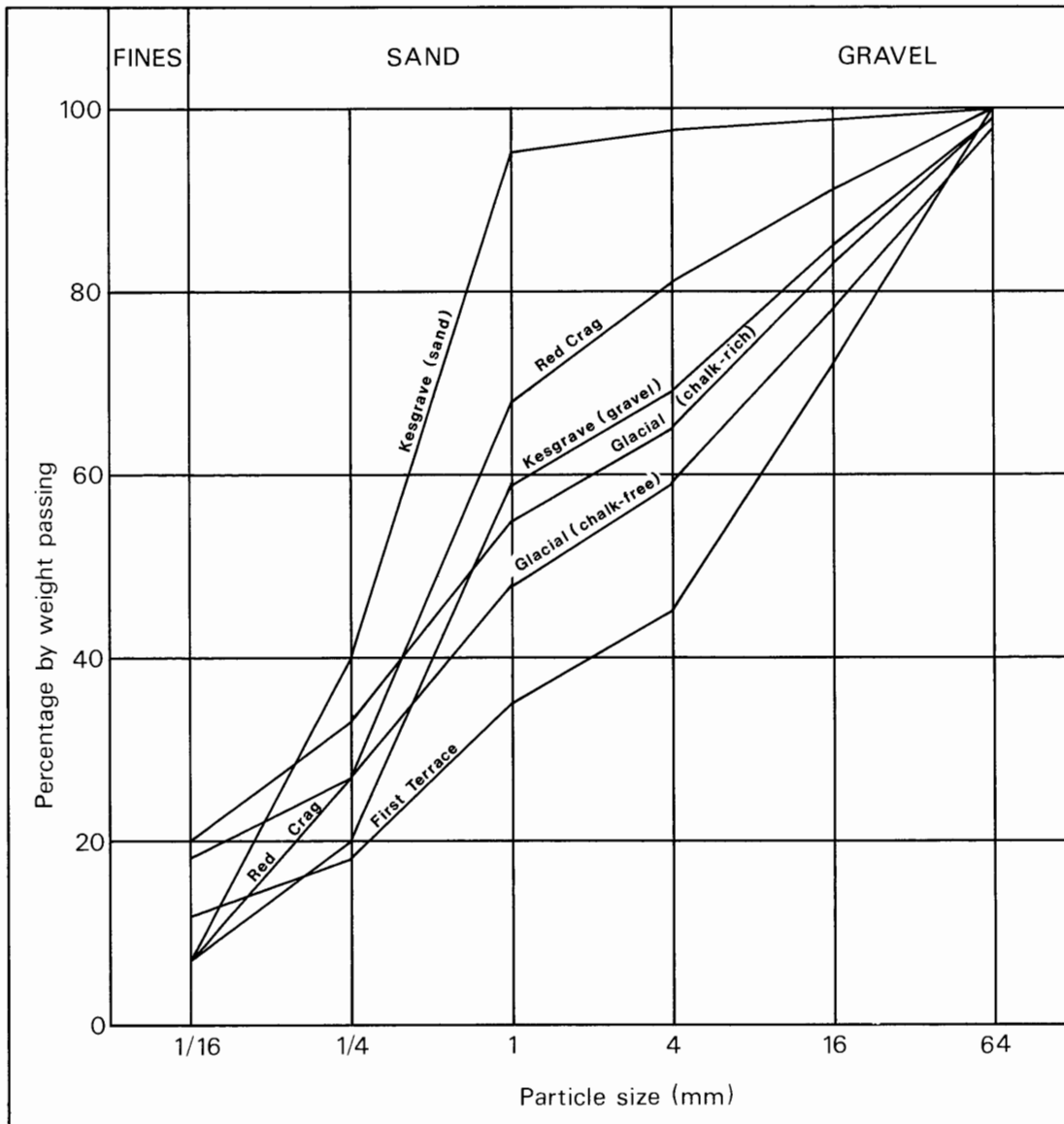
a Based on samples from one borehole only.

b Probable contamination from overlying Boulder Clay during drilling.

c Based on those boreholes with sufficient material for a statistical count.

d Probable contamination from underlying Chalk during drilling.

e 'Others' includes igneous, metamorphic, and fine-grained sedimentary rocks.



Deposit	Percentage by weight passing					
	1/16 mm	1/4 mm	1 mm	4 mm	16 mm	64 mm
First Terrace	12	18	35	45	72	100
Glacial Sand and Gravel (chalk-free)	18	27	48	59	78	98
Glacial Sand and Gravel (chalk-rich)	20	33	55	65	83	99
Kesgrave Sands and Gravels (gravel)	7	20	59	69	85	99
Kesgrave Sands and Gravels (sand)	7	40	95	98	99	100
?Red Crag	7	27	68	81	91	100

Figure 3 Particle-size distribution of the mineral-bearing deposits.

The sands have a bimodal or broadly unimodal grain-size distribution but the mean grading of all samples shows that the medium fraction predominates over the fine and coarse grades. They are composed of subrounded to rounded brown-stained quartz with some coarse and medium angular flint shards. Ironstone and mica are also present but usually only in trace amounts.

Kesgrave Sands and Gravels

The Kesgrave Sands and Gravels are of two distinct lithologies, one principally of sand and the other of pebbly sand to gravel. They are found respectively north and south of northing grid line 25.

The sands in the north have an overall mean grading of sand and are rarely pebbly and only occasionally

Table 3 Results of mechanical and physical testing.

The tests were conducted in accordance with BS 812, Parts 2 and 3 (1975) on natural samples.

Deposit	Aggregate Impact Value	10% Fines	Relative Density		Apparent Relative Density	Water Absorption (%)
			Oven-dried	Surface-dried		
First Terrace	24	Insufficient material	2.47	2.52	2.62	2.42
Glacial Sand and Gravel (chalk-free)	25	230	2.44	2.51	2.62	3.12
Glacial Sand and Gravel (chalk-rich)	34	110	2.33	2.46	2.67	5.47
Kesgrave Sands and Gravels (gravel)	22	284*	2.52	2.56	2.63	1.56
Kesgrave Sands and Gravels (sand)	23	Insufficient material	2.47	2.54	2.66	2.92
?Red Crag	21	270	2.50	2.56	2.66	2.35

*This result is based upon one test only; insufficient material was available for further tests.

'clayey'. Pebbles are found within the deposit only as thin stringers, such as those visible at Elsenham pit. Where sufficient +8 mm material is present in a sample or group of samples, compositional analyses have been included in the borehole records.

The fines content is mainly confined to seams and laminae of micaceous clay and silt up to 20 cm in thickness. Where the seams are found, individual samples may be 'clayey' or even 'very clayey', for example between 8.1 m and 8.9 m in borehole NW 72 [5067 2902].

The sand is strongly unimodal, up to 80 per cent being of either medium or fine grade; it is composed almost exclusively of subangular to subrounded quartz with some mica and ironstone and a trace of angular flint.

The gravel fraction (+4 mm), though not always represented in samples, is typically composed of subequal proportions of angular and well rounded black and brown flint, with some subrounded quartz and tabular ironstone. Traces of sandstone, phosphatic nodules, quartzite, chalk, limestone and igneous rock clasts are also found.

The deposits in the south of the sheet area, classified as pebbly sand to gravel, were only occasionally 'clayey' or 'very clayey'. However, in places where seams of silt and clay become dominant, as for example in borehole SW 84 [5161 2058], the sand and gravel may fall into the 'very clayey' category, or even become so 'clayey' as to be classified as non-mineral (i.e. it contains more than 40 per cent fines).

The gravel fraction typically comprises approximately equal amounts of fine and coarse grades with a trace of cobble grade. It is commonly composed of equal proportions of angular and well rounded pebbles of black, brown and white flint, and subrounded white quartz with liver-coloured quartzite. Some sandstone has also been found, together with traces of igneous rocks, chalk, limestone, fossil debris and phosphatic nodules.

The sand fraction is predominantly medium-grained with fine and coarse grades and is principally of subrounded to subangular pale yellow quartz, with some angular white flint and a trace of ironstone.

Glacial Sand and Gravel

The deposits of both proximal and glaciofluvial origin described within the Glacial Sand and Gravel have broadly similar compositions and gradings. However, leaching has removed the chalk from the uppermost two to three metres of the deposits of glaciofluvial origin in the 'spillway' from Ugley to Birchanger and virtually chalk-free (leached) and chalk-rich (unleached) types are recognisable. The effect of included chalk pebbles on the

mechanical and physical properties of the gravel is shown in Table 3.

Both deposits have similar gradings (Figure 3) and fall within the sandy gravel and gravel fields (Appendix C) and the 'clayey' and 'very clayey' categories within those fields.

The chalk-rich gravel has subequal proportions of fine and coarse grades with a trace of cobble grade. It is composed of angular flint and subrounded chalk, with some well rounded flint, sandstone, limestone and quartz. Quartzite, ironstone, fossil debris, phosphatic nodules and igneous rocks are also found in trace amounts (Table 2).

The largely chalk-free gravel comprises coarse and fine grades with some cobble grade principally of angular white and brown flint. Some well rounded flint, quartz, sandstone, quartzite and ironstone are also found, along with traces of igneous rocks, phosphatic nodules and chalk.

In both deposits the sand is medium with fine and coarse grades and is principally composed of angular flint and subangular quartz. The chalk-rich deposits have a high content of chalk pellets which become more angular with decreasing grain-size.

First Terrace

This deposit, as proved by borehole SW 75 [5018 2431], is classified as 'clayey' gravel.

The gravel fraction has equal proportions of coarse and fine grades and is composed of angular with some well rounded black and brown flint. Some quartz, quartzite and sandstone clasts were found, together with a trace of chalk.

The sand is medium and coarse in grade with some fine sand and is predominantly of angular flint and quartz, with a trace of chalk.

THE MAP

The sand and gravel resource map is folded into the pocket at the end of this report. The base map is the Ordnance Survey 1:25 000 Outline Edition in grey, on which the geological data are shown in black and the mineral resource information in shades of red.

Geological data The geological boundary lines, symbols, etc., shown are taken from the geological map of this area, which was surveyed recently at the scales of 1:10 560 and 1:10 000. This information was obtained by detailed application of field mapping techniques by the field staff in the Institute's East Anglia and South-East England Unit.

Table 4 The sand and gravel resources of sheet TL 52: summary of statistical assessments.

Block	Area		Mean thickness		Volume of mineral			Mean grading percentages					
	Block	Mineral	Overburden	Mineral	Million m ³	Limits at the 95% confidence level		Fines		Sand		Gravel	
	km ²	km ²	m	m		±%	±Million m ³	− $\frac{1}{16}$ mm	+ $\frac{1}{16}$ – $\frac{1}{4}$ mm	+ $\frac{1}{4}$ –1 mm	+1–4 mm	+4–16 mm	+16–64 mm
A	25.6	13.7	4.9	6.2	84.9	27	23.0	9	29	48	6	4	4 ^a
B	11.9	7.9	1.7	7.3	57.7	35	20.2	18	12	22	10	18	20 ^b
C	19.0	13.5	7.7	5.6	75.6	24	18.1	8	28	50	6	4	4 ^a
D	43.5	11.8	6.7	3.8	44.8	35	15.7	4	10	37	10	20	19 ^c
A-D	100.0	46.9	5.0	5.9	276.7	16	44.3	10	22	42	7	9	10 ^c

a Includes a trace of cobbles.

b Includes 2% of cobbles.

c Includes 1% of cobbles.

The geological boundaries are the best interpretation of the information available at the time of survey. However, it is inevitable that local irregularities and discrepancies will be revealed as new evidence from boreholes and excavations becomes available.

Borehole data, which include the stratigraphic relations, thicknesses and mean particle size distribution of the sand and gravel samples collected during the assessment survey, are also shown on the map.

Mineral resource information The mineral-bearing ground is divided into resource blocks (see Appendix A). Within a resource block the mineral is subdivided into areas where it is exposed, that is where the overburden averages less than 1 m in thickness, and areas where it is present in continuous, or almost continuous, spreads beneath overburden. The recognition of these categories is dependent upon the importance attached to the proportion of boreholes which did not find potentially workable sand and gravel and the distribution of barren boreholes within a block. The mineral is described as 'almost continuous' if it is present in 75 per cent or more of the boreholes in a resource block. The 'discontinuous' category has not been recognised on this sheet.

Areas where bedrock crops out, where boreholes indicate absence of sand and gravel beneath cover and where sand and gravel beneath cover is interpreted to be not potentially workable, are uncoloured on the map; where appropriate, the relevant criterion is noted. In such cases it has been assumed that mineral is absent except in infrequent and relatively minor patches that can neither be outlined nor assessed quantitatively in the context of this survey. Areas of unassessed sand and gravel, for example in built-up areas, are indicated by a red stipple.

The area of the mineral-bearing ground is measured, where possible, from the mapped geological boundary lines. The whole of this area is considered as mineral-bearing, even though it may include small areas where sand and gravel is not present or is not potentially workable. Inferred boundaries have been inserted to delimit areas where sand and gravel beneath cover is interpreted to be not potentially workable or absent. Such boundaries (for which a distinctive zigzag symbol is used) are drawn primarily for the purpose of volume estimation. The symbol is intended to indicate an approximate location within a likely zone of occurrence rather than to represent the breadth of the zone, its size being determined only by cartographic considerations. For the purpose of measuring areas the centre line of the symbol is used.

RESULTS

The statistical results are summarised in Table 4.

Accuracy of results For each of the resource blocks, the accuracy of the results at the 95 per cent probability level (that is, on average nineteen out of every twenty sets of limits constructed in this way contain the true value for the volume of mineral) varies between 24 per cent and 35 per cent (Appendix B). However, the true volumes are more likely to be nearer the figure estimated than either of the limits. Moreover, it is probable that roughly the same percentage limits would apply for the statistical estimate of mineral volume within a very much smaller parcel of ground (say 100 hectares) containing similar sand and gravel deposits, if the results from the same number of sample points (as provided by, say, ten boreholes) were used in the calculation. Thus, if closer limits are needed for quotation of reserves, data from more sample points would be required, even if the area were quite small. This point can be illustrated by considering the whole of the potentially workable sand and gravel in Blocks A to D. The total volume (276.7 million m³) can be estimated to limits of ± 16 per cent at the 95 per cent probability level by a calculation based on the data from the 74 sample points spread across the four resource blocks. However, it must be emphasised that the quoted volume of mineral has no simple relationship with the amount that could be extracted in practice, as no allowance has been made in the calculations for any restraints (such as existing buildings and roads) on the use of the land for mineral working.

NOTES ON THE RESOURCE BLOCKS

The Resource Block boundaries have been designed to divide the predominantly Glacial Sand and Gravel deposits in Block B from the older (pre-Anglian) sands and gravels assessed in Block A, C and D. A summary of the sand and gravel resources of sheet TL 52 is shown in Table 4.

Block A

This block comprises two areas of mineral-bearing ground in the north-west of the sheet; they are separated by the glacial deposits which are assessed in Block B. The block covers an area of 25.6 km², of which 13.7 km² is mineral-bearing.

The overburden, which is principally Boulder Clay with some thin Head deposits, ranges in thickness in IMAU boreholes from 0.3 m in borehole NW 95 [5382 2545] to 14.5 m in borehole NW 73 [5014 2899] and

has a mean of 4.9 m. In the vicinity of Henham the Boulder Clay becomes excessively thick, but Kesgrave Sands and Gravels have been proved at depth, for example in borehole NW 96 [5479 2856].

The mineral is predominantly Kesgrave Sands and Gravels and ?Red Crag with only a few occurrences of Glacial Sand and Gravel (for example, in borehole NE 13 [5566 2819]). It ranges in thickness in IMAU boreholes from 1.6 m in borehole SW 87 [5213 2406] to a total (in two beds) of 17.1 m in borehole NE 13.

The mean grading for the block is fines 9 per cent, sand 83 per cent and gravel (including a trace of cobble grade) 8 per cent. The estimated total volume of mineral is 84.9 ± 23 million m³.

Block B

This block includes the Glacial Sand and Gravel deposits in the 'spillway' from Ugley to Birchanger and covers an area of 11.9 km² of which 7.9 km² is mineral-bearing.

The overburden, which commonly consists of only topsoil and subsoil with some thin Boulder Clay in places, ranges in thickness in IMAU boreholes from 0.3 m, for example, in borehole NW 82 [5134 2600] to 2.8 m in borehole SW 77 [5060 2353]. It has a mean thickness of 1.7 m. From Old Mead to Brayshot excessively thick Boulder Clay covers Glacial Sand and Gravel in the buried tunnel valley of the River Cam. This area may contain thin localised deposits of sand and gravel of potential use but is considered to be generally barren.

The mineral is principally of Glacial Sand and Gravel lithology with only borehole NW 78 [5167 2897] showing an attenuated sequence of Kesgrave Sands and Gravels and ?Red Crag at depth. The mineral, which is absent in borehole NW 83 [5195 2522], ranges in thickness up to 14.1 m (in borehole NW 80) and has a mean of 7.3 m.

The overall mean grading for the block is fines 18 per cent, sand 44 per cent and gravel 38 per cent, including 2 per cent of cobble grade. The estimated total volume of resources is 57.7 ± 20.2 million m³.

Block C

Block C encompasses Kesgrave Sands and Gravels and the ?Red Crag deposits in the north-east of the sheet around Broxted. In the extreme north-east a train of Glacial Sand and Gravel deposits resting on Kesgrave Sands and Gravels has also been included. The block covers an area of 19.0 km² of which 13.5 km² is mineral-bearing.

The overburden, which is principally Boulder Clay, ranges in thickness in IMAU boreholes from 0.6 m in borehole NE 33 [5977 2919] to 17.4 m in borehole NE 19 [5646 2741] and has a mean of 7.7 m.

The mineral ranges in thickness in IMAU boreholes from 2.7 m in borehole NE 30 [5814 2664] to 10.8 m in borehole NE 35 [5977 2764] and has a mean of 5.6 m.

The mean grading for the block is fines 8 per cent, sand 84 per cent and gravel (including a trace of cobble grade) 8 per cent. The estimated total volume of mineral is 75.6 ± 18.1 million m³.

Block D

This block covers an area centred on Stansted Airport and is 43.5 km² in area, of which only 11.8 km² is mineral bearing. Apart from small outcrops at Start Hill, in and near Hatfield Forest, at Little Canfield and at great Easton, the resource is concealed.

Outside the mineral-bearing areas shown in the south and east of the block, sand and gravel is generally absent and Boulder Clay rests directly on London Clay bedrock. However, in the area around Molehill Green and Bambers Green [575 230], sand and gravel has been proved at depth beneath excessive thicknesses of Boulder Clay.

The overburden is principally Boulder Clay with some thin Alluvium and Head deposits masking sand and gravel in the Pincey Brook and River Roding valleys. The overburden proved in IMAU boreholes ranges in thickness

from 0.9 m in borehole SW 89 [5217 2223] to 15.9 m in borehole SE 31 [5873 2008] and has a mean of 6.7 m.

The mineral ranges in thickness from 0.8 m in borehole SE 33 [5976 2363] to 7.5 m in borehole SE 34 [5951 2274] and has a mean thickness of 3.8 m.

The overall mean grading for the block is fines 4 per cent, sand 57 per cent and gravel 39 per cent (including 1 per cent of cobble grade). The estimated total volume of mineral is 44.8 ± 15.7 million m³.

LIST OF ACTIVE AND DISUSED WORKINGS

Location	Grid reference	Deposit worked
Active Workings		
Ugley	517 278	Glacial Sand and Gravel
Elsenham	550 265	Kesgrave Sands and Gravels
Walpole Farm	523 259	Glacial Sand and Gravel
Armigers	595 290	Glacial Sand and Gravel
Main disused workings		
Alsa Lodge	515 264	Glacial Sand and Gravel
Norman House	531 263	Kesgrave Sands and Gravels
Sandpits Farm	542 268	Kesgrave Sands and Gravels
North of Start Hill	520 218	Kesgrave Sands and Gravels
Fullers End	536 255	Kesgrave Sands and Gravels

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APPENDIX A

FIELD AND LABORATORY PROCEDURES

Trial and error during initial studies of the complex and variable glacial deposits of East Anglia and Essex showed that an absolute minimum of five sample points evenly distributed across the sand and gravel are needed to provide a worthwhile statistical assessment, but that, where possible, there should be not less than ten. Sample points are any points for which adequate information exists about the nature and thickness of the deposit and may include boreholes other than those drilled during the survey and exposures. In particular, the cooperation of sand and gravel operators ensures that boreholes are not drilled where reliable information is already available; although this may be used in the calculations, it is held confidentially by the Institute and cannot be disclosed.

The mineral shown on each 1:25 000 sheet is divided into resource blocks. The arbitrary size selected is a compromise to meet the aims of the survey by providing sufficient sample points in each block. As far as possible the block boundaries are determined by geological boundaries so that, for example, glacial and river terrace gravels are separated. Otherwise division is by arbitrary lines, which may bear no relationship to the geology. The blocks are drawn provisionally before drilling begins.

A reconnaissance of the ground is carried out to record any exposures and inquiries are made to ascertain what borehole information is available. Borehole sites are then selected to provide an even pattern of sample points at a density of approximately one per square kilometre. However, because broad trends are independently overlain by smaller-scale characteristically random variations, it is unnecessary to adhere to a square grid pattern. Thus such factors as ease of access and the need to minimise disturbance to land and the public are taken into account in siting the holes; at the same time it is necessary to guard against the possibility that ease of access (that is, the positions of roads and farms) may reflect particular geological conditions, which may bias the drilling results.

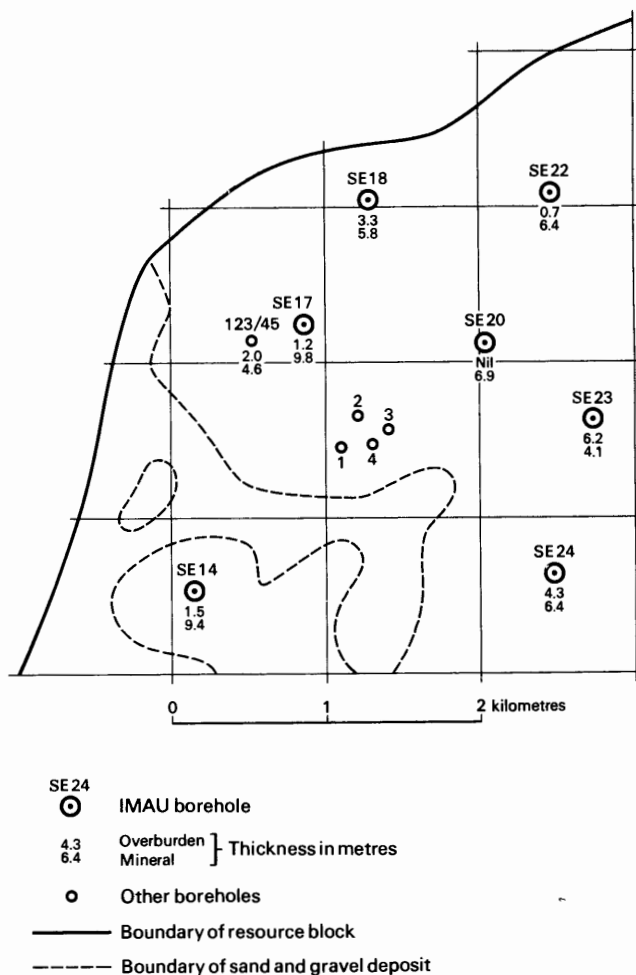
The drilling machine employed should be capable of providing a continuous sample representative of all unconsolidated deposits, so that the in-situ grading can be determined, if necessary, to a depth of 30 m (100 ft) at a diameter of about 200 mm (8 in), beneath different types of overburden. It should be reliable, quiet, mobile and relatively small (so that it can be moved to sites of difficult access). Shell and auger rigs have proved to be almost ideal.

The rigs are modified to enable deposits above the water table to be drilled 'dry', instead of with water added to facilitate the drilling, to minimise the amount of material drawn in from outside the limits of the hole. The samples thus obtained are representative of the in-situ grading, and satisfy one of the most important aims of the survey. Below the water table the rigs are used conventionally, although this may result in the loss of some of the fines fraction and the pumping action of the bailer tends to draw unwanted material into the hole from the sides or the bottom.

A continuous series of bulk samples is taken throughout the sand and gravel. Ideally samples are composed exclusively of the whole of the material encountered in the borehole between stated depths. However, care is taken to discard, as far as possible, material which has caved or has been pumped from the bottom of the hole. A new sample is commenced whenever there is an appreciable lithological change within the sand and gravel, or at every 1 m (3.3 ft) depth. The samples, each weighing between 25 and 45 kg (55 and 100 lb), are despatched in heavy-duty polythene bags to a laboratory for grading. The grading procedure is based on B.S. 1337 (British Standards Institution, 1967). Random checks of the accuracy of the grading are made in the Institute's laboratories.

All data, including mean grading analysis figures calculated for the total thickness of the mineral, are entered on standard record sheets, abbreviated copies of which are reproduced in Appendix E.

Detailed records may be consulted at the appropriate offices of the Institute, upon application to the Head, Industrial Minerals Assessment Unit.



Example of resource block assessment: map of a fictitious block

APPENDIX B

STATISTICAL PROCEDURE

Statistical assessment

1 A statistical assessment is made of an area of mineral greater than 2 km², if there are at least five evenly spaced boreholes in the resource block (for smaller areas, see Paragraph 12 below).

2 The simple methods used in the calculations are consistent with the amount of data provided by the survey (Hull, 1981). Conventional symmetrical confidence limits are calculated for the 95 per cent probability level, that is, on average nineteen out of every twenty sets of limits constructed in this way contain the true value for the volume of mineral.

3 The volume estimate (V) for the mineral in a given block is the product of two variables, the sampled areas (A) and the mean thickness (\bar{l}_m) calculated from the individual thicknesses at the sample points. The standard deviations for these variables are related such that

$$S_V = \sqrt{S_A^2 + S_{\bar{l}_m}^2} \quad [1]$$

4 The above relationship may be transposed such that

$$S_V = S_{\bar{l}_m} \sqrt{1 + S_A^2 / S_{\bar{l}_m}^2} \quad [2]$$

From this it can be seen that as $S_A^2 / S_{\bar{l}_m}^2$ tends to 0, S_V tends to $S_{\bar{l}_m}$.

If, therefore, the standard deviation for area is small with respect to that for thickness, the standard deviation for volume approximates to that for mean thickness.

5 Given that the number of approximately evenly spaced sample points in the sampled area is n with mineral thickness measurements $l_{m1}, l_{m2}, \dots, l_{mn}$, then the best estimate of mean thickness, \bar{l}_m , is given by

$$\Sigma (l_{m1} + l_{m2} \dots l_{mn}) / n.$$

For groups of closely spaced boreholes a discretionary weighting factor may be applied to avoid bias (see note on weighting below). The standard deviation for mean thickness $S_{\bar{l}_m}$, expressed as a proportion of the mean thickness, is given by

$$S_{\bar{l}_m} = (1/\bar{l}_m) \sqrt{[\Sigma (l_m - \bar{l}_m)^2 / (n - 1)]}$$

where l_m is any value in the series l_{m1} to l_{mn} .

6 The sampled area in each resource block is coloured pink on the map. Wherever possible, calculations relate to the mineral within mapped geological boundaries (which may not necessarily correspond to the limits of a deposit). Where the area is not defined by a mapped boundary, that is, where the boundary is inferred, a distinctive symbol is used. Experience suggests that the errors in determining area are small relative to those in thickness. The relationship $S_A / S_{\bar{l}_m} \leq 0.3$ is assumed in all cases. It follows from Equation [2] that

$$S_{\bar{l}_m} \leq S_V \leq 1.05 S_{\bar{l}_m} \quad [3]$$

7 The limits on the estimate of mean thickness of mineral, $L_{\bar{l}_m}$, may be expressed in absolute units $\pm (t/\sqrt{n}) \times S_{\bar{l}_m}$ or as a percentage $\pm (t/\sqrt{n}) \times S_{\bar{l}_m} \times (100/\bar{l}_m)$ per cent, where t is Student's t at the 95 per cent probability level for $(n - 1)$ degrees of freedom, evaluated by reference to statistical tables. (In applying Student's t it is assumed that the measurements are distributed normally).

8 Values of t at the 95 per cent probability level for values of n up to 20 are as follows:

n	t	n	t
1	infinity	11	2.228
2	12.706	12	2.201
3	4.303	13	2.179
4	3.182	14	2.160
5	2.776	15	2.145
6	2.571	16	2.131
7	2.447	17	2.120
8	2.365	18	2.110
9	2.306	19	2.101
10	2.262	20	2.093

(from Table 12 in *Biometrika Tables for Statisticians*, Volume 1, Second Edition, Cambridge University Press, 1962). When n is greater than 20, 1.96 is used (the value of t when n is infinity).

9 In calculating confidence limits for volume, L_V , the following inequality, corresponding to Equation [3], is applied:

$$L_{\bar{l}_m} \leq L_V \leq 1.05 L_{\bar{l}_m}.$$

10 In summary, for values of n between 5 and 20, L_V is calculated as

$$[(1.05 \times t) / \bar{l}_m] \times [\sqrt{\Sigma (l_m - \bar{l}_m)^2 / n (n - 1)}] \times 100$$

per cent,

and when n is greater than 20, as

$$[(1.05 \times 1.96) / \bar{l}_m] \times [\sqrt{\Sigma (l_m - \bar{l}_m)^2 / n (n - 1)}] \times 100$$

per cent.

11 The application of this procedure to a fictitious area is illustrated in the accompanying Figure and example of a block calculation.

Inferred assessment

12 If the sampled area of mineral in a resource block is between 0.25 km² and 2 km², an assessment is inferred on the basis of geological and topographical information, usually supported by the data from one or two boreholes. The volume of mineral is calculated as the product of the area, measured from field data, and the estimated thickness. Confidence limits are not calculated.

13 In some cases a resource block may include an area left uncoloured on the map, within which mineral (as defined) is interpreted to be generally absent. If there is reason to believe that some mineral may be present, an inferred assessment may be made.

14 No assessment is attempted for an isolated area of mineral less than 0.25 km².

15 Note on weighting The thickness of a deposit at any point may be governed solely by the position of the point in relation to a broad trend. However, most sand and gravel deposits also exhibit a random pattern of local, and sometimes considerable, variation in thickness. Thus the distribution of sample points needs to be only approximately regular and in estimating the mean thickness only simple weighting is necessary. In practice, equal weighting can often be applied to thicknesses at all sample points. If, however, there is a distinctly unequal distribution of points, bias is avoided by dividing the sampled area into broad zones, to each of which a value roughly proportional to its area is assigned. This value is then shared between the data points with the zone as the weighting factor.

Block calculation

Scale: 1:25 000
Block: Fictitious

Area
Block: 11.08 km²
Mineral: 8.32 km²

Mean thickness
Overburden: 2.5 m
Mineral: 6.5 m

Volume
Overburden: 21 million m³
Mineral: 54 million m³

Confidence limits of the estimate of mineral volume at the 95 per cent probability level: ± 20 per cent
That is, the volume of mineral (with 95 per cent probability): 54 ± 11 million m³

Thickness estimate (measurements in metres)
 l_o = overburden thickness l_m = mineral thickness

Sample point	Weighting w	Overburden		Mineral		Remarks
		l_o	wl_o	l_m	wl_m	
SE 14	1	1.5	1.5	9.4	9.4	IMAU boreholes
SE 18	1	3.3	3.3	5.8	5.8	
SE 20	1	nil	-	6.9	6.9	
SE 22	1	0.7	0.7	6.4	6.4	
SE 23	1	6.2	6.2	4.1	4.1	
SE 24	1	4.3	4.3	6.4	6.4	
SE 17	$\frac{1}{2}$	1.2	1.6	9.8	7.2	Hydrogeology Unit record
123/45	$\frac{1}{2}$	2.0		4.6		
1	$\frac{1}{4}$	2.7	2.6	7.3	5.8	Close group of four boreholes (commercial)
2	$\frac{1}{4}$	4.5		3.2		
3	$\frac{1}{4}$	0.4		6.8		
4	$\frac{1}{4}$	2.8		5.9		
Totals	$\Sigma w = 8$	$\Sigma wl_o = 20.2$		$\Sigma wl_m = 52.0$		
Means		$\overline{wl_o} = 2.5$		$\overline{wl_m} = 6.5$		

Calculation of confidence limits

wl_m	$ (wl_m - \overline{wl_m}) $	$(wl_m - \overline{wl_m})^2$
9.4	2.9	8.41
5.8	0.7	0.49
6.9	0.4	0.16
6.4	0.1	0.01
4.1	2.4	5.76
6.4	0.1	0.01
7.2	0.7	0.49
5.8	0.7	0.49

$$\Sigma (wl_m - \overline{wl_m})^2 = 15.82$$

$$n = 8$$

$$t = 2.365$$

L_y is calculated as

$$1.05 (t / \overline{wl_m}) \sqrt{[\Sigma (wl_m - \overline{wl_m})^2 / n(n-1)]} \times 100$$

$$= 1.05 \times (2.365 / 6.5) \sqrt{[15.82 / (8 \times 7)]} \times 100$$

$$= 20.3$$

$$\approx 20 \text{ per cent.}$$

APPENDIX C

CLASSIFICATION AND DESCRIPTION OF SAND AND GRAVEL

For the purposes of assessing resources of sand and gravel a classification should take account of economically important characteristics of the deposit, in particular the absolute content of fines and the ratio of sand to gravel.

The terminology commonly used by geologists when describing sedimentary rocks (Wentworth, 1922) is not entirely satisfactory for this purpose. For example, Wentworth proposed that a deposit should be described as a 'gravelly sand' when it contains more sand than gravel and there is at least 10 per cent of gravel, provided that there is less than 10 per cent of material finer than sand ($< \frac{1}{16}$ mm) and coarser than pebbles (> 64 mm in diameter). Because deposits containing more than 10 per cent fines are not embraced by this system, a modified binary classification based on Willman (1942) has been adopted.

When the fines content exceeds 40 per cent the material is considered to be not potentially workable and falls outside the definition of mineral. Deposits which contain 40 per cent fines or less are classified primarily on the ratio of sand to gravel but qualified in the light of the fines content, as follows: less than 10 per cent fines - no qualification; 10 per cent or more but less than 20 per cent fines - 'clayey'; 20 to 40 per cent fines - 'very clayey'.

The term 'clay' (as written, with single quote marks) is used to describe all material passing $\frac{1}{16}$ mm. Thus it has no mineralogical significance and includes particles falling within the size range of silt. The normal meaning applies to the term clay where it does not appear in single quotation marks.

The ratio of sand to gravel defines the boundaries between sand, pebbly sand, sandy gravel and gravel (at 19:1, 3:1 and 1:1).

Thus it is possible to classify the mineral into one of twelve descriptive categories (see the accompanying Figure). The procedure is as follows:

- 1 Classify according to the ratio of sand to gravel.
- 2 Describe the fines.

For example, a deposit grading 11 per cent gravel, 70 per cent sand and 19 per cent fines is classified as 'clayey' pebbly sand. This short description is included in the borehole log (see Appendix D)

Many differing proposals have been made for the classification of the grain size of sediments (Atterberg, 1905; Udden, 1914; Wentworth, 1922; Wentworth, 1935; Allen, 1936; Twenhofel, 1937; Lane and others, 1947). As Archer (1970a, b) has emphasised, there is a pressing need for a simple metric scale acceptable to both scientific and engineering interests, for which the class limit sizes correspond closely with certain marked changes in the natural properties of mineral particles. For example, there is an important change in the degree of cohesion between particles at about the $\frac{1}{16}$ -mm size, which approximates to the generally accepted boundary between silt and sand. These and other requirements are met by a system based on Udden's geometric scale and a simplified form of Wentworth's terminology (see the accompanying table), which is used in the Report.

The fairly wide intervals in the scale are consistent with the general level of accuracy of the qualitative assessments of the resource blocks. Three sizes of sand are recognised, fine ($+\frac{1}{16}$ - $\frac{1}{4}$ mm), medium ($+\frac{1}{4}$ - 1 mm) and coarse (+1 - 4 mm). The boundary at 16 mm distinguishes a range of finer gravel (+4 - 16 mm), often characterised by abundance of worn tough pebbles of vein quartz, from larger pebbles, often of notably different materials. The boundary at 64 mm distinguishes pebbles from cobbles. The term 'gravel' is used loosely to denote both pebble-sized and cobble-sized material.

The size distribution of borehole samples is determined by sieve analysis, which is presented by the laboratory as logarithmic cumulative curves (see, for example, British Standards Institution, 1967). In this report the grading is tabulated on the borehole record sheets (Appendix E), the intercepts corresponding with the simple geometric scale $\frac{1}{8}$ mm, $\frac{1}{4}$ mm, 1 mm, 4 mm, 16 mm and so on as required. Original sample grading curves are available for reference at the appropriate office of the Institute.

Each bulk sample is described, subjectively, by a geologist at the borehole site. Being based on visual examination, the description of the grading is inexact, the accuracy depending on the experience of the observer. The descriptions recorded are modified, as necessary, when the laboratory results become available.

The relative proportions of the rock types present in the gravel fraction are indicated by the use of the words 'and' or 'with'. For example, 'flint and quartz' indicates roughly equal proportions with neither constituent accounting for less than about 25 per cent of the whole; 'flint with quartz' indicates that flint is dominant and quartz, the principal accessory rock type, comprises 5 to 25 per cent of the whole. Where the accessory material accounts for less than 5 per cent of the whole, but is still readily apparent, the phrase 'with some' has been used. Rare constituents are referred to as 'trace'.

The terms used in the field to describe the degree of rounding of particles, which is concerned with the sharpness of the edges and corners of a clastic fragment and not the shape (after Pettijohn, 1957), are as follows.

Angular: showing little or no evidence of wear; sharp edges and corners.

Subangular: showing definite effects of wear. Fragments still have their original form but edges and corners begin to be rounded off.

Subrounded: showing considerable wear. The edges and corners are rounded off to smooth curves. Original grain shape is still distinct.

Rounded: original faces almost completely destroyed, but some comparatively flat surfaces may still remain. All original edges and corners have been smoothed off to rather broad curves. Original shape is still apparent.

Well rounded: not original faces, edges or corners left. The entire surface consists of broad curves; flat areas are absent. The original shape is suggested by the present form of the grain.

Classification of gravel, sand and fines

Size limits	Grain-size description	Qualification	Primary classification
64 mm	Cobble		
16 mm	Pebble	Coarse	Gravel
4 mm		Fine	
1 mm		Coarse	
$\frac{1}{4}$ mm	Sand	Medium	Sand
$\frac{1}{8}$ mm		Fine	
	Fines (silt and clay)		Fines

- I Gravel
- II 'Clayey' gravel
- III 'Very clayey' gravel
- IV Sandy gravel
- V 'Clayey' sandy gravel
- VI 'Very clayey' sandy gravel
- VII Pebbly sand
- VIII 'Clayey' pebbly sand
- IX 'Very clayey' pebbly sand
- X Sand
- XI 'Clayey' sand
- XII 'Very clayey' sand

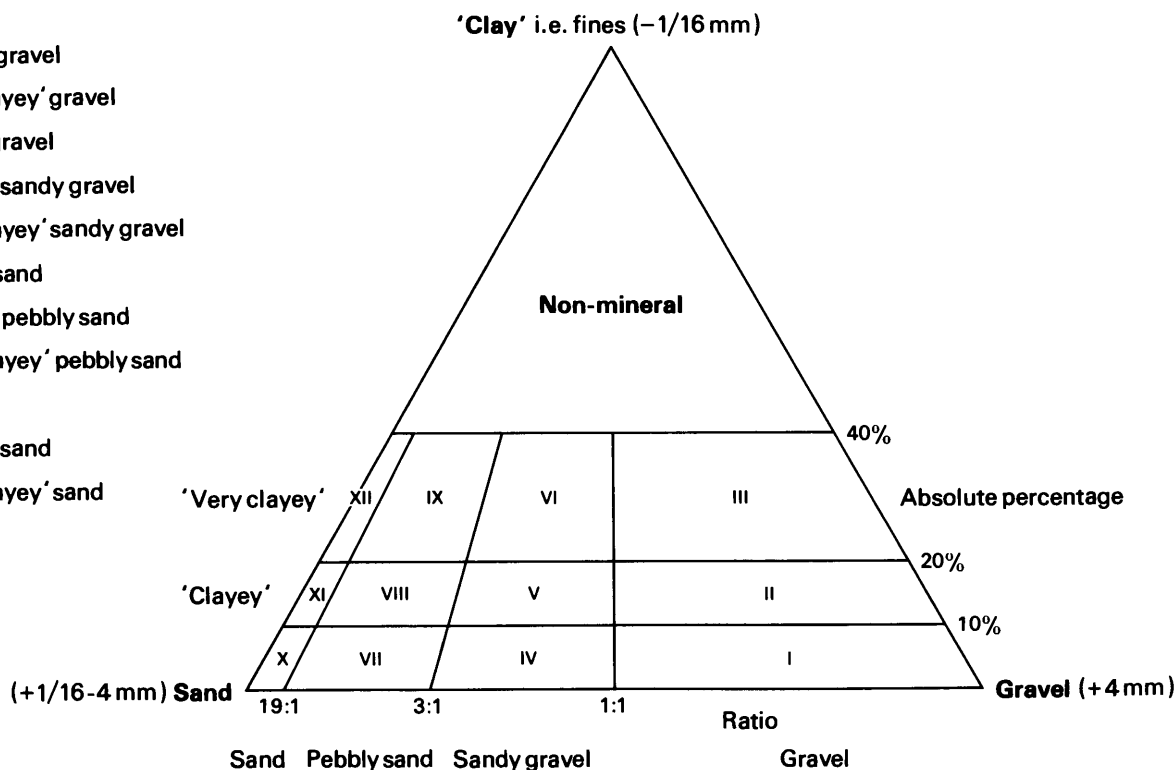


Diagram showing the descriptive categories used in the classification of sand and gravel

APPENDIX D

EXPLANATION OF THE BOREHOLE RECORDS

Annotated example

TL 52 NW 73	5014 2899	Near Catherine Grove, Ugley¹	Block A
Surface level +110.7 m ²			Overburden ⁵ 14.5 m
Water not struck ³			Mineral 7.5 m
November 1980 ⁴			Bedrock 0.4 m+

LOG

Geological classification	Lithology ⁶	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, fine sandy, with some angular flint pebbles, yellowish brown	0.2	0.5
	Clay, silty, fine, sandy, with pellets and pebbles of chalk and some angular flint, packed with dusky red sandy marly clay between 6.5-7.0 m, yellowish brown becoming pale yellowish brown and pale greyish brown	14.0	14.5
Kesgrave Sands and Gravels	a Pebbly sand, becomes less pebbly with depth Gravel: fine and coarse angular flint, well-rounded flint and quartz, and a trace of igneous and metamorphic Sand: medium with some fine and a trace of coarse, becomes medium and fine, subangular to subrounded quartz, pale orange and yellow brown	3.0	17.5
?Red Crag	b Sandy gravel Gravel: fine and coarse well rounded with angular flint; with some quartz and quartzite and a trace of igneous, metamorphic, phosphatic nodules and sandstone Sand: medium with fine and coarse subrounded to rounded quartz, with some angular flint, yellowish brown	4.5	22.0
Upper Chalk	Chalk some angular fragments in a puggy matrix, white	0.4+	22.4

GRADING⁷

	Mean for deposit percentages			Depth below surface (m) ⁸	percentages						
	Fines	Sand	Gravel		Fines			Gravel			
					-16	+16 -4	+4 -1	+1 -4	+4 -16	+16 -64	+64 mm
a	6	89	5	14.5-15.5	3	5	76	6	5	5	0
				15.5-16.5	6	13	76	1	3	1	0
				16.5-17.5	8	40	49	1	2	0	0
				Mean	6	19	67	3	3	2	0
b	9	62	29	17.5-18.5	8	24	28	10	14	16	0
				18.5-19.5	5	10	49	13	14	9	0
				19.5-20.5	8	9	44	18	15	6	0
				20.5-21.5	9	14	31	9	14	23	0
				21.5-22.0	24	9	24	7	16	20	0
				Mean	9	14	36	12	15	14	0
c	8	73	19	Mean	8	16	49	8	10	9	0

COMPOSITION⁹

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	14.5-17.5	Very small sample										
b	17.5-22.0	37	54	4	4	trace	0	0	0	trace	0	1

The numbered paragraphs below correspond with the annotations given on the specimen record:

1 Location

The position of the borehole is generally referred to the nearest named locality on the 1:25 000 base map and the resource block in which it lies is stated.

2 Surface level

The surface level at the borehole site is given in metres above Ordnance Datum. All measurements were made in metres.

3 Groundwater conditions

If groundwater was present the level at which it was encountered is normally given (in metres above OD).

4 Type of drill and date of drilling

All the boreholes were drilled with a modified shell and auger rig, using 152 mm diameter casing unless otherwise stated. The month and year of completion of the borehole are also stated.

5 Thickness

All measurements were made in metres to the nearest 0.1 m. The plus sign (+) indicates that the base of the deposit was not reached during drilling.

6 Lithological description

When sand and gravel is recorded a general description based on the mean grading characteristics (for details see Appendix C) is followed by more detailed particulars. The description of other rocks is based on visual examination in the field. Where more than one mineral deposit is recognised, each is designated by a letter, e.g. **a**, **b**, etc.

7 Mean grading for deposit

The grading of each mineral deposit identified in the log is the mean of the individual sample gradings weighted by the thicknesses represented. The classification used is shown in Appendix C. Due to the diameter of the casing (152 mm), gravel larger than 64 mm, which is rarely present in this district, is likely to be unrepresentatively sampled.

Fully representative sampling of sand and gravel is difficult to achieve, particularly where groundwater levels are high. Comparison between boreholes and adjacent exposures suggests that in borehole samples from below the water-table the proportion of sand may be higher and the proportions of fines and coarse gravel (+16 mm) may be lower.

8 Sampling

A continuous series of bulk samples is taken throughout the thickness of sand and gravel. A new sample is commenced whenever there is an appreciable lithological change in the sand and gravel or at every 1 m of depth.

9 Composition

Details are given of the composition on a percentage by weight basis of the gravel fraction (+8-16 mm). The 'angular flint' category includes flint with an angularity from angular to subrounded. The category of 'Others' includes igneous, metamorphic and fine-grained sedimentary rocks which occur in trace amounts.

APPENDIX E

INDUSTRIAL MINERALS ASSESSMENT UNIT BOREHOLE RECORDS

TL 52 NW 72	5067 2902	North of Burney Wood, Quendon and Rickling	Block A
Surface level +95.1 m			Overburden 1.8 m
Water not struck			Mineral 7.1 m
October 1980			Bedrock 4.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
	Clay, silty, very sandy, with a trace of flint pebbles, dark yellowish brown	0.3	0.5
Glacial Sand and Gravel	a Very sandy, pebbly, silty clay, with fine and coarse pebbles of angular flint; with some sandstone, quartzite quartz and ironstone; and a trace of well rounded flint, igneous, metamorphic, fossil debris and chalk. Medium with coarse and fine quartz and angular flint sand, dark yellowish brown	0.9	1.4
	Clay, silty, sandy, stiff, yellowish brown	0.4	1.8
Kesgrave Sands and Gravels	b 'Clayey' sand, with discrete thin, laminated, micaceous, silty clay seams throughout Gravel: a trace of fine and coarse, angular flint with some quartz, chalk and sandstone Sand: fine with medium and a trace of coarse, subangular to subrounded quartz with a trace of opaques, yellowish brown with dark reddish brown patches	3.2	5.0
?Red Crag	c Sandy gravel, becomes 'clayey' at base Gravel: fine and coarse, well rounded and angular flint, with some quartz and quartzite; and a trace of sandstone, igneous, metamorphic, ironstone and limestone Sand: medium with fine and coarse, subangular to subrounded quartz with some angular flint and opaques, dark yellowish brown	3.9	8.9
Woolwich and Reading Beds	d 'Very clayey' sand, with a trace of fine well rounded flint pebbles Sand: fine with a trace of medium and coarse, subrounded quartz with a trace of mica and opaques, glauconitic, dark yellowish brown	2.1	11.0
	Clay, silty, with some glauconite, laminated in parts, stiff, waxy, dark yellowish green and pale green	1.3	12.3
	Clay, silty, sandy, packed with fine and coarse black rounded flint pebbles, stiff to hard, dark dusky red mottled olive green	0.5	12.8
Upper Chalk	Chalk, angular fragments in a puggy matrix with some nodular blue-black flint, creamy white	0.7+	13.5

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages							
	Fines	Sand	Gravel		Fines		Sand			Gravel		
					- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm	
a	41	25	34	0.5-1.4	41	7	10	8	22	12	0	
b	11	88	1	1.8-2.8	9	44	43	2	2	0	0	
				2.8-3.8	10	81	9	0	0	0		
				3.8-5.0	14	55	28	1	1	0		
				Mean	11	60	27	1	0	0		
c	8	64	28	5.0-6.0	7	22	41	9	13	8	0	
				6.0-7.0	4	10	42	20	15	9	0	
				7.0-8.1	7	20	33	15	15	10	0	
				8.1-8.9	18	12	19	9	16	26	0	
				Mean	8	16	34	14	15	13	0	
b+c	10	75	15	Mean	10	36	31	8	8	7	0	
d	34	64	2	8.9-11.0	34	60	3	1	2	0	0	

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	0.5-1.4	84	1	3	4	4	trace	0	trace	0	3	1
b	1.8-5.0	Very small sample										
c	5.0-8.9	40	52	5	2	trace	0	trace	0	0	trace	1
d	8.9-11.0	Very small sample										

TL 52 NW 73 5014 2899 Near Catherine Grove, Ugley

Block A

Surface level +110.7 m
Water not struck
November 1980

Overburden 14.5 m
Mineral 7.5 m
Bedrock 0.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, fine sandy, with some angular flint pebbles, yellowish brown	0.2	0.5
	Clay, silty, fine, sandy, with pellets and pebbles of chalk and some angular flint, packed with dusky red sandy marly clay between 6.5-7.0 m, yellowish brown becoming pale yellowish brown and pale greyish brown	14.0	14.5
Kesgrave Sands and Gravels	a Pebbly sand, becomes less pebbly with depth Gravel: fine and coarse angular flint, well-rounded flint and quartz, and a trace of igneous and metamorphic Sand: medium with some fine and a trace of coarse, becomes medium and fine, subangular to subrounded quartz, pale orange and yellow brown	3.0	17.5

?Red Crag

b Sandy gravel

4.5 22.0

Gravel: fine and coarse well rounded with angular flint; with some quartz and quartzite and a trace of igneous, metamorphic, phosphatic nodules and sandstone

Sand: medium with fine and coarse subrounded to rounded quartz, with some angular flint, yellowish brown

Upper Chalk

Chalk some angular fragments in a puggy matrix, white

0.4+ 22.4

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages							
	Fines	Sand	Gravel		Fines			Sand		Gravel		
					- $\frac{1}{8}$	+ $\frac{1}{8}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm	
a	6	89	5	14.5-15.5	3	5	76	6	5	5	0	
				15.5-16.5	6	13	76	1	3	1	0	
				16.5-17.5	8	40	49	1	2	0	0	
				Mean	6	19	67	3	3	2	0	
b	9	62	29	17.5-18.5	8	24	28	10	14	16	0	
				18.5-19.5	5	10	49	13	14	9	0	
				19.5-20.5	8	9	44	18	15	6	0	
				20.5-21.5	9	14	31	9	14	23	0	
				21.5-22.0	24	9	24	7	16	20	0	
				Mean	9	14	36	12	15	14	0	
a+b	8	73	19	Mean	8	16	49	8	10	9	0	

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	14.5-17.5	Very small sample										
b	17.5-22.0	37	54	4	4	trace	0	0	0	trace	0	1

TL 52 NW 74 5079 2753 Bollington Hall, Ugley

Block A

Surface level +98.0 m
 Water not struck
 November 1980

Waste 3.7 m
 Bedrock 1.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.4	0.4
Boulder Clay (?reworked Lower London Tertiaries)	Clay, silty, sandy with some angular flints, yellowish brown	0.2	0.6
	Clay, silty, with a trace of angular flints and some quartz pebbles, yellowish brown mottled grey	1.1	1.7
	Clay, silty, fine sandy, with a trace of angular flint pebbles and many 'race' nodules, stiff, brown	2.0	3.7
Woolwich and Reading Beds	Clay, silty, packed with dark brown and white race nodules, stiff, waxy, dark grey mottled grey, dark brown and dusky red	1.3+	5.0

TL 52 NW 75 5068 2690 Houghty Wood, Stansted Mountfitchet

Block A

Surface level +101.7 m
 Water struck at +85.8 m
 October 1980

Waste 5.9 m
 Bedrock 11.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
Boulder Clay	Clay silty, with pellets and pebbles of chalk and some flint, yellowish brown mottled pale grey and olive brown	2.8	3.0
	Clay, silty, with pellets and pebbles of chalk, dark greyish brown mottled dark grey	1.5	4.5
	Clay, silty, with pellets and pebbles of chalk, grey	0.6	5.1
	Silt, laminated, greyish brown	0.8	5.9

Lower London Tertiaries	Clay, with some silt, very stiff to hard, waxy, dusky yellowish brown mottled brown, moderate reddish brown and grey	1.6	7.5
	Clay, silty, stiff, waxy, dusky yellowish brown mottled grey and yellowish brown	0.5	8.0
	Clay, silty, stiff, waxy, with nodules of race, brown mottled grey and red	1.6	9.6
	Clay stiff to hard, waxy, yellowish brown mottled and speckled black, grey and red	1.4	11.0
	Silt, fine sandy, crumbly, yellowish brown	0.5	11.5
	Clay, silty, becoming clayey, fine sandy, silt, firm, with race nodules, red mottled dusky red, very dark red, olive brown and pale olive; becomes olive mottled red speckled dark olive	2.5	14.0
	Clay, silty, with rounded to well rounded flint throughout and concentrated at base, pale olive mottled olive brown and red	1.9	15.9
	Silt with well rounded pebbles of flint, pale grey	0.5	16.4
Upper Chalk	Chalk, soft, puggy, creamy white	1.0+	17.4

TL 52 NW 76	5051 2577	Bentfield Green, Stansted Mountfitchet	Block A
Surface level +101.9 m			Overburden 3.6 m
Water struck at +98.3 m			Mineral 1.7 m
October 1980			Bedrock 1.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil and subsoil	0.5	0.5
Boulder Clay	Clay, silty, with pellets and pebbles of chalk and some flint, pale yellowish brown	3.1	3.6
?Red Crag	Pebbly sand, with some clay pellets Gravel: coarse and fine, well rounded flint; with some angular flint, rounded rotted phosphatic nodules and rounded quartz; and a trace of quartzite, chalk, ironstone and sandstone Sand: medium with fine and some coarse, subangular to subrounded quartz and some angular flint, yellowish brown	1.7	5.3
?London Clay	Clay, silty, laminated in parts, yellowish brown	0.8	6.1
Woolwich and Reading Beds	Clay, silty, dark yellowish brown becoming dark greyish brown mottled blue-grey and red	0.9+	7.0

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand		Gravel		
				-½	+½ -¼	+¼ -1	+1 -4	+4 -16	+16 -64	+64 mm
6	77	17	3.6-4.6*	8	11	55	11	7	8	0
			4.6-5.3*	4	30	40	6	10	10	0
			Mean	6	19	49	9	8	9	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
3.6-5.3	16	58	8	1	1	1	0	0	14	1	0

TL 52 NW 77	5138 2979	Quendon Wood, Quendon and Rickling	Block A
Surface level +93.5 m			Overburden 1.6 m
Water not struck			Mineral 16.4 m
November 1980			Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil and organic litter	0.3	0.3
	Clay, silty, very sandy, with some angular flint, dark yellowish brown	0.5	0.8
	Clay, sandy, with pebbles of flint and some quartz, stiff, yellowish brown	0.8	1.6
Kesgrave Sands and Gravels	a Sand, with waxy pinkish brown clay seams from 4.0 m to 6.0 m and a trace of very fine well rounded and angular flint pebbles Sand: medium with some fine and a trace of coarse becoming fine with a trace of medium and coarse, predominantly subangular to subrounded quartz and a trace of mica and opaques, yellowish brown	12.0	13.6
?Red Crag	b Sandy gravel, 'clayey' in bottommost 0.4 m Gravel: coarse and fine with a trace of cobble grade, well rounded flint; with angular flint and some quartz, with a trace of quartzite and sandstone Sand: medium and fine with some coarse, subangular to subrounded quartz with some angular flint, dark yellowish brown	4.4	18.0
Woolwich and Reading Beds	Clay, very sandy, silty, stiff, waxy, with flint pebbles, brown becoming greenish black in basal 2 cms	0.5	18.5
Upper Chalk	Chalk angular fragments set in a puggy matrix, soft white	0.5+	19.0

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines				Gravel		
					- $\frac{1}{16}$	$+\frac{1}{16} - \frac{1}{4}$	$+\frac{1}{4} - 1$	+1 -4	+4 -16	+16 -64	+64 mm
a	8	91	1	1.6-2.6	6	16	75	2	1	0	0
				2.6-3.6	7	16	75	1	1	0	0
				3.6-4.6	5	8	84	3	trace	0	0
				4.6-5.6	20	12	66	1	1	0	0
				5.6-6.6	8	11	77	3	1	0	0
				6.6-7.6	6	16	72	4	2	trace	0
				7.6-8.6	4	16	78	1	1	0	0
				8.6-9.6	6	15	74	5	trace	0	0
				9.6-10.6	6	25	59	5	3	2	0
				10.6-11.6	6	65	26	2	trace	1	0
				11.6-12.6	5	91	3	1	0	0	0
				12.6-13.6	15	77	5	1	2	trace	0
				Mean	8	31	58	2	1	trace	0
b	8	68	24	13.6-14.6	5	12	43	13	13	14	0
				14.6-15.6	8	20	30	10	15	15	2
				15.6-16.6	9	39	39	4	3	6	0
				16.6-17.6	6	23	38	11	13	9	0
				17.6-18.0	17	14	26	7	12	24	0
				Mean	8	23	36	9	11	12	1
a+b	8	85	7	Mean	8	29	52	4	4	3	trace

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	1.6-13.6	Very small sample										
b	13.6-18.0	30	63	6	1	trace	0	0	0	0	0	trace

Surface level +97.0 m
Water not struck
October 1980

Overburden 1.0 m
Mineral 7.5 m
Waste 0.5 m
Mineral 2.8 m
Bedrock 9.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
	Clay, silty, with some angular flint pebbles, stiff, dark yellowish brown	0.7	1.0
Glacial Sand and Gravel	a 'Clayey' gravel, becomes 'clayey' pebbly sand at base chalky from 2.8 m with thin medium sand seams throughout Gravel: coarse with fine and some cobble grade, angular flint; with rounded chalk and limestone with some well rounded flint, sandstone, quartz, quartzite, ironstone, fossil debris and phosphatic nodules; and a trace of igneous and metamorphic Sand: medium with coarse and fine, predominantly angular flint and subangular quartz with some chalk, dark yellowish brown	7.5	8.5
	Clay, silty, fine sandy, waxy in parts, yellowish brown grades into 'clayey' sand	0.5	9.0
Kesgrave Sands and Gravels	b 'Very clayey' sand, fines predominantly of silt grade Sand: fine with a trace of medium, predominantly subangular quartz	1.8	10.8
?Red Crag	c 'Clayey' pebbly sand Gravel: fine and coarse, well rounded with angular flint; with some quartz and quartzite and a trace of sandstone and phosphatic nodules Sand: medium with coarse and fine, predominantly rounded quartz with some angular flint and quartz, dark yellowish brown	1.0	11.8
Woolwich and Reading Beds	Clay, stiff to hard, waxy, strong brown streaked dark reddish brown and greyish green	1.8	13.6
	d 'Clayey' sand becomes pebbly towards base and 'very clayey' Gravel: fine with coarse in lowermost 1.6 m, well rounded flint and subrounded ironstone with some angular flint Sand: fine and medium with some coarse at base, predominantly angular quartz and some ironstone, pale yellowish brown becoming lilac brown	4.4	18.0
	Clay, silty, sandy, with seams of ironstone, dark dusky red mottled ochre brown	0.3	18.3
	Clay, silty, fine sandy, laminated at base, stiff; dark olive green mottled red and orange	0.5	18.8
	Clay, silty, fine sandy, firm, waxy, pale green speckled dark green	0.6	19.4
	Clay, very sandy, silty, soft, pale green mottled dark green, red and orange brown	0.3	19.7
	Clay, silty, with well rounded flints at base, pale green and white mottled ochre brown and red	0.3	20.0
	Clay, silty, sandy, rounded flint pebbles in basal 20 cm, dark olive green mottled pale green, dusky red and ochre brown	0.8	20.8

?Bullhead Bed	Clay, silty, sandy, with many angular and nodular flint pebbles and cobbles at base, dark olive green mottled pale green	0.2	21.0
Upper Chalk	Chalk angular fragments in a puggy soft matrix with some angular bluish black flint pebbles, creamy white	0.4+	21.4

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines			Gravel			
					- $\frac{1}{8}$	+- $\frac{1}{8}$ - $\frac{1}{4}$	+- $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
a	16	32	52	1.0-2.0	17	6	11	8	16	29	13
				2.0-3.0	21	7	28	5	11	22	6
				3.0-4.0	12	4	15	7	16	33	13
				4.0-5.0	13	6	11	9	19	36	6
				5.0-6.0	17	6	10	8	20	31	8
				6.0-7.0	16	7	9	11	24	30	3
				7.0-7.8	18	7	10	11	24	28	2
				7.8-8.5	10	12	54	11	11	2	0
				Mean	16	6	17	9	18	27	7
b	40	60	0	9.0-10.8	40	59	1	0	0	0	0
c	11	70	19	10.8-11.8	11	7	50	13	11	8	0
b+c	30	63	7	Mean	30	40	18	5	4	3	0
d	18	79	3	13.6-14.6	18	46	36	0	0	0	0
				14.6-15.6	11	57	31	1	0	0	0
				15.6-16.4	11	60	29	0	0	0	0
				16.4-17.4	22	31	33	5	6	3	0
				17.4-18.0	34	30	18	9	7	2	0
				Mean	18	46	31	2	2	1	0

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	1.0-8.5	57	4	2	2	3	15	10	2	2	2	1
b	9.0-10.8	No +8 mm material										
c	10.8-11.8	31	61	6	2	trace	0	0	0	trace	0	0
d	13.6-18.0	Very small sample										

Surface level +93.2 m
 Water struck at +85.5 m
 October 1980

Overburden 0.8 m
 Mineral 6.9 m
 Bedrock 2.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
	Clay, silty, sandy, with pebbles of angular flint, firm, strong brown	0.5	0.8
Glacial Sand and Gravel	'Clayey' gravel Gravel: coarse with fine and some cobble grade, angular flint; with some quartz, well rounded flint, ironstone, sandstone and quartzite, and a trace of phosphatic nodules, igneous, metamorphic and fossil debris Sand: medium and coarse with fine, angular flint with some angular quartz, strong brown becoming yellowish brown	6.9	7.7
Woolwich and Reading Beds	Clay, very sandy, silty, with some pebbles of ironstone, dark reddish brown mottled yellowish brown and dusky red	0.2	7.9
	Clay, very sandy, silty, stiff white waxy clay packed with well rounded flint pebbles in basal 2 cms, pale emerald green mottled very pale green	1.1	9.0
Thanet Beds	Sand, fine, very clayey and silty, laminated olive green	0.8	9.8
Bullhead Bed	Sand, with black and green coated angular and nodular flints, dark olive green	0.2	10.0
Upper Chalk	Chalk, angular fragments set in a soft puggy matrix, white	0.5+	10.5

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
18	29	53	0.8-1.8	20	4	8	12	18	33	5
			1.8-2.8	19	4	12	10	16	30	9
			2.8-3.8	20	5	16	9	20	26	4
			3.8-5.8	11	5	12	9	19	38	6
			5.8-6.8*	22	8	13	13	19	22	3
			6.8-7.7*	20	15	16	9	22	18	0
			Mean	18	6	13	10	19	29	5

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint	Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others	
	Ang.	W	R								
0.8-7.7	78	5	5	3	4	0	0	trace	trace	4	1

Surface level +90.4 m
 Water not struck
 November 1980

Overburden 0.3 m
 Mineral 14.1 m
 Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Glacial Sand and Gravel	'Clayey' gravel, 'very clayey', sand seam between 7.6 m and 8.4 m, becomes coarser with depth Gravel: fine and coarse with some cobble grade below 9.4 m, angular flint with chalk below 8.4 m, with some well rounded flint, sandstone, quartz, phosphatic nodules and quartzite; and a trace of limestone, igneous, metamorphic, ironstone and fossil debris Sand: medium with coarse and fine, predominantly predominantly subangular quartz and flint with chalk below 8.4 m dark brown becoming pale yellowish brown	14.1	14.4
Upper Chalk	Chalk, fragments of chalk in a soft puggy matrix, white	0.6+	15.0

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines			Sand		Gravel	
				- $\frac{1}{16}$	$+\frac{1}{16}$ - $\frac{1}{4}$	$+\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
16	41	43	0.3-1.3	18	5	31	8	19	19	0
			1.3-2.3	13	7	22	12	21	24	1
			2.3-3.3	13	6	19	13	23	26	0
			3.3-4.3	17	7	24	13	23	16	0
			4.3-5.3	12	6	24	12	28	18	0
			5.3-6.3	18	10	36	8	15	13	0
			6.3-7.3	18	9	23	12	23	15	0
			7.3-7.6	19	9	23	8	16	25	0
			7.6-8.4	36	43	18	2	1	0	0
			8.4-9.4	16	12	20	11	22	19	0
			9.4-10.4	16	6	9	12	27	26	4
			10.4-11.4	16	5	16	14	27	20	2
			11.4-12.4	12	5	14	14	26	28	1
			12.4-14.4	11	6	15	9	25	28	6
			Mean	16	9	21	11	22	20	1

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint	Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others	
	Ang.	W	R								
0.3-14.4	69	6	3	2	3	12	1	trace	2	1	1

Surface level +90.8 m
Water struck at +89.0 m
October 1980

Overburden 1.2 m
Mineral 2.9 m
Bedrock 2.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.4	0.4
Boulder Clay	Clay, silty with some angular flint pebbles, faintly laminated in parts, stiff, waxy, yellowish brown becoming pale grey	0.8	1.2
Glacial Sand and Gravel	'Clayey' gravel, 'very clayey' in uppermost 0.6 m Gravel: coarse and fine, angular flint with well-rounded flint, with some quartz, sandstone and quartzite and a trace of igneous, metamorphic phosphatic nodules ironstone and limestone Sand: medium with coarse and some fine, angular to subangular flint and quartz, yellowish brown	2.9	4.1
Woolwich and Reading Beds	Sand, fine, very silty and clayey, glauconitic light olive speckled olive and brown	0.3	4.4
	Sand, fine, very silty and clayey, glauconitic, with some rounded black flint pebbles, light olive speckled olive and yellow brown	1.1	5.5
Bullhead Bed	Sand, fine, silty, olive green, with a nodular flint cobble at base	1.0	6.5
Upper Chalk	Chalk, soft, puggy, white	0.2+	6.7

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
10	45	45	1.2-1.8	23	6	27	11	16	17	0
			1.8-2.8*	6	6	32	13	15	28	0
			2.8-4.1*	8	5	23	11	26	27	0
			Mean	10	6	27	12	20	25	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
1.2-4.1	69	16	5	3	4	0	trace	trace	1	1	1

Surface level +88.4 m
 Water not struck
 October 1980

Overburden 0.3 m
 Mineral 3.1 m
 Waste 1.6 m
 Mineral 5.5 m
 Waste 1.1 m
 Mineral 1.7 m
 Waste 0.2 m
 Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Glacial Sand and Gravel	a 'Very clayey' sandy gravel Gravel: fine with coarse, angular flint, with some sandstone, well rounded flint, quartzite and quartz; with a trace of fossil debris, igneous and metamorphic rocks, ironstone and limestone Sand: medium with fine and coarse, angular flint with angular quartz, reddish brown	3.1	3.4
Boulder Clay	Clay, silty with pellets and pebbles of chalk and some flint, yellowish brown	1.6	5.0
Glacial Sand and Gravel	b 'Very clayey' pebbly sand, with thin laminated silt and sand seams between 5.4 m to 5.6 m and 9.0 m to 9.4 m Gravel: fine with coarse, rounded chalk with angular flint; with some well rounded flint, sandstone, limestone, quartzite and quartz; and a trace of ironstone, phosphatic nodules, fossil debris, igneous and metamorphic Sand: medium with fine and coarse, subrounded quartz and chalk with angular flint, yellowish brown	5.5	10.5
	Clay, silty, becomes sandy, laminated, stiff, waxy, some chalk and flint pebbles, pale yellowish brown	1.1	11.6
	c 'Very clayey' sandy gravel, with some clay pellets Gravel: fine with some coarse, well rounded chalk and angular flint; with well rounded flint; with some limestone and quartz and a trace of sandstone quartzite, igneous, metamorphic, ironstone and phosphatic nodules Sand: medium with coarse and fine, angular flint and quartz with chalk, yellowish brown	1.7	13.3
	Silt, clayey, laminated with some chalk pellets, pale brown	0.2	13.5
Upper Chalk	Chalk, puggy, soft, yellowish brown becoming white	0.8+	14.3

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines			Gravel			
					- $\frac{1}{8}$	+ $\frac{1}{8}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1-4	+4-16	+16-64	+64 mm
a	20	43	37	0.3-1.3	26	10	22	11	21	10	0
				1.3-2.3	16	6	20	14	29	15	0
				2.3-3.4	17	8	28	12	21	14	0
				Mean	20	8	23	12	24	13	0
b	21	62	17	5.0-5.4	17	9	32	11	16	15	0
				5.6-6.6	23	7	39	11	15	5	0
				6.6-7.6	14	5	33	14	22	12	0
				7.6-8.6	19	18	40	12	10	1	0
				8.6-9.0	20	29	27	14	8	2	0
				9.4-10.5	28	35	29	5	3	0	0
				Mean	21	17	34	11	12	5	0
c	24	49	27	11.6-12.6	25	11	26	15	20	3	0
				12.6-13.3	22	8	21	16	27	6	0
				Mean	24	10	24	15	23	4	0

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	0.3-3.4	87	3	2	3	4	0	trace	trace	0	trace	1
b	5.0-10.5	28	5	2	2	5	54	3	trace	trace	1	trace
c	11.6-13.3	40	9	3	1	1	42	4	0	trace	trace	trace

TL 52 NW 83

5195 2522

Near Gall End, Stansted Mountfitchet

Block B

Surface level +86.9 m
Water not struck
October 1980

Waste 0.8 m
Bedrock 6.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
Glacial Sand and Gravel	'Very clayey' gravel, coarse and fine pebbles of flint angular and some rounded, sand medium and coarse with some fine angular flint and quartz, yellowish brown	0.6	0.8
Lower London Tertiaries	Clay, stiff to hard, waxy, dark yellowish brown to yellowish brown mottled grey and from 3.0 m red	5.6	6.4
	Silt, fine sandy, clayey, soft, greyish yellow-brown with a faint lilac tinge	0.4	6.8
	Clay, silty, with race nodules, red to dusky red mottled very dark red, olive and olive brown	0.4+	7.2

Surface level +77.5 m
 Water struck at +66.0 m
 October 1980

Overburden 0.4 m
 Mineral 1.2 m
 Waste 20.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.4	0.4
Glacial Sand and Gravel	a 'Very clayey' gravel Gravel: fine with coarse, angular flint, with some rounded quartz well rounded flint, quartzite igneous, metamorphic and sandstone; and a trace of ironstone Sand: medium and fine with coarse, predominantly subrounded to subangular quartz with some flint, dark yellowish brown	1.2	1.6
Boulder Clay	Clay, silty, fine sandy, with pellets and pebbles of chalk and some flint, yellowish brown mottled grey	2.4	4.0
	Clay, silty, fine sandy with pellets and pebbles of chalk, and some flint and black paper shale, dark grey	1.0	5.0
	Clay, silty with pellets and pebbles of chalk, with some flint and black paper shale, bluish grey	1.9	6.9
	Clayey silt, with some fine sand, and a trace of chalk pellets, dark bluish grey	0.4	7.3
	Clay, silty, stiff, waxy, dark yellowish brown	0.1	7.4
Glacial Sand and Gravel	b Very sandy and pebbly, silty clay, with seams of silt throughout Gravel: a trace of fine angular flint pebbles Sand: fine and medium with a trace of coarse, angular to subangular quartz, with some angular chalk and flint, yellowish brown	1.0	8.4
Glacial Silt	Interlaminated silt and fine sand, silt seams predominate, soft, greyish brown and pale yellowish brown	3.1	11.5
Glacial Sand and Gravel	c Sandy gravel, 'clayey' in uppermost 1.0 m Gravel: fine and coarse, rounded chalk and angular flint; with some subangular sandstone, limestone and quartz and a trace of fossil debris, well rounded flint, quartzite, igneous, metamorphic and ironstone Sand: medium with fine and coarse, angular quartz, flint, and chalk, yellowish brown	2.5	14.0
Glacial Silt	Silt, clayey, with some fine sand laminae, laminated and stiff in parts, brown between 16.0 m and 17.0 m, pale blue grey and grey	8.0+	22.0

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines	Sand			Gravel		
						-1/8	+1/8 - 1/4	+1/4 - 1	+1 - 4	+4 - 16	+16 - 64
a	31	34	35	0.4-1.6	31	11	15	8	23	12	0
b	48	50	2	7.4-8.4	48	24	24	2	2	0	0
c	7	48	45	11.5-12.5*	11	12	20	11	30	16	0
				12.5-13.5*	4	12	28	10	20	26	0
				13.5-14.0*	4	11	32	13	23	17	0
				Mean	7	12	25	11	25	20	0

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	0.4-1.6	75	7	8	3	3	0	0	0	0	1	3
b	7.4-8.4	Small sample all angular flint										
c	11.5-14.0	37	1	2	1	7	46	3	2	0	trace	1

TL 52 NW 85 5217 2858 The Hall, Ugley Block B

Surface level +99.3 m Waste 11.9 m
 Water struck at +90.8 m Bedrock 0.6 m+
 October 1980

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, with pebbles of angular flint, pale yellowish brown	0.4	0.7
	Clay, silty, with pellets and pebbles of chalk and some angular flint, pale grey mottled yellowish brown	2.8	3.5
	Clay, silty, with pellets and pebbles of chalk with some angular flint, dark grey with ochre brown fissures	0.9	4.4
	Clay, silty with pellets and pebbles of chalk and some angular flint and black paper shale, stiff, dark grey	4.1	8.5
	Clay, silty, sandy, with pebbles of flint and some chalk and some chalk, soft, dark brown	0.1	8.6
Glacial Sand and Gravel	Gravel, with a thin brown chalky clay seam at 8.8 m 'clayey' in uppermost 1.0 m Gravel: fine and coarse with a trace of cobble grade, rounded chalk with angular flint, with some rounded quartz and well rounded flint, with a trace of sandstone, ironstone, limestone quartzite, fossil debris, igneous and metamorphic Sand: medium with coarse and some fine predominantly angular flint with some chalk and quartz, pale yellowish brown	2.2	10.8
Boulder Clay	Clay, silty, with pellets and pebbles of chalk with some flints, firm, dark brown becoming greyish brown	0.7	11.5
Glacial Sand and Gravel	'Very clayey' gravel, with chalk and some flint fine pebbles, and angular flint and chalk sand, yellowish brown	0.4	11.9
Woolwich and Reading Beds	Clay, with race nodules, stiff, waxy, orange mottled pale green	0.6+	12.5

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand			Gravel	
				-16	+16 -4	+4 -1	+1 -4	+4 -16	+16 -64	+64 mm
9	34	57	8.6-9.6*	14	5	14	11	27	28	1
			9.6-10.8*	5	7	21	10	28	29	0
			Mean	9	6	18	10	28	29	trace

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
8.6-10.8	22	8	8	2	5	48	2	2	0	2	1

TL 52 NW 86 5241 2768 Fieldgate, Ugley Block A

Surface level +99.6 m
 Water struck at +95.6 m
 October 1980

Overburden 1.7 m
 Mineral 3.9 m
 Bedrock 1.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.1	0.1
Boulder Clay	Clay, silty, with some chalk and flint pebbles, yellowish brown	1.1	1.2
	Clay, silty, with pellets and pebbles of chalk and flint, yellowish grey becoming greyish brown	0.5	1.7
Kesgrave Sands and Gravels	a 'Clayey' sand with discrete clay pellets and laminae Gravel: a trace of fine and coarse, angular flint with well rounded flint and quartz; with some quartzite and ironstone; and a trace of sandstone Sand: fine and medium with a trace of coarse, predominantly subrounded to subangular quartz, yellowish grey to orange brown	2.3	4.0
?Red Crag	b Sandy gravel with some clay pellets Gravel: coarse and fine, well rounded flint; with angular flint and tabular ironstone; with some quartz and a trace of quartzite Sand: medium with fine and some coarse, predominantly subangular quartz, yellowish brown	1.6	5.6
London Clay	Clay, silty, fine sandy, micaceous, faintly laminated dark yellowish brown and strong brown	1.3+	6.9

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines		Sand			Gravel	
					- $\frac{1}{16}$	$+\frac{1}{16}$ - $\frac{1}{4}$	$+\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
a	15	82	3	1.7-2.8	13	42	38	3	2	2	0
				2.8-4.0	17	33	44	5	1	0	0
				Mean	15	37	41	4	2	1	0
b	5	64	31	4.0-5.0	7	24	29	10	15	15	0
				5.0-5.6	2	17	37	13	14	17	0
				Mean	5	21	32	11	15	16	0
a+b	11	75	14	Mean	11	30	38	7	7	7	0

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	1.7-4.0	Small sample										
b	4.0-5.6	17	59	6	1	0	0	0	0	0	17	0

TL 52 NW 87 5269 2629 **Alsa Wood, Stansted Mountfitchet**

Block A

Surface level +101.7 m
Water struck at +93.8 m
October 1980

Overburden 7.9 m
Mineral 4.1 m
Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, fine sandy, with pellets and pebbles of chalk and flint with some quartz, soft, yellowish brown	2.6	2.9
	Clay, silty, with chalk and flint pebbles and cobbles, firm, pale grey	5.0	7.9
?Red Crag	Pebbly sand, 'clayey' in uppermost 1.7 m becomes a sandy gravel with depth Gravel: fine and coarse, well rounded with angular flint, with some rotted phosphatic nodules at base, rounded quartz and tabular ironstone, and a trace of sandstone, quartzite, igneous and metamorphic Sand: medium with fine and coarse, predominantly subrounded to subangular quartz, yellowish brown	4.1	12.0
London Clay	Clay, silty, sandy, micaceous, faintly laminated, dark yellowish brown	0.5	12.5
	Clay, silty, sandy, soft, micaceous, bluish grey	0.5+	13.0

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand			Gravel	
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
8	76	16	7.9-8.6*	16	24	39	7	11	3	0
			8.6-9.6*	10	27	41	12	6	4	0
			9.6-10.6*	2	23	50	16	4	5	0
			10.6-12.0*	6	9	43	15	14	13	0
			Mean	8	19	44	13	9	7	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartzite	Sandstone	Chalk	Limestone	Fossil debris	Phosph. nodules	Ironstone	Others
	Ang.	W R									
7.9-12.0	20	62	4	1	1	0	0	0	9	3	trace

TL 52 NW 88 5219 2611 Norman House, Stansted Mountfitchet Block A

Surface level +98.0 m Overburden 0.9 m
 Water struck at +94.6 m Mineral 3.9 m
 October 1980 Bedrock 1.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.4	0.4
	Clay, silty, sandy, dark greyish brown	0.5	0.9
?Red Crag	Pebbly sand becomes sandy gravel in basal 1.4 m, some thin clay seams throughout Gravel: fine and coarse with a trace of cobble grade, well rounded with angular flint; with some rotted phosphatic nodules at base and rounded quartz and a trace of igneous, metamorphic, ironstone, sandstone and quartzite Sand: medium with fine and coarse, subrounded to subangular quartz with some flint and mica, yellow brown	3.9	4.8
London Clay	Silt, clayey, fine sandy, dark yellowish brown and greyish brown	0.2	5.0
	Clay, very fine sandy and silty, bluish grey	1.0+	6.0

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand			Gravel	
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
6	79	15	0.9-1.9	6	13	68	6	4	3	0
			1.9-2.9	8	16	61	9	3	1	2
			2.9-3.4	9	18	63	6	3	1	0
			3.4-4.8*	4	13	37	16	17	13	0
			Mean	6	14	55	10	8	6	1

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
0.9-4.8	23	66	3	trace	1	0	0	0	5	1	1

TL 52 NW 89 5334 2971 Brayshot, Henham Block B

Surface level +98.8 m Waste 13.5 m
 Water not struck Bedrock 6.5 m+
 October 1980

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.4	0.4
Boulder Clay	Clay, silty, with angular flint pebbles, stiff brown	0.4	0.8
	Clay, silty, sandy, with pellets and pebbles of chalk and some flint, soft, yellowish brown	3.0	3.8
	Clay, very sandy, silty, with pebbles of chalk and flint, soft, dark yellowish brown	1.2	5.0
	Clay, silty with pellets and pebbles of chalk with some flint, firm, pale yellowish brown. Very sharp junction at base	0.8	5.8
	Clay, silty, with pellets and pebbles of chalk and flint, with a trace of black paper shale, sandstone, fossil debris and quartz, firm to stiff, grey becoming very dark grey with ochreous fissures	0.6	6.4
	Clay, silty, with pebbles and pellets of chalk and some flint, with a trace of quartz, fossil debris, black paper shale and sandstone, firm to stiff with soft very silty seams, pale grey becoming dark grey. Thin grey pebbly sand at base	7.1	13.5
Lower London Tertiaries	Clay, stiff to hard, waxy, dark brown streaked dark yellowish brown and pale grey	1.1	14.6
	Silt, fine sandy, clayey, soft friable, dusky red	0.5	15.1
	Sand, fine, very silty, quartz, pale reddish brown	0.4	15.5
	Clay, very sandy, silty dark reddish brown mottled strong brown and red	1.2	16.7
	Clay, silty, very sandy, moderate yellowish green mottled and speckled very dark grey and dusky red	0.7	17.4
	Sand, fine, silty, very clayey, pale green mottled and speckled moderate yellow green and dark olive green	0.9	18.3
	Sand, fine, clayey, firm, pale green	1.4	19.7
	Sand, fine, clayey, with black nodular flints, pale green with ochreous patches	0.1	19.8
Upper Chalk	Chalk, angular fragments set in puggy matrix with black patinated flints, creamy white	0.2+	20.0

Surface level +91.6 m
 Water not struck
 October 1980

Overburden 3.9 m
 Mineral 1.6 m
 Waste 13.2 m
 Bedrock 2.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.4	0.4
Boulder Clay	Clay, silty, sandy, with pebbles of angular flint with some quartz, very stiff to hard, strong brown	3.1	3.5
	Clay, very sandy, silty, with ironstone pan fragments and a trace of flint, brown	0.4	3.9
Glacial Sand and Gravel	'Very clayey' sandy gravel, very sandy at top Gravel: fine with coarse, angular flint with subangular sandstone and some ironstone, quartzite, quartz and a trace of chalk Sand: fine with medium and some coarse, angular quartz and some flint, yellowish brown	1.6	5.5
Boulder Clay	Clay, silty, sandy at top, with pellets and pebbles of chalk and some flint, pale yellowish brown	1.7	7.2
	Clay, silty, very silty in parts, with pebbles and pellets of chalk and some angular flint, grey becoming dark grey	11.2	18.4
	Clay, silty to very silty, with pebbles and pellets of chalk, dark yellowish brown	0.3	18.7
Upper Chalk	Chalk, angular fragments in white puggy matrix, some bluish black flints	2.4+	21.1

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				-16	+16 -4	+4 -1	+1 -4	+4 -16	+16 -64	+64 mm
37	43	20	3.9-5.5	37	22	14	7	14	6	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
3.9-5.5	71	0	2	3	18	1	0	0	0	5	0

TL 52 NW 91 5301 2839 Hazelmoor Common, Henham

Block B

Surface level +90.0 m
Water not struck
October 1980

Waste 25.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, with angular flint pebbles, yellowish brown	0.2	0.5
	Clay, silty, sandy, with pellets and pebbles of chalk and some angular flint, firm, dark yellowish brown	4.0	4.5
	Clay, silty, fine sandy, with pellets and pebbles of chalk and some angular flint, stiff, greyish brown	1.2	5.7
	Clay, silty, fine sandy, with pebbles and pellets of chalk with some flint and a trace of black paper shale, stiff, grey becoming dark grey	12.4	18.1
	Clay, silty, with chalk pellets and pebbles of chalk and some angular flint and black paper shale, stiff, waxy, dark yellowish brown	0.2	18.3
	Clay, silty, with pellets and pebbles of chalk and some black paper shale and flint, with a trace of limestone and greensand, firm, soft in places, pale grey	6.7+	25.0

TL 52 NW 92 5368 2788 Near Old Mead, Henham

Block A

Surface level +92.3 m
Water struck at +91.2 m
October 1980

Waste 3.2 m
Bedrock 1.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
Head	Clay, very sandy, silty, sand medium to fine with a trace of coarse, subangular quartz, soft, brown	0.8	1.0
	Sand, very silty, clayey with pebbles of angular flint, very soft, yellow brown	0.8	1.8
	Clay, very silty and sandy, with traced of organic debris, micaceous, very soft, orange brown streaked grey	1.4	3.2
London Clay	Clay, very silty and sandy, micaceous, very soft, dark brown with some mottles of orange and dark red	0.9	4.1
	Silt, very fine sandy, clayey, micaceous, pyriteous, with pockets of dark olive green sand, very soft, dark grey	0.6+	4.7

Surface level +98.3 m
 Water struck at +94.5 m
 October 1980

Overburden 0.6 m
 Mineral 8.4 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.6	0.6
Kesgrave Sands and Gravels	a Sand with some discrete clay seams throughout Gravel: a trace of fine, angular with well rounded flint, with some quartz and a trace of quartzite and sandstone Sand: medium with some fine and a trace of coarse subangular to subrounded quartz, and some mica, pale yellowish brown	4.0	4.6
?Red Crag	b Pebbly sand Gravel: coarse and fine, well rounded with angular flint, with some quartz, ironstone and quartzite, and a trace of sandstone Sand: medium with fine and coarse subangular to subrounded quartz and some mica and ironstone, orange brown	4.4	9.0
London Clay	Clay, silty, fine sandy, dark grey	1.0+	10.0

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines		Sand			Gravel	
					-16	+16 -1/4	+1/4 -1	+1 -4	+4 -16	+16 -64	+64 mm
a	5	94	1	0.6-1.6	6	16	72	4	2	0	0
				1.6-2.6	7	13	76	2	2	0	0
				2.6-3.6	0	25	73	1	1	0	0
				3.6-4.6*	6	28	63	3	trace	0	0
				Mean	5	20	71	3	1	0	0
b	4	86	10	4.6-5.6*	4	28	50	12	3	3	0
				5.6-6.7*	6	15	61	11	3	4	0
				6.7-7.7*	3	22	33	15	8	19	0
				7.7-8.7*	4	10	58	26	1	1	0
				8.7-9.0*	5	7	54	31	1	2	0
				Mean	4	18	51	17	4	6	0
a+b	5	90	5	Mean	5	19	61	10	2	3	0

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	0.6-4.6	58	30	10	1	1	0	0	0	0	0	0
b	4.6-9.0	26	64	5	2	1	0	0	0	0	2	0

Surface level +94.8 m
 Water struck at +92.1 m
 October 1980

Overburden 0.9 m
 Mineral 5.8 m
 Bedrock 1.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil and subsoil	0.9	0.9
Kesgrave Sands and Gravels	a Sand, with a trace of fine gravel in uppermost 1.8 m, discrete clay laminae in parts Gravel: a trace of fine, angular and well rounded flint and phosphatic nodules, with some quartz Sand: medium and fine with a trace of coarse becoming fine with a trace of medium and coarse, subrounded to subangular quartz, with a trace of flint and mica, yellowish brown	4.8	5.7
?Red Crag	b Pebbly sand Gravel: fine and coarse, well rounded with angular flint, with some well rounded quartz and rotted phosphatic nodules and tabular ironstone; and a trace of sandstone, quartzite, igneous and metamorphic Sand: fine and medium with coarse, subrounded to subangular quartz, with some flint and ironstone and a trace of mica, dark yellowish brown	1.0	6.7
London Clay	Clay, silty, faintly laminated, brown	0.5	7.2
	Clay, silty, fine sandy, very dark grey	0.8+	8.0

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines	Sand			Gravel		
						- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64
a	9	91	0	0.9-1.9	7	41	49	2	1	0	0
				1.9-2.7	13	72	13	1	1	0	0
				2.7-3.7*	13	82	4	1	0	0	0
				3.7-4.7*	8	89	2	1	0	0	0
				4.7-5.7*	4	93	2	1	0	0	0
				Mean	9	76	14	1	trace	0	0
b	5	76	19	5.7-6.7*	5	35	26	15	10	9	0
a+b	8	89	3	Mean	8	69	16	4	2	1	0

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	0.9-5.7	Small sample										
b	5.7-6.7	20	60	7	1	1	0	0	0	7	3	1

Surface level +96.8 m
 Water struck at +91.8 m
 November 1980

Overburden 0.3 m
 Mineral 7.7 m
 Bedrock 1.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Kesgrave Sands and Gravels	a 'Clayey' sand, with a trace of pebbles Gravel: fine and coarse, well rounded and angular flint, with rounded quartz, with some sandstone; and a trace of quartzite and at top derived chalk pellets Sand: medium with fine and a trace of coarse becoming fine with medium and some coarse, subangular to subrounded quartz with a trace of angular flint and opaques, yellowish brown becoming orange brown	6.7	7.0
?Red Crag	b Pebbly sand Gravel: coarse and fine, well rounded with angular flint, with some rounded quartz and phosphatic nodules, and a trace of sandstone quartzite, igneous, metamorphic and ironstone Sand: medium with coarse and fine, predominantly subrounded with some subangular quartz, and some angular flint and a trace of ironstone, orange brown	1.0	8.0
London Clay	Clay, silty, fine sandy, stiff, ochreous brown	0.3	8.3
	Clay, silty, stiff, waxy, with mica flakes and pyrite nodules, dark grey mottled brown becoming dark grey	0.9+	9.2

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages							
	Fines	Sand	Gravel			Fines			Gravel			
						-16	+16 - 4	+4 - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
a	10	87	3	0.3-1.3	19	16	57	4	3	1	0	
				1.3-2.3	9	11	74	5	1	0	0	
				2.3-3.3	16	20	60	3	1	0	0	
				3.3-4.3	8	39	48	4	1	0	0	
				4.3-5.0	11	43	44	1	1	0	0	
				5.0-6.0*	4	55	29	6	3	3	0	
				6.0-7.0*	6	46	36	10	1	1	0	
				Mean	10	32	50	5	2	1	0	
b	2	74	24	7.0-8.0*	2	19	33	22	9	15	0	
a+b	9	86	5	Mean	9	31	48	7	3	2	0	

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartzite	Sandstone	Chalk	Limestone	Fossil debris	Phosph. nodules	Ironstone	Others
		Ang.	W R									
a	0.3-7.0	42	43	12	trace	2	1	0	0	0	0	0
b	7.0-8.0	28	60	6	1	1	0	0	0	4	trace	trace

Surface level +114.4 m
 Water struck at +104.3 and +100.3 m
 October 1980

Waste 21.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.6	0.6
Boulder Clay	Clay, silty, with some angular flints, stiff, waxy, yellowish brown	1.7	2.3
	Clay, silty, with pellets and pebbles of chalk and some angular flint, stiff, waxy, becomes softer with depth, yellowish brown becoming brown	1.7	4.0
	Clay, very silty, with pellets and pebbles of chalk and some flint, yellowish brown	4.6	8.6
	Clay, very silty and sandy, with chalk and flint pebbles, dark yellowish brown	0.9	9.5
Glacial Sand and Gravel	a Clay, very pebbly and sandy, pebbles predominantly coarse with fine rounded chalk, with angular flint and subangular limestone; with some quartz and a trace of sandstone	1.0	10.5
	b Clayey gravel Gravel: fine and coarse, well rounded chalk with angular flint, with some limestone and sandstone, and a trace of fossil debris, quartzite, ironstone, igneous, metamorphic and phosphatic nodules Sand: coarse, medium and fine, angular flint and chalk with some subangular quartz, pale yellow	1.5	12.0
Boulder Clay	Clay, silty, sandy, with pellets and pebbles of chalk, firm, pale yellowish brown	0.3	12.3
	Clay, silty, with pellets and pebbles of chalk and some flint with black paper shale, stiff dark grey	1.8	14.1
Glacial Sand and Gravel	c Clay, extremely sandy with a trace of chalk and sandstone pebbles; sand fine with some medium and coarse angular flint and chalk, pale grey	0.9	15.0
Boulder Clay	Clay, silty, with pellets and pebbles of chalk and some flint stiff, brownish grey becoming grey and dark grey	5.0	20.0
	Clay, silty, with pellets and pebbles of chalk and a trace of flint, firm, brown	0.8	20.8
Kesgrave Sands and Gravel	d Sand with a trace of fine angular flint and rounded quartz pebbles Sand: medium with fine and a trace of coarse, subangular to subrounded quartz, pale yellow	0.5+	21.3

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages							
	Fines	Sand	Gravel									
					Fines		Sand			Gravel		
					- $\frac{1}{16}$		+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
a	43	23	34	9.5-10.5	43	10	5	8	13	21	0	
b	11	44	45	10.5-11.5*	9	7	8	18	29	29	0	
				11.5-12.0*	14	17	27	22	11	9	0	
				Mean	11	10	15	19	23	22	0	
c	48	49	3	14.1-15.0	48	31	9	9	3	0	0	
d	8	89	3	20.8-21.3	8	31	57	1	3	0	0	

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	9.5-10.5	28	0	5	0	1	52	14	0	0	0	0
b	10.5-12.0	21	0	0	1	5	65	7	1	trace	trace	trace
c	14.1-15.0	Small sample										
d	20.8-21.3	Small sample										

TL 52 NW 97 5452 2747 Mill Farm, Henham

Block A

Surface level +106.4 m
Water struck at +92.4 m
October 1980

Overburden 9.0 m
Mineral 10.5 m
Bedrock 1.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.6	0.6
	Made ground	0.5	1.1
Boulder Clay	Clay, silty, with chalk pellets and pebbles, yellowish brown	2.7	3.8
	Clay, silty, sandy, with pellets and pebbles of chalk and some flint, with thin sand seam at top, yellowish brown to brown	0.7	4.5
	Clay, silty, with pellets and pebbles of chalk, pale brown	4.5	9.0
Kesgrave Sands and Gravels	a Sand, with a trace of gravel, chalk contamination at top Gravel: a trace of fine and coarse, angular with well rounded flint; with some quartz, and a trace of sandstone, chalk, igneous, metamorphic and ironstone Sand: medium with fine and a trace of coarse subangular to subrounded quartz, with a trace of angular flint and mica, white to pale yellowish brown	8.0	17.0
?Red Crag	b Pebbly sand, with thin ironpan seams throughout Gravel: coarse with fine, well rounded with angular flint, with some tabular ironstone and quartz Sand: fine and medium with coarse, rounded to subrounded quartz with some flint and ironstone, orange brown	2.5	19.5
London Clay	Clay, silty, soft, dark grey	1.5+	21.0

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines	Sand			Gravel		
						- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64
a	4	94	2	9.0-10.0	4	21	72	1	1	1	0
				10.0-11.0	3	16	80	1	trace	0	0
				11.0-12.0	4	22	69	2	1	2	0
				12.0-13.0	5	27	63	2	1	2	0
				13.0-14.0	5	33	59	1	1	1	0
				14.0-15.0*	6	65	27	1	1	0	0
				15.0-16.0*	4	48	48	trace	trace	0	0
				16.0-17.0*	2	38	56	3	1	0	0
				Mean	4	34	59	1	1	1	0
b	3	89	8	17.0-18.0*	3	29	49	14	3	2	0
				18.0-19.0*	3	50	32	7	1	7	0
				19.0-19.5*	4	49	27	6	3	11	0
				Mean	3	41	38	10	2	6	0
a+b	4	93	3	Mean	4	36	54	3	1	2	0

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	9.0-17.0	56	34	9	0	1	trace	0	0	0	trace	trace
b	17.0-19.5	22	67	2	0	0	0	0	0	0	9	0

TL 52 NW 98 5470 2555 Gaunts End, Elsenham

Block A

Surface level +107.2 m
Water struck at +100.2 m and +93.9 m
November 1980

Overburden 13.3 m
Mineral 4.4 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil and made ground	0.4	0.4
Boulder Clay	Clay, silty, with some pockets of orange brown fine sand, pellets and pebbles of chalk and flint, pale yellowish brown becoming yellowish brown	4.7	5.1
	Silt, fine sandy, clayey, with some pebbles of chalk, soft, pale yellowish brown	0.9	6.0
	Fine sandy silt interlaminated with silty fine sand, soft, yellowish brown	1.0	7.0
	Clay, silty, with pellets and pebbles of chalk and some flint, soft, pale yellowish brown	0.5	7.5
	Clay, silty, with pellets and pebbles of chalk and some flint stiff, pale greyish brown becoming grey	5.7	13.2
	Clay, silty, with pellets and pebbles of chalk, pale greyish brown	0.1	13.3

Kesgrave Sands and Gravels	'Clayey' sand, becomes pebbly in basal 0.4 m. Basal 0.4 m pebble bed composed of well rounded flint and phosphatic nodules probably of Red Crag age, stiff waxy clay balls throughout Gravel: a trace of fine and coarse, angular and well rounded flint at base, with a trace of quartz, sandstone, limestone and ironstone Sand: medium with fine and some coarse, predominantly angular quartz with some angular flint, yellowish brown	4.4	17.7
London Clay	Clay, silty, fine sandy, micaceous, stiff, yellowish brown	0.1	17.8
	Clay, silty, fine sandy, micaceous, pyritous, stiff, dark grey	0.2+	18.0

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages							
Fines	Sand	Gravel		Fines				Gravel			
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm	
16	83	1	13.3-14.3*	17	20	59	3	1	0	0	
			14.3-15.3*	12	14	70	4	trace	0	0	
			15.3-16.3*	30	13	53	4	trace	0	0	
			16.3-17.3*	7	21	63	8	1	0	0	
			17.3-17.7*	14	21	54	6	2	3	0	
			Mean	16	17	61	5	1	trace	0	

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
13.3-17.3	49	37	3	0	0	0	3	0	0	8	0
17.3-17.7	0	50	0	0	2	0	0	0	47	1	0

The basal pebble bed is quoted separately since the true composition of the overlying sand is overwhelmed in mean calculations

TL 52 NE 12	5588 2914	Spring Gate, Chickney	Block A
Surface level +117.4 m			Overburden 4.2 m
Water struck at +111.6 m			Mineral 1.8 m
October 1980			Waste 16.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil and made ground	0.6	0.6
Boulder Clay	Clay, silty, with pebbles and pellets of chalk and some angular flints, firm, yellowish brown mottled grey	3.6	4.2
Glacial Sand and Gravel	a 'Very clayey' sandy gravel Gravel: fine with coarse; angular flint well rounded chalk and subangular sandstone; with some fossil debris and limestone; and a trace of quartz Sand: fine with medium and coarse; angular flint subangular quartz and subrounded chalk; with a trace of fossil debris, yellowish brown	1.8	6.0

Boulder Clay	Clay, silty, with pellets and pebbles of chalk, and some flint and black paper shale, dark greyish brown	1.0	7.0
	Clay, silty, with pellets and pebbles of chalk with some flint and black paper shale, becomes very chalky from 17.0 m, dark grey becomes brownish grey	15.3	22.3
	Clay, silty, packed with angular chalk fragments, dark yellowish brown	0.2	22.5
Kesgrave Sands and Gravels	b Sand Sand: medium with some fine, subrounded to subangular quartz with some opaques, yellow	0.3+	22.8

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages							
	Fines	Sand	Gravel		Fines			Sand		Gravel		
					- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm	
a	37	40	23	4.2-6.0	37	19	12	9	14	9	0	
b	3	97	0	22.5-22.8	3	12	85	0	0	0	0	

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	4.2-6.0	35	0	1	0	22	32	3	7	0	3	0
b	22.5-22.8	No pebbles retained										

TL 52 NE 13

5566 2819

Greenend Farm, Henham

Block A

Surface level +110.5 m
Water struck at +93.2 m
October 1980

Overburden 7.6 m
Mineral 5.0 m
Waste 1.5 m
Mineral 12.1 m
Bedrock 0.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
Boulder Clay	Clay, silty, sandy, with pellets and pebbles of chalk and some angular flint and rare quartz, stiff, dark yellowish brown	0.6	0.8
	Clay, silty, becomes sandy, with pellets and pebbles of chalk and some flint, firm, pale yellowish brown mottled grey	2.0	2.8
	Clay, silty, sandy, with pellets and pebbles of chalk and some flint, grey mottled yellowish brown	3.2	6.0
	Clay, silty, sandy, with pellets and pebbles of chalk and some flint and black paper shale, stiff, dark grey	1.5	7.5
	Silt, clayey, sandy, with some flint and chalk pebbles, dark yellowish brown	0.1	7.6

Glacial Sand and Gravel	a 'Very clayey' sandy gravel marginally grading as non-mineral from 8.6 m to 11.6 m Gravel: fine and coarse, becoming coarser with depth; well rounded chalk with angular flint, with some sandstone and limestone, and a trace of quartz, quartzite, well rounded flint and fossil debris Sand: fine with medium and coarse, angular flint and subrounded chalk, with some quartz, yellowish brown	5.0	12.6
Boulder Clay	Clay, very silty and sandy, packed with chalk pellets, pale yellowish brown mottled grey	1.5	14.1
Kesgrave Sands and Gravels	b Sand, 'clayey' between 17.3 m and 19.3 m becomes pebbly in basal 1.9 m Gravel: fine and coarse, a trace of angular and well rounded flint and some quartz Sand: medium and fine with a trace of coarse, becomes finer in parts, subangular to subrounded quartz with a trace of mica and opaques; banded pale yellow brown, white and yellow brown becomes orange brown in basal 1.9 m	12.1	26.2
London Clay	Clay, very silty and sandy, micaceous, soft, dark brown mottled greyish green	0.2	26.4
	Sand, fine, very clayey and silty, micaceous, pyriteous, with pyrite and siltstone nodules, bioturbated dark grey and olive green	0.7+	27.1

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines	Sand			Gravel		
						- $\frac{1}{8}$	+- $\frac{1}{8}$ - $\frac{1}{4}$	+- $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64
a	39	35	26	7.6-8.6	39	23	13	9	14	2	0
				8.6-9.6	41	27	14	7	9	2	0
				9.6-10.6	40	9	14	12	21	4	0
				10.6-11.6	41	7	8	9	17	18	0
				11.6-12.6	34	7	9	8	15	27	0
				Mean	39	15	12	9	15	11	0
b	6	93	1	14.1-15.1	7	24	68	1	trace	0	0
				15.1-16.1	5	20	71	trace	trace	4	0
				16.1-17.3	7	17	75	1	0	0	0
				17.3-18.3*	10	42	46	2	trace	0	0
				18.3-19.3*	10	78	12	0	trace	0	0
				19.3-20.3*	5	55	50	0	0	0	0
				20.3-21.3*	7	32	60	1	0	0	0
				21.3-22.3*	4	29	66	1	trace	0	0
				22.3-23.3*	5	29	65	1	0	0	0
				23.3-24.3*	3	79	18	0	trace	0	0
				24.3-25.3*	2	55	33	8	2	0	0
				25.3-26.2*	2	16	58	15	5	4	0
				Mean	6	39	52	2	1	trace	0

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartzite	Sandstone	Chalk	Limestone	Fossil debris	Phosph. nodules	Ironstone	Others
		Ang.	W R									
a	7.6-12.6	16	trace	1	1	3	77	2	trace	0	0	0
b	12.6-26.2	Sample small										

Surface level +110.5 m
 Water struck at +97.1 m
 October 1980

Overburden 13.4 m
 Mineral 6.3 m
 Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
Boulder Clay	Clay, silty, with chalk pellets, yellowish grey becomes mottled grey	3.5	3.7
	Clay, silty, with some chalk pellets, firm, dark grey	5.1	8.8
	Clay, sandy, silty, with chalk pellets, thin seams of silt and fine micaceous sand, some faint laminations, pale brown	4.6	13.4
Kesgrave Sands and Gravel	Sand, with some clay pellets and seams and a trace of gravel Gravel: a trace of fine and coarse, angular and well rounded flint; with some quartz and a trace of chalk in uppermost 1.0 m Sand: medium with fine and a trace of coarse becomes medium and fine, subangular to subrounded quartz, with a trace of angular flint and mica, yellowish brown becomes dark yellowish brown	6.3	19.7
London Clay	Clay, silty, brown	0.1	19.8
	Clay, silty, very dark grey	0.7+	20.5

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand		Gravel			
				- $\frac{1}{16}$	$+\frac{1}{16}$ - $\frac{1}{4}$	$+\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
5	95	0	13.4-14.4*	5	20	74	1	trace	0	0
			14.4-15.4*	11	25	62	2	trace	0	0
			15.4-16.4*	4	23	70	2	trace	1	0
			16.4-17.4*	4	42	53	1	trace	0	0
			17.4-18.4*	4	52	44	0	trace	0	0
			18.4-19.4*	2	42	55	1	trace	0	0
			19.4-19.7*	3	40	53	0	trace	4	0
			Mean	5	34	60	1	trace	trace	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction									
	Flint	Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W	R							
13.4-19.7	Very small sample									

Surface level +102.4 m
 Water struck +94.4 m
 October 1980

Overburden 7.8 m
 Mineral 5.7 m
 Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.1	0.1
Boulder Clay	Clay, silty, with some chalk pellets, dark greyish brown and pale brown	0.6	0.7
	Clay, silty, with pellets and pebbles of chalk, dark yellowish brown and pale brown	5.8	6.5
	Clay, silty, with pellets and pebbles of chalk, grey	1.3	7.8
Kesgrave Sands and Gravels	a Sand, with discrete clay laminae and pellets and a trace of gravel Gravel: a trace of fine, angular and well rounded flint, with quartz and ironstone and a trace of chalk in uppermost 1.0 m Sand: medium with fine and a trace of coarse, subangular to subrounded quartz; with some flint, ironstone and mica, yellowish brown becoming orange brown	5.0	12.8
?Red Crag	b Pebbly sand Gravel: coarse and fine, well rounded flint; ironstone and phosphatic nodules and a trace of sandstone, quartzite, igneous and metamorphic Sand: medium with fine and some coarse, subangular to subrounded quartz with some ironstone, orange brown	0.7	13.5
London Clay	Clay, silty, fine sandy, with race nodules, very dark grey	0.8+	14.3

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines		Sand		Gravel		
					- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
a	6	93	1	7.8-8.8*	7	14	76	2	1	0	0
				8.8-9.8*	5	18	76	1	trace	0	0
				9.8-10.8*	4	14	81	1	trace	trace	0
				10.8-11.8*	10	22	63	3	1	0	0
				11.8-12.8*	5	28	64	3	trace	0	0
				Mean	6	19	72	2	1	trace	0
b	3	81	16	12.8-13.5	3	17	59	5	7	9	0
a+b	2	92	6	Mean	6	19	71	2	1	1	0

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	7.8-12.8	Very small sample										
b	12.8-13.5	18	72	5	trace	1	0	0	0	2	2	trace

Surface level +112.9 m
 Water struck at +92.4 m
 November 1980

Waste 20.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, sandy, with chalk pellets and pebbles of flint, stiff, yellowish brown	0.7	1.0
	Clay, silty, with pellets and pebbles of chalk and some flint, yellowish brown mottled pale grey	4.4	5.4
	Clay, silty, with pellets and pebbles of chalk and some flint, stiff, olive grey	6.6	12.0
	Clay, silty, sandy, with chalk pellets, yellowish brown	1.5	13.5
	Clay, silty, sandy, becoming less sandy, with pellets and pebbles of chalk, soft, grey becoming dark grey	7.0	20.5
Glacial Sand and Gravel	'Clayey' pebbly sand Gravel: fine with some coarse, well rounded and angular flint, with rounded quartz and some ironstone, chalk and sandstone Sand: medium with fine and coarse, subangular to subrounded quartz and some flint and chalk, orange brown	0.2+	20.7

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				-16	+16 -1/4	+1/4 -1	+1 -4	+4 -16	+16 -64	+64 mm
16	69	15	20.5-20.7*	16	17	40	12	13	2	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
20.5-20.7	34	36	15	0	4	5	0	0	0	6	0

Surface level +120.0 m
 Water struck at +115.0 m +110.8 m and +110.0 m
 October 1980

Overburden 0.3 m
 Mineral 0.9 m
 Waste 3.1 m
 Mineral 2.2 m
 Waste 3.4 m
 Mineral 1.7 m
 Waste 14.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Glacial Sand and Gravel	a 'Very clayey' gravel Gravel: coarse and fine with some cobble grade, angular flint; with some sandstone, ironstone igneous, metamorphic, phosphatic nodules, quartzite and well rounded flint, and a trace of quartz Sand: fine with medium and fine, angular flint and quartz, dark yellowish brown	0.9	1.2
Boulder Clay	Clay, silty, sandy, with pebbles of angular flint and some quartz, firm, dark yellowish brown	0.8	2.0
	Clay, silty, with pellets and pebbles of chalk and some angular flint, soft, yellowish brown	2.3	4.3
Glacial Sand and Gravel	b 'Very clayey' sandy gravel Gravel: fine and coarse with some cobble grade, angular flint with rounded chalk, with some limestone, ironstone and sandstone; and a trace of quartz, igneous, metamorphic, quartzite, well rounded flint, fossil debris and phosphatic nodules Sand: medium with coarse and fine, angular flint and subangular chalk with subangular quartz, dark yellowish brown	2.2	6.5
Boulder Clay	Clay, silty, fine sandy, with pellets and pebbles of chalk and some angular flint, firm, yellowish brown	0.6	7.1
	Clay, silty, with pellets and pebbles of chalk and some angular flint and black paper shale, stiff, grey	2.1	9.2
	Silt, very clayey and fine sandy with some chalk pellets, soft, dark grey	0.3	9.5
	Clay, sandy, silty, with pellets and pebbles of chalk and some flint, soft, grey	0.4	9.9
Glacial Sand and Gravel	c 'Very clayey' sand, with a trace of fine chalk and flint pebbles Sand: fine with medium and some coarse, predominantly subangular quartz with some chalk and flint, yellowish brown	1.7	11.6
Boulder Clay	Clay, silty, with pellets and pebbles of chalk with some flint and black paper shale, firm to stiff becoming very stiff, pale grey becoming dark grey	13.9	25.5
	Clay, silty, packed with angular chalk pellets and pebbles, firm, dark yellowish brown	0.3	25.8
Kesgrave Sands and Gravels	d Sand Sand: medium and fine, subangular to subrounded quartz with some opaques, yellow	0.7+	26.5

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages							
	Fines	Sand	Gravel		Fines				Gravel			
					- $\frac{1}{16}$	$+\frac{1}{16}$ - $\frac{1}{4}$	$+\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm	
a	30	25	45	0.3-1.2	30	10	10	5	15	24	6	
b	34	34	32	4.3-5.3*	32	9	16	8	16	15	4	
				5.3-6.5*	35	11	13	11	19	11	0	
				Mean	34	10	14	10	17	13	2	
c	24	75	1	9.9-10.9*	25	52	18	4	1	0	0	
				10.9-11.6*	22	51	24	3	trace	0	0	
				Mean	24	52	20	3	1	0	0	
d	5	95	0	25.8-26.5	5	9	86	0	0	0	0	

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	0.3-1.2	78	2	trace	2	6	0	0	0	3	5	4
b	4.3-6.5	46	trace	1	trace	2	35	13	trace	trace	2	1
c	9.9-11.6	No + 8 mm material										
d	25.8-26.5	No + 8 mm material										

TL 52 NE 18 5669 2852 Chickney Lane, Chickney

Block C

Surface level +113.8 m
Water not struck
October 1980

Waste 19.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
Boulder Clay	Clay, silty, with chalk pellets and pebbles, dark yellowish brown	3.5	3.7
	Silt, interlaminated by fine sand, yellowish brown	0.7	4.4
	Clay, silty, with chalk pellets and pebbles, grey becoming dark grey	6.8	11.2
	Silt, chalky, fine sandy, yellowish brown	0.8	12.0
	Clay, silty, with pellets and pebbles of chalk, pale grey	3.0	15.0
	Chalk rubble in a puggy chalk matrix, white	0.3	15.3
	Clay, silty, with pellets and pebbles of chalk, pale grey	3.7+	19.0

Surface level +112.3 m
 Water struck at +94.9 m
 October 1980

Overburden 17.4 m
 Mineral 8.4 m
 Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, with a trace of chalk pellets, dark yellowish brown	0.4	0.7
	Clay, silty, with pellets and pebbles of chalk and some flint, yellowish brown mottled grey	2.3	3.0
	Clay, silty, with pellets and pebbles of chalk and some flint, dark greyish brown becoming grey	3.2	6.2
	Clay, silty, with many pellets and pebbles of chalk, soft, yellowish brown	5.3	11.5
	Clay, with many chalk pebbles, soft, pale brown	5.9	17.4
Kesgrave Sands and Gravels	a Sand with a trace of fine and coarse angular flint, quartz, ironstone and contaminating chalk at top Sand: medium with fine and a trace of coarse becoming finer with depth, subangular to subrounded quartz with some ironstone and mica, yellow	7.0	24.4
?Red Crag	b Pebbly sand Gravel: coarse and fine, well rounded with angular flint, with some tabular ironstone and rounded quartz Sand: fine with medium and some coarse, subangular to subrounded quartz, yellowish brown	1.4	25.8
London Clay	Clay, silty, laminated, dark brown	0.2	26.0
	Clay, silty, fine, sandy, bluish dark grey	0.4+	26.4

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines			Gravel			
					- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
a	4	95	1	17.4-18.4*	5	21	71	2	1	0	0
				18.4-19.4*	3	14	81	1	trace	1	0
				19.4-20.4*	3	17	78	2	trace	0	0
				20.4-21.4*	5	28	65	2	trace	0	0
				21.4-22.4*	5	55	37	2	1	0	0
				22.4-23.4*	6	42	48	3	1	trace	0
				23.4-24.4*	5	59	35	1	trace	0	0
				Mean	4	34	59	2	1	trace	0
b	4	78	18	24.4-25.4*	3	55	19	3	7	13	0
				25.4-25.8*	5	55	20	5	4	11	0
				Mean	4	55	19	4	6	12	0
a+b	4	92	4	Mean	4	37	53	2	2	2	0

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	17.4-24.4	Very small sample										
b	24.4-25.8	32	58	2	0	0	0	0	0	8	0	0

TL 52 NE 20 5651 2662 Wood Farm, Broxted Block C

Surface level +113.5 m Waste 22.5 m+

Water struck at +91.6 m

December 1980

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.4	0.4
Boulder Clay	Clay, silty, dark yellowish brown	0.3	0.7
	Clay, silty, with pellets and pebbles of chalk, yellowish brown mottled grey from 3.0 m	5.0	5.7
	Clay, silty, with pellets and pebbles of chalk, dark grey	4.9	10.6
	Clay, silty, very sandy, with pebbles of chalk flint and quartz	0.3	10.9
	Clay, silty, with pellets and pebbles of chalk and some flint, dark grey	3.6	14.5
	Clay, silty, with pellets and pebbles of chalk, pale yellowish brown	1.5	16.0
	Clay, silty, with pellets and pebbles of chalk, pale grey mottled brown along fissures	5.9	21.9
Kesgrave Sands and Gravels	'Clayey' sand, with a trace of very fine flint and chalk gravel Sand: medium with fine and a trace of coarse, subangular to subrounded quartz, yellow	0.6+	22.5

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
19	90	1	21.9-22.5	19	22	57	1	1	0	0

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
	21.9-22.5	No + 8mm material										

Surface level +106.9 m
 Water struck at +96.4 m and +89.9 m
 November 1980

Waste 20.8 m
 Bedrock 1.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, sandy, with many chalk pellets, yellowish brown	4.7	5.0
	Clay, silty, sandy, with many chalk pellets and pebbles, grey	5.5	10.5
	Clay, silty, very fine sandy, with chalk pellets, grey	0.8	11.3
	Clay, silty, with pellets of chalk, brownish grey	1.5	12.8
	Chalk rubble in a sandy, silty, clay, matrix; olive grey becoming pale grey	0.2	13.0
	Clay, sandy, silty, with pellets and pebbles of chalk, grey	4.0	17.0
Kesgrave Sands and Gravels	Sandy gravel	3.8	20.8
	Gravel: fine and coarse, well rounded flint and rounded quartz, with angular flint and some sandstone; with a trace of chalk, igneous, metamorphic, fossil debris and phosphatic nodules Sand: medium with coarse and some fine, subrounded quartz with some subangular flint and a trace of subangular chalk, yellowish brown becoming orange		
London Clay	Clay, silty, stiff, reddish brown	1.8+	22.6

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand			Gravel	
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
6	68	28	17.0-18.0*	9	10	47	8	13	13	0
			18.0-19.0*	4	5	36	23	16	16	0
			19.0-20.0*	5	6	43	21	17	8	0
			20.0-20.8*	4	15	42	18	14	7	0
			Mean	6	9	42	17	15	11	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
17.0-20.8	17	41	34	0	6	1	0	trace	trace	0	1

Surface level +111.8 m
 Water struck at +89.1 m
 October 1980

Overburden 18.6 m
 Mineral 8.1 m
 Bedrock 1.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, fine sandy, with pebbles of angular flint, firm, dark yellowish brown	0.5	0.8
	Clay, silty, with pellets and pebbles of chalk with some angular flint, firm, dark yellowish brown	0.7	1.5
	Clay, silty, with pellets and pebbles of chalk and some angular flint, firm, dark yellowish brown mottled grey	1.5	3.0
	Clay, silty with pellets and pebbles of chalk and angular flint, dark greyish brown	2.0	5.0
	Clay, silty, with sandy greenish grey streaks from 7.5 m, with pellets and pebbles of chalk and some angular flint, with a trace of black shale and micaceous sandstone, stiff, dark grey	6.5	11.5
	Clay, silty, fine sandy, becoming very silty in parts with pebbles of chalk, firm to soft, grey becoming pale greyish brown	3.5	15.0
	Clay, silty, with pebbles and pellets of chalk with some angular flint, grey becoming dark grey	3.1	18.1
	Clay, silty, sandy packed with flint and chalk pebbles, firm, dark yellowish brown	0.5	18.6
Kesgrave Sands and Gravels	Sand, basal pebble bed of well rounded with angular flint, thin clay laminae from 20.6 m Sand: medium with fine and a trace of coarse, predominantly subangular to subrounded quartz with some opaques and a trace of angular coarse flint at base, white and pale yellow brown becoming greenish yellow	8.1	26.7
London Clay	Clay, very silty, sandy, laminated at top, micaceous, pale yellowish brown and greenish brown becoming ochre brown	0.5	27.2
	Clay, very silty, fine sandy, micaceous, bioturbated with patches of very dark olive green fine sandy silt, grey	0.6+	27.8

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand		Gravel		
				- $\frac{1}{8}$	+ $\frac{1}{8}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
7	92	1	18.6-19.6	7	24	67	2	trace	0	0
			19.6-20.6	5	25	70	0	0	0	0
			20.6-21.6	7	29	63	0	1	0	0
			21.6-22.7	19	37	44	0	0	0	0
			22.7-23.7*	7	33	59	1	0	0	0
			23.7-24.7*	4	31	64	1	0	0	0
			24.7-25.7*	2	14	84	0	0	0	0
			25.7-26.7*	4	12	66	8	10	trace	0
			Mean	7	26	64	2	1	trace	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction									
	Flint	Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W	R							
18.6-26.7	Very small sample									

TL 52 NE 23	5797 2881	Near Broxted Hill, Broxted	Block C
Surface level +97.8 m			Overburden 2.1 m
Water struck at +88.7 m			Mineral 1.5 m
September 1980			Waste 5.5 m
			Mineral 5.6 m
			Bedrock 1.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, very sandy, with pebbles of chalk and some flint, yellowish brown to pale yellowish brown	1.8	2.1
Glacial Sand and Gravel	a 'Very clayey' gravel Gravel: coarse and fine, rounded chalk and angular flint, with some limestone, sandstone, fossil debris, quartz and ironstone; and a trace of quartzite, igneous and metamorphic Sand: medium coarse and fine, angular flint and chalk with some subangular quartz, pale yellow brown	1.5	3.6
Boulder Clay	Clay, silty, with pellets and pebbles of chalk and some flint, soft becoming firm, pale yellowish grey mottled grey	3.4	7.0
	Clay, silty, with pellets of chalk, stiff becoming hard, pale grey becoming dark grey	1.7	8.7
	Clay, silty, firm, dark grey mottled dark brown becoming yellowish brown	0.4	9.1
Glacial Sand and Gravel	b 'Very clayey' pebbly sand Gravel: coarse and fine with some cobble grade, angular flint, sandstone and well rounded chalk with quartz and some quartzite, with a trace of ironstone and fossil debris Sand: medium with fine and a trace of coarse, subangular quartz, yellowish brown	1.0	10.1
Kesgrave Sands and Gravels	c Sand, 'clayey' in upper 1.0 m pebbly at top and base basal Red Crag pebble bed Gravel: coarse with fine, well rounded with angular flint; with some phosphatic nodules, quartz and ironstone Sand: medium with fine and a trace of coarse, subangular to subrounded quartz with some angular flint	4.6	14.7
London Clay	Clay, silty, fine sandy, micaceous, dark brown mottled and streaked yellowish brown	0.1	14.8
	Clay, silty, fine sandy, micaceous, becoming very sandy and bioturbated, dark grey	1.0+	15.8

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages									
	Fines	Sand	Gravel		Fines			Sand				Gravel		
					- $\frac{1}{8}$	$+\frac{1}{8}$ - $\frac{1}{4}$	$+\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm			
a	26	26	48	2.1-3.1	25	6	12	10	20	27	0			
				3.1-3.6	27	6	9	9	22	27	0			
				Mean	26	6	11	9	21	27	0			
b	28	59	13	9.1-10.1*	28	12	44	3	3	8	2			
c	7	89	4	10.1-11.1*	10	12	60	6	3	7	0			
				11.1-12.1*	7	16	64	2	trace	0	0			
				12.1-13.1*	5	27	66	4	trace	0	0			
				13.1-14.1*	4	50	37	2	trace	7	0			
				14.1-14.7*	7	35	46	7	4	1	0			
				Mean	7	30	55	4	1	3	0			
b+c	10	84	6	Mean	10	27	53	4	2	4	trace			

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	2.1-3.6	36	0	2	1	3	45	8	2	trace	2	1
b	9.1-10.1	Very small sample										
c	10.1-14.7	19	54	9	0	0	0	0	0	10	9	0

TL 52 NE 24

5740 2730

Broxted

Block C

Surface level +105.6 m
Water struck at +90.6 m
September 1980

Waste 18.9 m
Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
Boulder Clay	Clay, silty, with pellets and pebbles of chalk and some flint, yellowish brown mottled grey	9.3	9.5
	Clay, silty, with pellets and pebbles of chalk and some flint, light grey becoming grey, brownish grey at base	5.5	15.0
Kesgrave Sands and Gravels	'Clayey' sand, 'very clayey' in uppermost 1.0 m becomes pebbly at base, with clay seams Gravel: a trace of coarse and fine, well rounded and angular flint Sand: medium with fine and a trace of coarse, subangular to subrounded quartz with a trace of angular flint, yellowish brown	3.9	18.9
London Clay	Clay, silty, dark yellowish brown	0.5	19.4
	Clay, silty, very dark grey	0.1+	19.5

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand			Gravel	
				- $\frac{3}{16}$	+ $\frac{3}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
13	86	1	15.0-16.0*	21	20	58	1	trace	0	0
			16.0-17.0*	16	14	69	1	trace	0	0
			17.0-18.0*	5	18	76	1	trace	0	0
			18.0-18.9*	8	18	64	3	1	6	0
			Mean	13	18	67	1	trace	1	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction									
	Flint	Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W	R							
15.0-18.9	Very small sample									

TL 52 NE 25 5733 2607 Brick End, Broxted

Block C

Surface level +106.2 m
Water struck at +96.8 m and +90.2 m
December 1980

Waste 16.0 m
Mineral 5.5 m
Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil and made ground	0.4	0.4
Boulder Clay	Clay, silty, with pellets and pebbles of chalk and some flint, pale yellowish brown mottled grey becoming darker with depth	2.6	3.0
	Clay, silty, sandy, very chalky, sandy chalk rubble in parts, yellowish brown mottled grey, ochre brown fissures with depth	4.0	7.0
	Clay, silty, with pellets and pebbles of chalk and some flints, grey	2.2	9.2
	Clay, silty, sandy, with flint and chalk pebbles, pale yellowish brown	0.2	9.4
Glacial Sand and Gravel	a Clay, very silty, sandy and pebbly; with pebbles of chalk; with some angular flint; and a trace of sandstone, limestone, fossil debris and ironstone. Sand predominantly angular flint with some chalk and quartz, pale yellowish brown	1.3	10.7
	Clay, silty, with pellets and pebbles of chalk and some flint, firm, pale grey becoming grey	5.2	15.9
	Clay, silty, with some chalk and flint, soft, ochre brown	0.1	16.0
Kesgrave Sands and Gravels	b Sand, 'clayey' in uppermost 1.0 m with a trace of pebbles Gravel: fine with coarse, well rounded flint with angular flint and tabular ironstone, with some quartz, chalk and phosphatic nodules; and a trace of quartzite and limestone Sand: medium with fine and some coarse, subangular to subrounded quartz with a trace of angular flint and ironstone, yellowish brown	5.5	21.5

London Clay	Clay, silty, micaceous, soft, ochre brown	0.4	21.9
	Clay, silty, fine sandy, micaceous, firm to stiff dark grey	0.4+	22.3

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines			Sand		Gravel	
					- $\frac{1}{16}$	$+\frac{1}{16}$ - $\frac{1}{4}$	$+\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
a	45	34	21	9.4-10.7*	45	18	8	8	11	10	0
b	7	90	3	16.0-17.0*	13	11	68	6	2	0	0
				17.0-18.0*	7	17	69	4	2	1	0
				18.0-19.0*	7	19	70	3	1	0	0
				19.0-20.0*	5	17	69	7	1	1	0
				20.0-21.0*	4	18	65	9	2	2	0
				21.0-21.5*	5	15	69	9	2	0	0
				Mean	7	16	68	6	2	1	0

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	9.4-10.7	9	0	0	0	1	88	1	1	0	trace	trace
b	16.0-21.5	22	41	5	1	0	5	trace	0	3	21	0

TL 52 NE 26 5742 2550 Browns End Road, Broxted

Block C

Surface level +108.5 m
Water struck at +93.5 m and +87.4 m
December 1980

Waste 23.2 m
Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.4	0.4
Boulder Clay	Clay, silty, fine sandy, with pellets and pebbles of chalk and some flint, pale yellowish brown mottled grey	1.1	1.5
	Clay, silty, with pebbles and pellets of chalk and some flint, stiff, greyish brown	4.5	6.0
	Clay, silty, with pellets and some pebbles of chalk and a trace of flint and black shale, stiff, grey	4.6	10.6
Glacial Sand and Gravel	a Clay, very silty, sandy and pebbly, becomes very silty fine sandy clay with stringers of chalk gravel. Pebbles of chalk with some angular flint and limestone. Sand fine and medium with coarse, angular flint and chalk, pale yellowish brown	2.9	13.5
Boulder Clay	Clay, fine sandy, silty, extremely chalky in parts, soft, grey	0.5	14.0
	Clay, silty, fine sandy, with pellets and pebbles of chalk and rare flint, soft, brownish grey	0.5	14.5
	Clay, silty, extremely chalky, soft, grey	1.0	15.5
	Clay, silty, with pellets and pebbles of chalk, firm, greyish brown	5.0	20.5

	Clay, silty, with pellets and pebbles of chalk, and some and some flint with black paper shale, stiff, grey	0.6	21.1
Kesgrave Sands and Gravels	b Pebbly sand, 'clayey' in upper 1.0 m Gravel: fine and coarse, well rounded and angular flint; with some quartz, and a trace of sandstone, limestone and chalk Sand: medium with fine and some coarse, subangular to subrounded quartz with a trace of angular flint and chalk, dark yellowish brown	2.1	23.2
London Clay,	Clay, silty, micaceous, firm, ochre brown	0.4	23.6
	Clay, silty, fine sandy, micaceous, stiff, grey	0.4+	24.0

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages									
	Fines	Sand	Gravel		Fines			Sand				Gravel		
					- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm			
a	47	33	20	10.6-12.1 12.1-13.5	47	15	10	8	14	6	0			
					No grading data available									
b	8	86	6	21.1-22.1 22.1-23.2 Mean	13 4 8	18 25 22	59 58 58	5 7 6	3 3 3	2 3 3	0 0 0			

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	10.6-13.5	14	0	1	trace	trace	79	6	trace	0	trace	0
b	21.1-23.2	42	52	5	0	1	trace	trace	0	0	0	0

TL 52 NE 27 5892 2935 Horham Hall, Thaxted

Block C

Surface level +105.3 m
Water struck at +103.3 m and +87.8 m
October 1980

Overburden 13.5 m
Mineral 9.4 m
Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil and made ground	2.2	2.2
Boulder Clay	Clay, silty, fine sandy, with pellets and pebbles of chalk with some flint, yellowish brown mottled grey	0.6	2.8
	Clay, silty, fine sandy, with pebbles and pellets of chalk with some flint, brown mottled grey	2.2	5.0
	Clay, silty, with pebbles and pellets of chalk with some flint, stiff, grey becoming dark grey	1.9	6.9
	Clay, silty, with pebbles and pellets of chalk with some flint, grey mottled brown	0.6	7.5

	Clay, silty, with pebbles and pellets of chalk with some flint, firm, pale yellow brown	1.7	9.2
Glacial Sand and Gravel	a Clay, extremely sandy and pebbly. Pebbles of chalk with angular flint and some ironstone, sandstone, well rounded flint and quartz. Sand angular flint and chalk with some quartz, pale yellowish brown	1.0	10.2
Boulder Clay	Clay, very silty, sandy and pebbly, with pellets and pebbles of chalk and some flint, firm, pale yellowish brown	3.3	13.5
Kesgrave Sands and Gravels	b Sand, becomes pebbly at base, clay pellets and very thin brown clay in upper 2.0 m Gravel: fine and coarse, angular with well rounded flint and ironstone; with a trace of chalk Sand: medium with fine and a trace of coarse becoming fine and medium, subangular subrounded quartz, with a trace of flint and mica, pale yellow banded white and brown	9.4	22.9
London Clay	Clay, silty, fine sandy, light olive brown, some ironstone fragments	0.1	23.0
	Clay, silty, fine sandy, becoming clayey fine sandy silt, with pyritised wood fragments, dark grey	0.5+	23.5

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines	Sand			Gravel		
						+ $\frac{1}{8}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
	- $\frac{1}{8}$										
a	40	37	23	9.2-10.2	40	16	14	7	14	9	0
b	5	93	2	13.5-14.5	4	19	76	0	1	0	0
				14.5-15.5	4	17	78	1	trace	0	0
				15.5-16.5	7	24	68	1	trace	0	0
				16.5-17.5	4	20	76	0	0	0	0
				17.5-18.5*	4	25	71	0	0	0	0
				18.5-19.5*	5	35	59	1	trace	0	0
				19.5-20.5*	4	32	59	4	1	trace	0
				20.5-21.5*	6	32	58	4	trace	0	0
				21.5-22.5*	5	47	36	1	2	9	0
				22.5-22.9*	5	46	36	3	1	9	0
			Mean	5	29	63	1	1	1	0	

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	9.2-10.2	16	3	1	0	3	73	0	0	0	4	0
b	13.5-22.9	Very small sample										

TL 52 NE 28 5851 2821 Sucksted Green, Broxted

Block C

Surface level +100.3 m
 Water struck at +88.3 m
 October 1980

Waste 16.0 m
 Bedrock 0.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, with pellets and pebbles of chalk and some flint, brown and yellowish brown mottled grey	2.0	2.3
	Clay, silty, with pellets and pebbles of chalk and some flint, grey becoming dark grey	9.7	12.0
	Clay, silty, with much chalk and flint, some faint laminations, soft, dark grey	1.0	13.0
	Clay, silty, with pellets and pebbles of chalk and some flint, grey	2.1	15.1
	Clay, silty, with pellets of chalk and some flint and black paper shale, stiff, very dark grey to black	0.9	16.0
London Clay	Clay, silty, with race nodules, dark brownish black	0.9+	16.9

TL 52 NE 29 5801 2736 Church Hall, Broxted

Block C

Surface level +93.3 m
 Water struck at +87.3 m
 October 1980

Overburden 4.3 m
 Mineral 4.2 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
Boulder Clay	Clay, silty, with some chalk and flint pebbles, dark yellowish brown	0.9	1.1
	Clay, silty, with pellets and pebbles of chalk and some flint, pale brown and pale yellowish brown	3.2	4.3
Kesgrave Sands and Gravels	Sand, 'clayey' in upper 1.0 m becomes pebbly with depth, with thin clay seams and pellets Gravel: fine and coarse, well rounded flint, with angular flint, rounded quartz and sandstone; with some phosphatic nodules at base, quartzite and a trace of chalk Sand: medium with fine and a trace of coarse becoming medium and fine with some coarse, subrounded to subangular quartz with a trace of mica and flint, yellow becomes orange brown	4.2	8.5
London Clay	Clay, silty, yellowish brown	0.2	8.7
	Clay, silty, micaceous, very dark grey	0.8+	9.5

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand			Gravel	
				- $\frac{1}{16}$	$+\frac{1}{16}$ - $\frac{1}{4}$	$+\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
6	90	4	4.3-5.3	12	29	57	1	1	0	0
			5.3-6.0	4	11	83	1	1	0	0
			6.0-7.0*	3	14	79	1	0	3	0
			7.0-8.0*	7	25	52	9	4	3	0
			8.0-8.5*	2	37	44	10	6	1	0
			Mean	6	22	64	4	2	2	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartzite	Sandstone	Chalk	Limestone	Fossil debris	Phosph. nodules	Ironstone	Others
	Ang.	W R									
4.3-8.5	15	50	14	4	9	2	0	0	5	0	1

TL 52 NE 30

5814 2664

Malting Bridge, Broxted

Block C

Surface level +90.1 m
 Water struck at +87.7 m
 December 1980

Overburden 1.6 m
 Mineral 2.7 m
 Bedrock 0.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.4	0.4
Boulder Clay	Clay, silty, sandy, with some flint pebbles, dark grey and yellowish brown	1.2	1.6
Kesgrave Sands and Gravels	Pebbly sand, 'clayey' sand in upper 0.8 m basal Red Crag pebble bed Gravel: coarse and fine, well rounded with angular flint; with some quartz and quartzite and a trace of phosphatic nodules at base, sandstone, igneous and metamorphic Sand: medium with fine and some coarse with depth, subangular to subrounded quartz with some angular flint, yellowish brown	2.7	4.4
London Clay	Clay, silty, firm to stiff, yellowish brown becoming dark grey with depth	0.3+	4.7

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand			Gravel	
				- $\frac{1}{16}$	$+\frac{1}{16}$ - $\frac{1}{4}$	$+\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
5	84	11	1.6-2.4	10	7	80	1	1	1	0
			2.4-3.4*	4	20	60	8	3	5	0
			3.4-4.3*	2	23	40	14	11	10	0
			Mean	5	17	59	8	5	6	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
1.6-4.3	29	57	9	2	1	0	0	0	1	0	1

TL 52 NE 31	5816 2598	Moor Hall, Broxted	Block C
Surface level +94.7 m			Overburden 4.7 m
Water struck at +88.4 m			Mineral 5.1 m
December 1980			Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
Boulder Clay	Clay, silty, with some chalk and flint pebbles, firm to stiff, yellowish to dark yellowish brown	1.0	1.2
	Clay, silty, with pellets and pebbles of chalk and some flint, pale brown becomes yellowish brown	3.5	4.7
Kesgrave Sands and Gravels	Pebbly sand, 'clayey' in upper 1.0 m Gravel: fine and coarse, well rounded and angular flint, with some quartz and ironstone; with a trace of igneous, metamorphic, sandstone, phosphatic nodules, quartzite and chalk Sand: medium and fine with some coarse becomes fine with medium and coarse, subangular to subrounded quartz with some angular flint and ironstone, orange brown	5.1	9.8
London Clay	Clay, silty, yellowish to dark yellowish brown	0.2	10.0
	Clay, silty, very dark grey	0.4+	10.4

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
7	82	11	4.7-5.7	11	34	47	2	3	3	0
			5.7-6.3	8	18	70	3	1	0	0
			6.3-7.3*	7	8	58	9	9	9	0
			7.3-8.3*	4	18	41	20	10	7	0
			8.3-9.3*	6	42	27	22	3	0	0
			9.3-9.8*	4	40	22	16	9	9	0
			Mean	7	26	44	12	6	5	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
4.7-9.8	34	45	10	1	2	1	0	0	1	4	2

Surface level +90.0 m
 Water struck at +83.9 m
 December 1980

Overburden 2.3 m
 Mineral 5.8 m
 Bedrock 0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.1	0.1
Boulder Clay	Clay, silty, with chalk pebbles, very hard, pale brown	2.2	2.3
Kesgrave Sands and Gravels	a Sand, pebbly at base Gravel: fine with a trace of coarse, angular to well rounded flint, with quartz; and a trace of sandstone, quartzite, igneous, metamorphic and chalk Sand: medium with fine and some coarse, subangular to subrounded quartz with some flint and mica, yellow	3.0	5.3
?Red Crag	b Pebbly sand Gravel: fine with coarse, well rounded with angular flint, with some igneous, quartz and sandstone; and a trace of chalk, fossil debris, ironstone and quartzite Sand: medium with coarse and fine, subangular to subrounded quartz with a trace of flint, orange brown	2.8	8.1
London Clay	Clay, silty, dark yellowish brown becomes dark grey	0.6+	8.7

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines	Sand			Gravel		
						- $\frac{1}{8}$	+ $\frac{1}{8}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64
a	8	90	2	2.3-3.3	7	18	73	2	trace	0	0
				3.3-4.3	6	41	45	6	2	0	0
				4.3-5.3	10	35	43	8	3	1	0
				Mean	8	31	54	5	2	trace	0
b	4	74	22	5.3-6.1	10	28	41	13	7	1	0
				6.1-7.1*	2	11	45	26	12	4	0
				7.1-8.1*	2	14	29	17	20	18	0
				Mean	4	17	38	19	14	8	0
a+b	5	83	12	Mean	5	25	46	12	8	4	0

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	2.3-5.3	42	41	15	1	1	trace	0	0	0	0	trace
b	5.3-8.1	27	54	7	trace	3	1	0	trace	0	trace	8

Surface level +89.5 m
 Water struck at +84.8 m
 October 1980

Overburden 0.6 m
 Mineral 7.4 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil and made ground	0.4	0.4
	Clay, very sandy, silty, many pebbles of flint and chalk, brown	0.2	0.6
Glacial Sand and Gravel	a 'Clayey' gravel Gravel: coarse and fine, angular flint, with some chalk, quartz and sandstone and a trace of phosphatic nodules and limestone Sand: medium with fine and coarse, subangular quartz with angular chalk and flint, dark brown	1.1	1.7
Kesgrave Sands and Gravels	b Sand, 'clayey' in upper 2.0 m becomes pebbly in basal 0.3 m; clay laminae to 3.7 m Gravel: a trace of fine and coarse and a single flint cobble at 3.0 m, angular with well rounded flint, and a trace of ironstone, quartz, igneous, metamorphic and sandstone Sand: fine and medium with a trace of coarse, subangular to subrounded quartz with some mica, yellow brown banded white and brown becomes orange brown from 6.7 m	6.3	8.0
London Clay	Clay, silty, fine sandy, firm brown	0.1	8.1
	Clay, silty, fine sandy, micaceous, pyritous, with carbonaceous patches, dark grey	0.9+	9.0

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines			Gravel			
					- $\frac{1}{16}$	$+\frac{1}{16}$ - $\frac{1}{4}$	$+\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
a	19	40	41	0.6-1.7	19	13	18	9	20	21	0
b	6	93	1	1.7-2.7	10	31	57	1	1	0	0
				2.7-3.7	10	60	26	1	trace	1	2
				3.7-4.7	6	40	53	1	0	0	0
				4.7-5.7*	3	54	41	2	trace	0	0
				5.7-6.7*	4	62	33	1	0	0	0
				6.7-7.7*	4	55	39	1	1	0	0
				7.7-8.0*	3	24	48	16	3	6	0
Mean	6	49	42	2	1	trace	trace				
a+b	8	85	7	Mean	8	44	38	3	4	3	trace

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	0.6-1.7	77	0	8	0	6	9	trace	0	trace	0	0
b	1.7-8.0	66	30	1	0	0	trace	0	0	0	2	1

Surface level +95.4 m
 Water struck at +86.0 m
 October 1980

Overburden 9.4 m
 Mineral 3.7 m
 Bedrock 1.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.1	0.1
Boulder Clay	Clay, silty, with some flint pebbles, yellowish brown	0.1	0.2
	Clay, silty, fine sandy, with pebbles and pellets of chalk and some flint, firm, yellowish brown	0.6	0.8
	Clay, silty, with a trace of fine sand, pellets and pebbles of chalk and some flint, firm becoming stiff, yellowish brown mottled pale grey	1.9	2.7
	Clay, silty, fine sandy, with pellets and pebbles of chalk with some flint, dark grey mottled dark yellowish brown	1.3	4.0
	Gravel, fine very chalky with clay seams throughout, soft, pale yellowish brown	0.5	4.5
	Clay, silty, fine sandy, with pellets and pebbles of chalk and some flint, stiff, dark grey mottled yellowish brown	1.5	6.0
	Clay, silty, fine sandy, with pellets and pebbles of chalk and some flint, pale grey becoming dark grey and pale greyish brown from 8.6 m	3.0	9.0
	Clay, silty, with pellets and pebbles of chalk and some flint cobbles, dark brown	0.4	9.4
Glacial Sand and Gravel	a Pebbly sand Gravel: fine with some coarse, angular flint, with rounded quartz; with some quartzite and well rounded flint; and a trace of sandstone, igneous, metamorphic and ironstone Sand: medium with fine and coarse, subangular quartz with coarse and medium angular flint, yellowish brown	1.0	10.4
	b Sand, with a trace of angular flint pebbles at base Sand: fine with medium and some coarse, subangular to subrounded quartz with some angular flint, pale yellowish brown becoming greenish yellow	2.7	13.1
London Clay	Clay, silty, laminated at top, firm becoming stiff, dark yellowish brown	0.3	13.4
	Clay, silty, fine sandy, micaceous and pyriteous, firm, dark grey	0.9+	14.3

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages								
	Fines	Sand	Gravel										
					Fines			Sand			Gravel		
					-#	+# - 1/4	+ 1/4 - 1	+ 1 - 4	+ 4 - 16	+ 16 - 64	+ 64 mm		
a	4	82	14	9.4-10.4*	4	17	53	12	12	2	0		
b	7	93	0	10.4-11.4*	10	40	45	5	trace	0	0		
				11.4-12.4*	4	68	24	4	trace	0	0		
				12.4-13.1*	6	72	16	5	1	0	0		
				Mean	7	59	29	5	trace	0	0		
a+b	6	90	4	Mean	6	47	36	7	3	1	0		

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	9.4-10.4	70	5	18	5	2	0	0	0	0	trace	trace
b	10.4-13.1	Very small sample										

TL 52 NE 35 5977 2764 Tingates Farm, Broxsted Block C

Surface level +89.0 m Overburden 1.5 m
 Water struck at +76.7 m Mineral 10.8 m
 October 1980 Bedrock 0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.5	0.5
	Gravel, fine and coarse angular flint with some chalk and medium sand	0.2	0.7
	Clay, silty, sandy, extremely pebbly, with flint and chalk, yellowish brown	0.8	1.5
Glacial Sand and Gravel	a 'Very clayey' gravel, becomes marginally non-mineral in basal 0.9 m Gravel: fine and coarse, with a trace of cobble grade, angular flint with rounded chalk and limestone; with some sandstone, quartz, well rounded flint, fossil debris, igneous, metamorphic and quartzite and a trace of ironstone and phosphatic nodules Sand: medium with coarse and fine, angular flint chalk and quartz, dark yellowish brown	4.8	6.3
Kesgrave Sands and Gravels	b Sand, becomes pebbly at base, with some thin silty clay laminae throughout Gravel: fine with coarse angular and well rounded flint, with some sandstone and a trace of quartz chalk and ironstone Sand: medium, with fine and some coarse; becomes fine and medium; subangular to subrounded quartz and some angular flint; yellowish brown becoming orange brown	6.0	12.3
London Clay	Clay, silty, fine sandy, yellowish brown	0.1	12.4
	Clay, silty, fine sandy, dark grey	0.4+	12.8

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines	Sand			Gravel		
					-#	+# - 1/4	+1/4 - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
a	22	35	43	1.5-2.5	34	11	17	8	11	17	2
				2.5-3.4	15	8	23	11	22	19	2
				3.4-4.4	12	7	21	16	29	15	0
				4.4-5.4	11	9	12	10	29	28	1
				5.4-6.3	41	5	8	7	16	23	0
			Mean	22	8	16	11	22	20	1	
b	6	90	4	6.3-7.3	9	20	59	6	3	3	0
				7.3-8.3	5	14	74	5	1	1	0
				8.3-9.3	6	39	50	3	1	1	0
				9.3-10.3	5	27	54	11	3	0	0
				10.3-11.6	6	46	43	4	4	0	0
				11.6-12.3*	2	48	33	5	6	6	0
	6	32	53	5	3	1	0				
a+b	13	66	21	Mean	13	22	36	8	11	10	trace

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
		Ang.	W R									
a	1.5-6.3	47	3	3	2	6	20	14	2	trace	1	2
b	6.3-12.3	54	40	1	0	4	1	0	0	0	trace	0

Surface level +89.5 m
 Water struck at +81.2 m
 December 1980

Waste 9.1 m
 Bedrock 1.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.4	0.4
Boulder Clay	Clay, silty, with pellets and pebbles of chalk and some flint, firm, yellowish brown mottled grey	2.1	2.5
	Clay, silty, with pellets and pebbles of chalk, brownish grey to dark grey	5.8	8.3
Glacial Sand and Gravel	'Very clayey' gravel Gravel: coarse with fine and some cobble grade, angular flint with rounded chalk, with some limestone, sandstone, igneous, metamorphic, quartz, fossil debris and well rounded flint; and a trace of quartzite and phosphatic nodules Sand: coarse medium and fine, angular flint and chalk with some quartz, grey	0.6	8.9
Boulder Clay	Clay, silty, with pellets and pebbles of chalk, dark grey	0.2	9.1
London Clay	Clay, silty, dark grey	1.6+	10.7

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{8}$	$+\frac{1}{8}$ - $\frac{1}{4}$	$+\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
24	36	40	8.3-8.9	24	10	13	13	10	25	5

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartzite	Sandstone	Chalk	Limestone	Fossil debris	Phosph. nodules	Ironstone	Others
	Ang.	W R									
8.3-8.9	45	2	3	1	5	26	10	3	1	0	4

Surface level +60.9 m
 Water struck at +59.4 m
 November 1980

Overburden 0.7 m
 Mineral 1.9 m
 Waste 2.9 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil and organic subsoil	0.7	0.7
First Terrace	a 'Clayey' gravel Gravel: fine and coarse, angular flint with well rounded flint; with some quartz, quartzite and sandstone and a trace of igneous, metamorphic and chalk Sand: medium with coarse and some fine, angular flint and quartz with a trace of chalk, yellowish brown	1.9	2.6
	Silt, clayey, laminated, with a thin dark brown carbonaceous layer at 4.4 m, some flint and chalk pebbles, pale grey	2.3	4.9
	b 'Clayey' gravel Gravel: coarse with fine, angular flint with well rounded flint and quartz, with some sandstone Sand: medium with coarse and fine, angular flint and quartz, pale grey	0.6	5.5
Upper Chalk	Chalk, soft, puggy, white	1.0+	6.5

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines	Sand			Gravel		
						- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64
a	11	34	55	0.7-1.5	15	6	17	9	30	23	0
				1.5-2.6*	8	5	18	12	32	25	0
				Mean	11	5	18	11	31	24	0
b	17	31	52	4.9-5.5*	17	7	17	7	13	39	0

COMPOSITION

	Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
		Flint		Quartz	Quartzite	Sandstone	Chalk	Limestone	Fossil debris	Phosph. nodules	Ironstone	Others
		Ang.	W R									
a	0.7-2.6	78	11	4	4	2	trace	0	0	0	0	1
b	4.9-5.5	76	13	8	0	3	0	0	0	0	0	0

Surface level +75.5 m
 Water not struck
 October 1980

Overburden 1.6 m
 Mineral 7.1 m
 Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil and sandy, pebbly subsoil	0.8	0.8
Glacial Sand and Gravel	Clay, silty, becoming very sandy and pebbly with chalk and flint pebbles, yellowish red	0.8	1.6
	'Very clayey' sandy gravel Gravel: fine and coarse with a trace of cobble grade, rounded chalk with angular flint; with some well rounded flint, limestone, quartz and sandstone and a trace of ironstone, fossil debris, phosphatic nodules, igneous and metamorphic Sand: medium with fine and some coarse, angular flint and chalk with some quartz, yellowish brown	7.1	8.7
Upper Chalk	Chalk, soft, white	0.6+	9.3

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				-½	+½ -¼	+¼ -1	+1 -4	+4 -16	+16 -64	+64 mm
21	55	24	1.6-2.7	21	13	30	8	18	10	0
			2.7-3.6	15	7	15	9	27	27	0
			3.6-4.6	26	11	12	5	14	24	8
			4.6-5.6	34	22	25	6	8	5	0
			5.6-6.6	21	24	41	9	5	0	0
			6.6-7.6	15	26	38	7	10	4	0
			7.6-8.7	13	32	36	5	9	5	0
			Mean	21	20	28	7	13	10	1

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
1.6-8.7	31	7	3	0	2	50	5	trace	1	1	trace

Surface level +78.3 m
 Water not struck
 October 1980

Waste 3.5 m
 Bedrock 3.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.4	0.4
Glacial Sand and Gravel	Clay, silty, fine sandy, with a trace of flint pebbles, firm to stiff, yellowish brown mottled pale grey	0.7	1.1
	Clay, very sandy and silty, dark greenish yellow mottled dusky red	0.9	2.0
	Clay, silty, fine sandy, with some nodular flint, stiff, dark yellowish brown mottled grey	0.8	2.8
	'Very clayey' sandy gravel Gravel: fine and coarse, angular flint, with some well rounded flint, ironstone, quartz and sandstone and a trace of quartzite, igneous and metamorphic Sand: medium and fine with coarse, subangular to subrounded quartz, with some flint, dark yellowish brown	0.7	3.5
Woolwich and Reading Beds	Clay, silty, very fine sandy, stiff becoming firm, yellowish brown, mottled dusky red, becoming pale green mottled pale red	2.9	6.4
	Clay, fine sandy, laminated, stiff, grey mottled yellowish brown and pale green	0.2	6.6
Bullhead Bed	Clay, silty, fine sandy, with nodular flints, pale green mottled ochre brown	0.2	6.8
Upper Chalk	Chalk, crumbly, angular fragments in a puggy matrix, white	0.5+	7.3

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				-1/8	+1/8 - 1/4	+1/4 - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
35	40	25	2.8-3.5	35	13	18	9	15	10	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartzite	Sandstone	Chalk	Limestone	Fossil debris	Phosph. nodules	Ironstone	Others
	Ang.	W R									
2.8-3.5	81	10	3	trace	2	0	0	0	0	4	trace

Surface level +100.4 m
 Water struck at +98.3 m
 November 1980

Overburden 1.1 m
 Mineral 1.7 m
 Bedrock 16.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil and made ground	0.7	0.7
	Clay, silty, with some flint pebbles, dark brown becoming yellowish brown	0.4	1.1
?Red Crag	'Clayey' pebbly sand Gravel: fine with coarse, well rounded and angular flint with some quartz and a trace of ironstone, sandstone and quartzite Sand: medium and fine with coarse, subangular to subrounded quartz with mica, yellowish brown	1.7	2.8
London Clay	Clay, silty, yellowish brown	0.5	3.3
	Clay, silty, fine sandy, micaceous, with small race nodules, very dark grey	4.2	7.5
	Clay, silty, fine sandy, micaceous, firm, very dark grey	9.0	16.5
	Clay, silty, fine sandy, very sandy in parts bioturbated, micaceous, carbonaceous, with pockets of dark olive green sand, shell debris, dark grey	2.4+	18.9

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{8}$	+ $\frac{1}{8}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
10	79	11	1.1-2.1	11	33	31	18	6	1	0
			2.1-2.8	9	28	31	16	11	5	0
			Mean	10	31	31	17	8	3	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartzite	Sandstone	Chalk	Limestone	Fossil debris	Phosph. nodules	Ironstone	Others
	Ang.	W R									
1.1-2.8	30	54	12	1	1	0	0	0	0	2	trace

TL 52 SW 79

5091 2164

South south east of Birchanger Lodge, Birchanger

Block D

Surface level +93.8 m
Water not struck
November 1980

Waste 10.5 m
Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.3	0.3
Boulder Clay	Clay, silty, with some chalk and flint pebbles, dark yellowish brown	0.2	0.5
	Clay, silty, with pellets and pebbles of chalk and some flint; pebble content decreasing with depth, pale yellow mottled light grey becomes brownish grey and dark grey	9.5	10.0
	Clay, silty, with chalk pellets, very dark grey to black	0.5	10.5
London Clay	Clay, silty, fine sandy, micaceous, with some race nodules, dark grey	0.8+	11.3

TL 52 SW 80

5090 2002

Hanginghill Spring, Great Hallingbury

Block D

Surface level +76.0 m
Water struck at +65.0 m
November 1980

Waste 11.0 m
Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, with pebbles and pellets of flint and chalk, yellowish brown mottled light grey	0.8	1.1
	Clay, silty, with pellets and pebbles of chalk and some flint, light grey mottled dark grey becoming olive grey	6.2	7.3
	Clay, silty, with pellets of chalk and a trace of flint and quartz pebbles, dark olive grey	1.7	9.0
Kesgrave Sands and Gravels	Sandy gravel Gravel: fine and coarse, angular flint, with rounded quartz and well rounded flint; with some quartzite, sandstone, ironstone, igneous and metamorphic and a trace of chalk at top Sand: medium with coarse and fine, subangular to subrounded quartz with some angular flint, yellowish brown	2.0	11.0
London Clay	Clay, silty, yellowish brown	0.1	11.1
	Clay, silty, dark grey	0.9+	12.0

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{4}$	+ $\frac{1}{4}$ - $\frac{1}{2}$	+ $\frac{1}{2}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
7	50	43	9.0-10.0	6	12	39	9	18	16	0
			10.0-11.0	8	6	22	12	27	25	0
			Mean	7	9	31	10	23	20	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
9.0-11.0	58	10	15	9	4	trace	0	0	0	2	2

TL 52 SW 81 5137 2415 Rochfords Nurseries, Birchanger Block B

Surface level +84.4 m Overburden 0.4 m
 Water not struck Mineral 8.3 m
 October 1980 Bedrock 1.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.4	0.4
Glacial Sand and Gravel	'Clayey' sandy gravel, chalk free in upper 1.7 m Gravel: fine and coarse with a trace of cobble grade at base, angular flint, with some rounded chalk, well rounded flint, quartz, sandstone, limestone, quartzite and ironstone; and a trace of fossil debris, phosphatic nodules, igneous and metamorphic Sand: medium with fine and coarse, angular flint with chalk and quartz, yellowish brown becoming pale brown,	8.3	8.7
Thanet Beds	Sand, silty, fine, dark olive green speckled black	0.9	9.6
Upper Chalk	Chalk, soft, puggy, white	0.4+	10.0

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{8}$	+ $\frac{1}{8}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
16	54	30	0.4-1.4	12	6	17	14	25	26	0
			1.4-2.1	14	6	32	10	19	19	0
			2.1-3.1	11	9	29	12	26	13	0
			3.1-4.7	10	9	40	14	19	8	0
			4.7-5.7	17	21	51	5	5	1	0
			5.7-6.2	14	25	49	5	3	4	0
			6.2-7.5	23	16	18	7	22	14	0
			7.5-8.0	35	49	9	2	4	1	0
			8.0-8.7	19	13	11	11	22	22	2
			Mean	16	15	29	10	18	12	trace

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
0.4-8.7	66	7	3	2	3	15	2	trace	trace	2	trace

Surface level +99.5 m
 Water struck at +97.8 m
 October 1980

Overburden 0.7 m
 Mineral 4.9 m
 Bedrock 2.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil and subsoil	0.7	0.7
?Red Crag	Pebbly sand Gravel: fine with coarse, well rounded flint; with angular flint and rounded quartz, with some ironstone and a trace of quartzite, sandstone, igneous, metamorphic and chalk Sand: medium with fine and coarse, subangular quartz and a trace of flint, yellowish brown becoming orange.	4.9	5.6
London Clay	Clay, silty, with some medium sand, stiff, waxy brown	0.7	6.3
	Clay, silty, fine, sandy, micaceous, yellowish brown	0.6	6.9
	Clay, silty, fine sandy, micaceous, with pyrite nodules, dark grey	0.7+	7.6

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines				Gravel		
				- $\frac{1}{8}$	+- $\frac{1}{8}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
8	79	13	0.7-1.7	11	11	56	8	9	5	0
			1.7-2.7*	7	12	61	12	5	3	0
			2.7-3.7*	11	18	45	13	9	4	0
			3.7-4.7*	8	16	49	14	8	5	0
			4.7-5.6*	3	24	35	24	12	2	0
			Mean	8	16	49	14	9	4	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartzite	Sandstone	Chalk	Limestone	Fossil debris	Phosph. nodules	Ironstone	Others
	Ang.	W R									
0.7-5.6	28	57	12	1	trace	trace	0	0	0	2	trace

TL 52 SE 83 5165 2228 Duckend Farm, Birchanger

Block D

Surface level +81.2 m
Water struck at +74.5 m
November 1980

Waste 0.5 m
Bedrock 6.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.1	0.1
Head	Clay, silty, with angular flint pebbles, dark yellowish brown	0.4	0.5
London Clay	Clay, silty, fine sandy, dark yellowish brown mottled pale grey	0.9	1.4
	Clay, silty, fine sandy, micaceous, with some race nodules, faintly laminated, dark grey	2.4	3.8
	Sand, silty, clayey, glauconitic, dark olive green	0.3	4.1
	Silt, fine sandy, clayey, micaceous, dark olive grey	2.7+	6.8

TL 52 SW 84 5161 2058 Harps, Great Hallingbury

Block D

Surface level +90.0 m
Water struck at +64.0 m
November 1980

Overburden 12.2 m
Mineral 3.0 m
Waste 1.0 m
Mineral 4.8 m
Waste 2.4 m
Mineral 1.7 m
Bedrock 4.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
Boulder Clay	Clay, silty, with chalk pellets and pebbles, pale yellow mottled grey	6.4	6.6
	Clay, silty, with pellets and pebbles of chalk, grey becoming dark grey	5.3	11.9
	Clay, silty, with flint and some chalk pebbles, yellowish brown	0.3	12.3

Kesgrave Sands and Gravels	a 'Very clayey' pebbly sand Gravel: fine with coarse, angular flint and rounded quartz; with rounded quartzite and well rounded flint; with some sandstone; and a trace of chalk, igneous metamorphic and ironstone Sand: medium with fine and coarse, subangular to subrounded quartz with some flint, brownish grey	3.0	15.2
	b Clay, very sandy, pebbly, quartz with angular and well rounded flint, yellowish brown	1.0	16.2
	c 'Very clayey' pebbly sand, becomes sandy with depth Gravel: fine with coarse, angular and well rounded flint and rounded quartz; with some sandstone; and a trace of quartzite and ironstone Sand: fine with medium and some coarse, subangular to subrounded flint and quartz, yellowish brown	4.8	21.0
	d Clay, silty, extremely sandy, with some angular flint, rounded quartz and flint with sandstone and quartzite pebbles; sand, fine with medium and a trace of coarse subrounded quartz, yellowish brown	2.4	23.4
	e 'Clayey' gravel Gravel: fine with coarse, angular flint and rounded quartzite with well rounded flint; and a trace of quartz and sandstone Sand: medium with coarse and fine, angular to subrounded quartz and some flint, orange brown	1.7	25.1
London Clay	Sand, fine, silty, dark greyish brown	1.0	26.1
	Sand, fine, silty, clayey in parts, very dark grey	3.7+	29.8

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages							
	Fines	Sand	Gravel		Fines	Sand			Gravel			
						- $\frac{1}{8}$	+ $\frac{1}{8}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
a	31	40	29	12.2-13.2	23	11	16	10	26	14	0	
				13.2-14.2	33	8	20	9	21	8	0	
				14.2-15.2	39	19	19	6	12	5	0	
				Mean	31	13	18	9	20	9	0	
b	43	41	16	15.2-16.2	22	15	4	8	8	0		
c	22	73	15	16.2-17.4	31	24	19	8	13	5	0	
				17.4-18.0	20	31	22	7	14	6	0	
				18.0-19.0	14	54	24	3	4	1	0	
				19.0-20.0	14	46	30	2	4	4	0	
				20.0-21.0	29	29	15	4	12	11	0	
Mean	22	36	22	5	10	5	0					
d	53	44	3	21.0-22.0	53	26	15	2	3	1	0	
				22.0-22.4	61	28	9	1	1	0	0	
				22.4-23.4	51	37	10	trace	2	trace	0	
				Mean	53	31	12	1	2	1	0	
e	14	35	51	23.4-24.4	13	10	19	8	29	21	0	
				24.4-25.1	15	7	13	12	34	19	0	
				Mean	14	9	16	10	31	20	0	
a+b+c +d+e	31	48	21	Mean	31	25	18	5	13	8	0	

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
12.2-15.2	34	16	28	17	4	1	0	0	0	trace	trace
15.2-16.2	Very small sample										
16.2-21.0	38	30	28	1	2	0	0	0	0	1	0
21.0-23.4	Very small sample										
23.4-25.1	44	16	2	37	1	0	0	0	0	0	0

TL 52 SW 85 5201 2462 Stansted Park, Stansted Mountfitchet Block B

Surface level +88.4 m Overburden 0.4 m
 Water not struck Mineral 1.0 m
 October 1980 Bedrock 5.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.4	0.4
Glacial Sand and Gravel	'Very clayey' gravel Gravel: coarse and fine, angular flint; with some sandstone and ironstone; and a trace of quartzite, well rounded flint, chalk, phosphatic nodules and quartz Sand: fine and coarse with fine, angular flint with some quartz, dark brown	1.0	1.4
Woolwich and Reading Beds	Clay, silty, stiff, waxy, strong brown mottled pale reddish brown	4.7	6.1
	Sand, fine and medium, subrounded quartz, greyish brown	0.5	6.6
	Clay, silty, stiff, waxy, strong brown mottled and streaked greenish grey	0.3+	6.9

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand			Gravel	
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
27	32	41	0.4-1.4	27	6	15	11	19	22	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
0.4-1.4	90	1	1	1	3	1	0	0	1	2	0

TL 52 SW 86 5276 2408

Burton Bower, Stansted Mountfitchet

Block A

Surface level +102.1 m
Water struck at +94.5 m
October 1980

Waste 16.2 m
Bedrock 3.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
Boulder Clay	Clay, silty, with some pebbles of chalk and flint, dark yellowish brown	1.4	1.6
	Clay, silty, with pellets and pebbles of chalk and some flint, brownish yellow to yellow	6.0	7.6
Glacial Sand and Gravel	Gravel, flint and chalk gravel, with chalky flint and quartz sand, grey	0.3	7.9
Boulder Clay	Clay, silty, with pellets and pebbles of chalk and flint, grey	7.0	14.9
	Clay, silty, with some chalk pelets, hard, dark grey to very dark grey	1.3	16.2
London Clay	Clay, becoming silty and fine sandy, micaceous, black	3.4+	19.6

TL 52 SW 87 5213 2406

Church House, Stansted Mountfitchet

Block A

Surface level +95.3 m
Water not struck
November 1980

Overburden 1.2 m
Mineral 1.6 m
Bedrock 2.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	1.2	1.2
Kesgrave Sands and Gravels	'Very clayey' pebbly sand Gravel: fine with a trace of coarse, rounded quartz and angular flint, with well rounded flint Sand: fine with medium and some coarse, subangular to subrounded quartz, with some mica, yellowish brown	1.6	2.8
London Clay	Clay, silty, soft, dark yellowish brown	0.7	3.5
	Clay, silty, stiff, very dark grey	1.5+	5.0

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				-#	+# - 1/4	+ 1/4 - 1	+ 1 - 4	+ 4 - 16	+ 16 - 64	+ 64 mm
25	71	4	1.2-2.2	26	35	29	6	4	0	0
			2.2-2.8	23	42	26	5	3	1	0
			Mean	25	38	28	5	4	trace	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
1.2-2.8	39	20	41	0	0	0	0	0	0	0	0

TL 52 SW 88 5263 2332 Stansted Airport, Stansted Mountfitchet Block D

Surface level +98.8 m Waste 15.5 m
 Water seepage +95.8 m to +93.5 m Bedrock 0.6 m+
 December 1980

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
Boulder Clay	Clay, silty, sandy, with pebbles of angular flint, firm, pale yellowish brown	0.2	0.4
	Clay, silty, with pellets and pebbles of chalk and some flint, soft, yellowish brown mottled pale grey	4.9	5.3
	Clay, silty, with pellets and pebbles of chalk and some flint, firm, greyish brown	0.5	5.8
	Clay, silty, with pellets and pebbles of chalk and some flint, stiff, grey becoming dark grey	3.0	8.8
	Clay, silty, with pellets and pebbles of chalk and some flint and black paper shale, stiff to hard, waxy, very dark grey	1.7	10.5
	Clay, silty, with pellets of chalk, and pebbles of flint, quartz and black paper shale, stiff, waxy, dark to very dark greyish brown	5.0	15.5
London Clay	Clay, silty, fine sandy, micaceous, pyriteous, firm, dark greyish brown	0.6+	16.1

TL 52 SW 89 5217 2223 Round Coppice, Stansted Mountfitchet Block D

Surface level +92.6 m Overburden 0.9 m
 Water struck at +90.9 m Mineral 4.1 m
 November 1980 Bedrock 0.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.6	0.6
Boulder Clay	Clay, silty, with some chalk pebbles, pale brownish grey	0.3	0.9
Kesgrave Sands and Gravels	Sandy Gravel Gravel: coarse and fine with a trace of cobble grade, angular and well rounded flint and rounded quartz; with quartzite and sandstone and a trace of igneous and metamorphic Sand: medium with some coarse and fine, angular to subrounded quartz with some angular flint, very pale yellow	4.1	5.0
London Clay	Clay, silty, yellowish brown becomes very dark grey from 5.6 m	0.9+	5.9

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand			Gravel	
				- $\frac{1}{8}$	+ $\frac{1}{8}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
4	51	45	0.9-1.7	13	17	42	8	12	6	0
			1.7-2.7*	3	8	51	7	15	15	1
			2.7-3.7*	1	2	32	5	21	38	1
			3.7-5.0*	1	3	27	7	23	37	2
			Mean	4	7	37	7	18	26	1

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
0.9-5.0	30	27	24	13	5	0	0	0	0	0	1

TL 52 SW 90 5264 2052 Bedlars Green, Great Hallingbury

Block D

Surface level +93.5 m
Water not struck
November 1980

Waste 9.5 m
Bedrock 1.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.5	0.5
Boulder Clay	Clay, silty, with pellets and pebbles of chalk, pale yellowish brown becomes mottled pale grey	2.5	3.0
	Clay, silty, with pellets and pebbles of chalk, olive grey mottled grey and dark grey	2.0	5.0
	Clay, silty, with chalk pellets, very dark grey	4.5	9.5
London Clay	Clay, silty, fissured, firm, waxy, greyish brown	1.1+	10.6

TL 52 SW 91 5392 2449 Tye Green, Elsenham

Block A

Surface level + 103.8 m
Water struck at +97.8 m
November 1980

Waste 20.8 m
Bedrock 1.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, fine sandy, with some angular flint pebbles	0.4	0.7
	Clay, silty, sandy, with pellets and pebbles of chalk and some angular flints, firm, yellowish brown	5.3	6.0
	'Very clayey' sandy gravel Gravel: fine with a trace of coarse, angular flint and rounded chalk, with a trace of fossil debris and quartz Sand: medium and coarse with some fine, subangular quartz with some chalk grey	0.2	6.2
	Clay, silty, with pellets and pebbles of chalk and some flint, black paper shale and a trace of quartz, firm becoming stiff, grey becoming very dark grey	14.6	20.8
London Clay	Clay, silty, fine sandy, with pockets of dark olive green glauconitic fine sand, micaceous, firm to stiff, dark grey	1.2+	22.0

Surface level +100.3 m
 Water struck at +94.3 m and +90.8 m
 December 1980

Waste 17.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
Boulder Clay	Clay, silty, with pellets and pebbles of chalk and some flint, pale yellowish brown	0.4	0.6
	Clay, silty, with pellets and pebbles of chalk and some flint, firm, pale yellowish brown mottled pale grey	3.4	4.0
	Clay, silty, with pellets and pebbles of chalk and some flint, firm, greyish brown	1.0	5.0
	Clay, silty, sandy, with thin chalky sand seams throughout, with pellets and pebbles of chalk and some flint, with a trace of black paper shale, grey	4.5	9.5
	'Very clayey' sandy gravel Gravel: fine, overwhelmingly chalk with some flint Sand: medium and coarse with a trace of fine, angular flint and chalk, pale grey	0.2	9.7
	Clay, silty, very silty in parts, with pellets and pebbles of chalk and flint, firm, pale greyish brown becoming pale grey	6.5	16.2
	Clay, silty, with chalk pellets and some pebbles of flint and black paper shale, very dark grey to black, very stiff, waxy	0.8	17.0
	Clay, silty, with chalk pellets and some pebbles of flint and black paper shale, stiff, dark brown	0.4	17.4 rock obstruction

Surface level +103.3 m
 Water struck at +93.7 m and 90.8 m
 December 1980

Waste 13.8 m
 Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
Boulder Clay	Clay, silty, sandy, with some angular flints and rounded flint and quartz, yellowish brown	0.8	1.0
	Clay, silty, with pellets and pebbles of chalk and some angular flints, pale yellowish brown	0.6	1.6
	Clay, silty, with pellets and pebbles of chalk and some angular flints, pale yellowish brown mottled grey	2.5	4.1
	Clay, silty, with pellets and pebbles of chalk and some angular flint, seam of chalk putty between 9.4 m and 9.6 m, grey becoming dark grey	8.4	12.5

Glacial Sand and Gravel	Pebbly sand, with thin chalky clay seams in uppermost 0.5 m Gravel: fine with coarse, well rounded and angular flint; with rounded quartz; with some chalk, sandstone and quartzite; and a trace of igneous, metamorphic and ironstone Sand: medium with fine and coarse, subrounded and subangular quartz with angular flint, and a trace of chalk and ironstone, grey becoming yellowish brown	1.3	13.8
London Clay	Clay, silty, fine sandy, laminated in parts, firm, orange brown	0.2	14.0
	Clay, silty, stiff, waxy, with mica, greyish brown becoming grey	0.4+	14.4

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand		Gravel			
				- $\frac{1}{16}$	$+\frac{1}{16}$ - $\frac{1}{4}$	$+\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
6	85	9	12.5-13.8*	6	28	40	17	6	3	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartzite	Sandstone	Chalk	Limestone	Fossil debris	Phosph. nodules	Ironstone	Others
	Ang.	W R									
12.5-13.8	33	44	13	2	3	5	0	0	0	trace	trace

TL 52 SW 94 5397 2196 Long Spring, Takeley Block D

Surface level +100.0 m
Water not struck
November 1980

Waste 11.9 m
Bedrock 6.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, with pellets and pebbles of chalk, yellowish brown	2.8	3.1
	Clay, silty, with pellets and pebbles of chalk and some flint, yellowish brown mottled pale grey	3.7	6.8
	Clay, silty, with pellets and pebbles of chalk and some flint, greyish brown becoming grey	5.1	11.9
London Clay	Clay, silty, stiff, dark greyish brown becoming dark grey	6.6+	18.5

Surface level +98.2 m
Water struck at +88.2 m
December 1980

Waste 10.0 m
Bedrock 0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
Boulder Clay	Clay, silty, fine sandy, with pellets and pebbles of chalk and some flint, firm to soft, pale yellowish brown mottled grey	4.1	4.3
	Clay, silty, fine sandy, with pellets and pebbles of chalk and some flint, greyish brown becoming pale grey	0.7	5.0
	Clay, silty, with pellets and pebbles of chalk and some flint, firm, dark grey	2.3	7.3
	Clay, silty, with pellets of chalk and some pebbles of flint and black paper shale, thin seam of fine and medium sand at base, very stiff to hard, waxy, very dark grey	2.7	10.0
London Clay	Clay, silty, stiff, waxy, micaceous, dark greyish brown	0.5+	10.5

Surface level +96.7 m
Water struck at +88.1 m and +87.8 m
November 1980

Waste 10.2 m
Bedrock 0.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.1	0.1
Boulder Clay	Clay, silty, with some chalk and flint pebbles, yellowish brown mottled grey with depth	0.9	1.0
	Clay, silty, with chalk and flint pebbles, yellowish brown becoming darker with depth	5.6	6.6
	Clay, silty, with chalk pellets and pebbles, and some flint pebbles, olive brown mottled grey becomes greyish brown	1.7	8.3
	Clay, silty, with pellets and pebbles of chalk, sandy with depth, thin sand seam at 8.6 m, dark grey	0.6	8.9
Kesgrave Sands and Gravels	Sandy gravel Gravel: fine and coarse, angular and well rounded flint; with rounded quartz; with some sandstone and quartzite; and a trace of phosphatic nodules Sand: medium with some coarse and fine, subangular to subrounded quartz, with a trace of flint, orange and yellowish brown	1.3	10.2
London Clay	Clay, silty, firm becoming stiff and waxy, dark orange brown becoming dark greyish brown	0.7+	10.9

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{8}$	+ $\frac{1}{8}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
6	70	24	8.9-10.2*	6	8	50	12	12	12	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
8.9-10.2	36	35	22	3	3	0	0	0	1	0	0

TL 52 SW 97 5354 2047 Portingbury Hills, Hatfield Broad Oak Block D

Surface level +93.4 m Waste 6.5 m
 Water not struck Bedrock 4.2 m+
 November 1980

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.7	0.7
Boulder Clay	Clay, silty, with pellets and pebbles of chalk and some flint, yellowish brown mottled grey	2.3	3.0
	Clay, silty, with pellets and pebbles of chalk and some flint, olive grey mottled grey, hard and waxy	2.0	5.0
	Clay, silty, with pellets and pebbles of chalk and some flint, brown	1.5	6.5
London Clay	Clay, silty, fissured, waxy yellowish brown	1.0	7.5
	Clay, silty, fissured, waxy, dark greyish brown	3.2+	10.7

TL 52 SW 98 5459 2493 Tye Green, Elsenham Block A

Surface level +104.6 m Waste 17.3 m
 Water struck at +97.6 m Bedrock 1.7 m+
 November 1980

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, with some angular flint pebbles, yellowish brown	0.2	0.5
	Clay, silty, with pellets and pebbles of chalk and some angular flints, stiff, yellowish brown	3.0	3.5
	Clay, silty, with pellets and pebbles of chalk and some angular flints, firm, yellowish brown mottled pale grey	3.5	7.0

Glacial Sand and Gravel	Very gravelly, sandy, silty, clay, gravel fine with coarse rounded chalk, with angular flint and a trace of sandstone, limestone, quartzite, quartz, and fossil debris, sand fine medium and coarse angular flint and chalk with some quartz	1.5	8.5
Boulder Clay	Silt, clayey, fine sandy, with pellets and pebbles of chalk and some flint, firm, pale yellowish brown	1.0	9.5
	Clay, silty, fine sandy, with pellets and pebbles of chalk and some flint and black paper shale, firm, yellowish brown	1.5	11.0
	Clay, silty, with pellets and pebbles of chalk and some flint and black paper shale, stiff, grey	5.3	16.3
	Clay, silty, sandy, with pellets of chalk and angular flint with quartz pebbles, becomes very sandy with depth, and thin sand seam at base, strong brown	1.0	17.3
London Clay	Clay, silty, fine sandy, micaceous, pyriteous, with comminuted shell debris in parts, stiff to hard, very dark grey	1.7+	19.0

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
48	31	21	7.0-8.5*	48	13	10	8	15	6	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
7.0-8.5	16	0	1	1	3	78	1	trace	0	0	trace

TL 52 SW 99 5469 2359 Stansted Airport, Stansted Mountfitchet Block D

Surface level +98.2 m
Water struck at +94.2 m
November 1980

Waste 23.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
Boulder clay	Clay, silty, with pellets and pebbles of chalk and some flints, firm, yellowish brown	1.3	1.5
	Clay, silty, sandy, very sandy in parts, with pellets and pebbles of chalk and some flint, dark yellowish brown mottled grey	1.9	3.4
	Clay, silty, with pellets and pebbles of chalk and a trace of flint, some sandy fissures, dark yellowish grey	2.6	6.0

Clay, silty, with pellets and pebbles of chalk and some flint and black shale, grey becoming darker with depth	10.3	16.3
Clay, silty, with chalk pellets and pebbles and a trace of flint, stiff, greyish brown	3.0	19.3
Clay, silty, with some thin sand seams, with pellets and some pebbles of chalk and some flint, very stiff to hard, waxy, very dark brown becoming dark grey	4.2+	23.5

TL 52 SW 100 5486 2155 Takeley Street, Takeley Block D

Surface level +82.6 m Waste 25.4 m+
 Water not struck
 November 1980

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
Boulder Clay	Clay, very silty, with some chalk and flint pebbles, yellow	2.8	3.0
	Clay, silty, with chalk pellets and pebbles, dark grey becoming grey	22.4+	25.4

TL 52 SE 13 5511 2411 Stansted Airport, Stansted Mountfitchet Block D

Surface level +103.3 m Waste 15.9 m
 Water struck at +100.1 m and +87.4 m Bedrock 0.9 m+
 November 1980

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
Boulder Clay	Clay, silty, fine sandy, with some fine flint pebbles and rare chalk pellets, firm, dark yellowish brown	0.4	0.6
	Clay, silty, with pellets and pebbles of chalk and some angular flint, yellowish brown mottled grey around chalk pebbles	2.6	3.2
	Clay, silty, with chalk pellets and pebbles and thin chalky sand seams, brown	0.3	3.5
	Clay, silty, with pellets and pebble of chalk and some flint and and black shale, firm becoming stiff, grey becoming dark grey	12.0	15.5
	Clay, silty, packed with chalk pellets, flint cobble at base, stiff to hard, waxy	0.4	15.9
London Clay	Clay, silty, fine sandy, micaceous, with comminuted shell debris, stiff to hard, very dark greyish brown	0.9+	16.8

Surface level +100.0 m
 Water struck at +93.7 m and +91.4 m
 November 1980

Waste 15.2 m
 Bedrock 1.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	1.7	1.7
Boulder Clay	Clay, silty, with pebbles and pellets of chalk and some angular flint, yellowish brown mottled grey	1.8	3.5
	Clay, silty, with pebbles and pellets of chalk and some angular black flint, firm, yellowish brown	2.0	5.5
	Clay, silty, with pebbles and pellets of chalk and some angular flint and black shale, stiff, grey becoming dark grey	0.8	6.3
	Sand, 'clayey', fine and medium subangular quartz	0.2	6.5
	Clay, silty, with some silty sand seams between 8.0 m and 9.0 m, with pebbles and pellets of chalk, black shale and flint, stiff, grey becoming dark grey	7.5	14.0
	Clay, silty, with pellets of chalk and rare pebbles of flint and quartz, stiff and waxy, very dark brown	1.2	15.2
London Clay	Clay, silty, fine sandy, with pockets of dark brownish green sand, micaceous, stiff to hard, waxy, very dark brown	1.8+	17.0

Surface level +89.0 m
 Water struck at +82.2 m
 November 1980

Waste 7.2 m
 Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, with pebbles of flint and chalk, yellowish brown	0.3	0.6
	Clay, silty, with pellets of chalk and flint, yellowish brown becoming light brown mottled light grey	2.6	3.2
	Clay, silty, with pellets and pebbles of chalk and some flint, dark grey	3.6	6.8
	Sand, 'clayey' with chalk pellets, light greyish brown	0.1	6.9
	Clay, silty, with chalk pellets, very soft, dark grey	0.3	7.2
London Clay	Clay, silty, stiff, waxy, dark greyish black	1.0+	8.2

Surface level +91.0 m
 Water struck at +84.8 m
 November 1980

Overburden 5.2 m
 Mineral 3.1 m
 Bedrock 0.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.4	0.4
Boulder Clay	Clay, silty, with some flint pebbles, dark yellowish brown	0.7	1.1
	Clay, silty, with pellets and pebbles of chalk and some flint, light grey to pale yellow becoming light brownish grey	4.1	5.2
Kesgrave Sands and Gravels	Gravel, with some clay pellets in uppermost 0.5 m Gravel: fine and coarse with a trace of cobble grade at base, well rounded flint, rounded quartz and angular flint; with subrounded quartzite; and some sandstone, igneous and metamorphic Sand: medium with coarse and some fine, subangular to subrounded quartz with angular flint, orange brown	3.1	8.3
London Clay	Clay, silty, yellowish brown becomes very dark brownish grey	0.9+	9.2

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand			Gravel	
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
4	43	53	5.2-6.2	9	8	16	20	32	15	0
			6.2-7.2*	2	1	24	13	36	24	0
			7.2-8.3*	1	4	33	10	23	28	1
			Mean	4	4	25	14	30	23	trace

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
5.2-8.3	25	29	28	13	3	0	0	0	0	0	2

Surface level +109.7 m
 Water struck at +97.7 m
 November 1980

Waste 27.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, with some angular flint pebbles, orange brown mottled yellowish brown	0.5	0.8
	Clay, silty, sandy, with pellets and pebbles of chalk and some flint, orange brown and yellowish brown mottled light grey	3.4	4.2
	Clay, silty, sandy, with pellets and pebbles of chalk and some flint, grey	6.8	11.0

Clay, silty, with discrete seams of fine and medium sand throughout, grey	1.0	12.0
Clay, silty, sandy, with pellets and pebbles of chalk and some flint, grey becoming dark grey, becomes brownish grey from 24.5 m to 25.6 m	15.7+	27.7

TL 52 SE 18 5652 2406 Waltham Hall, Takeley Block D

Surface level +108.1 m Waste 25.0 m
Water struck at +98.1 m Bedrock 1.0 m+
November 1980

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, sandy, with some chalk pellets, yellowish brown	0.2	0.5
	Clay, silty, sandy, with pellets of chalk, yellowish brown mottled light grey	1.6	2.1
	Clay, silty, sandy, with pellets and pebbles of chalk and some flint, brownish grey becoming grey from 5.0 m	9.4	11.5
	Clay, silty, with discrete 'clayey' sand seams throughout, some chalk pellets, grey	1.5	13.0
	Chalk rubble, with some interstitial clay, greyish white	0.7	13.7
	Clay, silty, sandy, with pebbles and pellets of chalk, grey	3.3	17.0
	Clay, silty, with discrete sand seams up to 30 cms thick through, some chalk pellets, grey and light-grey	2.0	19.0
	Clay, silty, with pellets of chalk and black paper shale and some angular flint, very stiff to hard, waxy, olive-grey becoming black	6.0	25.0
London Clay	Clay, silty, with faint laminations and bioturbation, micaceous, very stiff, olive-grey	1.0+	26.0

TL 52 SE 19 5658 2241 Warish Hall, Takeley Block D

Surface level +95.5 m Waste 12.9 m
Water struck at +83.4 m Bedrock 0.8 m+
November/December 1980

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.5	0.5
Boulder Clay	Clay, silty, with pellets and pebbles of chalk, yellowish brown mottled light grey	4.8	5.3
	Clay, silty, with pellets and pebbles of chalk, grey becoming dark grey	6.8	12.1
Glacial Sand and Gravel	'Very' clayey pebbly sand Gravel: fine and coarse, rounded chalk and angular flint; with rounded quartz; and some limestone, igneous, metamorphic, well rounded flint, sandstone and quartzite Sand: medium with fine and a trace of coarse, angular quartz with some chalk, grey	0.8	12.9

London Clay

Clay, silty, dark yellowish brown becomes dark brownish grey

0.8+ 13.7

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16} - \frac{1}{4}$	$+\frac{1}{4} - 1$	$+1 - 4$	$+4 - 16$	$+16 - 64$	$+64$ mm
24	70	6	12.1-12.9*	24	17	50	3	3	3	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
12.1-12.9	33	2	11	2	2	43	4	0	0	0	3

TL 52 SE 20**5625 2023****South of Woodlands, Hatfield Broad Oak****Block D**

Surface level +93.2 m
 Water struck at +84.9 m
 November 1980

Overburden 8.3 m
 Mineral 4.0 m
 Bedrock 0.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder clay	Clay, silty, with chalk pellets and pebbles, brownish yellow mottled light grey becoming darker with depth	3.7	4.0
	Clay, silty, with pellets and pebbles of chalk and some flint and black shale, dark grey	4.3	8.3
Kesgrave Sands and Gravels	Gravel Gravel: coarse and fine with a trace of cobble grade, well rounded flint, rounded quartz and quartzite; with angular flint; and a trace of sandstone, chalk and limestone at top, igneous and metamorphic Sand: medium with some fine and coarse, subangular quartz with some angular flint, pale yellow	4.0	12.3
London Clay	Clay, silty, yellowish brown becomes dark greyish brown from 13.0 m	0.9+	13.2

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16} - \frac{1}{4}$	$+\frac{1}{4} - 1$	$+1 - 4$	$+4 - 16$	$+16 - 64$	$+64$ mm
2	45	53	8.3-9.6*	5	6	50	6	21	11	1
			9.6-10.3*	1	5	30	6	22	35	1
			10.3-11.3*	1	3	31	8	27	28	2
			11.3-12.3*	0	2	18	9	31	39	1
			Mean	2	4	34	7	25	27	1

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
8.3-12.3	15	31	27	24	2	1	trace	0	0	0	trace

TL 52 SE 21 5788 2491 Near North Hall, Broxted Block D

Surface level +105.6 m Waste 21.3 m+

Water struck at +91.6 m and +84.8 m

November 1980

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil and made ground	0.4	0.4
Boulder Clay	Clay, silty, fine and sandy, with angular flint pebbles, yellowish brown	0.2	0.6
	Clay, silty, sandy, with pellets and pebbles of chalk and some flint, pale yellowish brown mottled grey	0.4	1.0
	Clay, silty, with pellets and pebbles of chalk and some flint, stiff, pale brown becoming greyish brown	5.0	6.0
	Clay, silty, with pellets and pebbles of chalk and a trace of flint, limestone and black shale, stiff, grey becoming dark grey	5.0	11.0
	Clay, silty, sandy, with pellets and pebbles of chalk and some flint, firm, grey mottled brown	0.4	11.4
	Chalk rubble in a soft puggy sandy matrix, creamy white	0.6	12.0
	Clay, silty, sandy, with pebbles and pellets of chalk and some angular flint, a trace of black shale and quartz with depth, firm, grey	8.8	20.8
Glacial Sand and Gravel	'Very clayey' sandy gravel Gravel: coarse and fine, angular flint, rounded quartz and well rounded flint; with rounded chalk; with a trace of sandstone and limestone Sand: medium and fine with some coarse, angular quartz with some angular flint and chalk, pale greyish brown	0.5+	21.3

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				-16	+16 - 4	+4 - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
20	58	22	20.8-21.3*	20	24	30	4	10	12	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartzite	Sandstone	Chalk	Limestone	Fossil debris	Phosph. nodules	Ironstone	Others
	Ang.	W R									
20.8-21.3	32	22	28	0	3	14	1	0	0	0	0

TL 52 SE 22 5763 2349 Cobbs Lane, Takeley

Block D

Surface level +101.7 m
 Water struck at +97.8 m and +87.9 m
 November/December 1980

Waste 17.0 m
 Bedrock 0.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, with pellets and pebbles of chalk and some flint, firm, pale yellowish brown	4.7	5.0
	Clay, silty, fine sandy, with some thin fine and medium sand seams, pellets and pebbles of chalk and some flint, soft, pale greyish brown	4.5	9.5
	Clay, silty, with pellets and pebbles of chalk and some flint and black shale, stiff, grey becoming dark grey	4.3	13.8
Kesgrave Sands and Gravels	Sandy gravel Gravel: coarse and fine, angular and well rounded flint; with rounded quartz and quartzite; and a trace of chalk, sandstone, limestone, ironstone, and phosphatic nodules Sand: medium and some coarse and fine, subangular to subrounded quartz, with some angular flint and a trace of chalk at top, grey becoming yellowish brown	3.2	17.0
London Clay	Clay, silty, micaceous, stiff, waxy, dark yellowish brown becoming greyish brown	0.4+	17.4

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				-1/16	+1/16 - 1/4	+1/4 - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
4	71	25	13.8-14.8*	6	4	35	12	18	25	0
			14.8-15.8*	3	7	67	9	5	9	0
			15.8-17.0*	2	8	57	14	11	8	0
			Mean	4	6	53	12	11	14	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartzite	Sandstone	Chalk	Limestone	Fossil debris	Phosph. nodules	Ironstone	Others
	Ang.	W R									
13.8-17.0	32	32	22	10	1	1	1	0	trace	1	trace

Surface level +104.5 m
 Water struck at +96.7 m and +86.6 m
 December 1980

Waste 21.0 m
 Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.5	0.5
Boulder Clay	Clay, silty, with pebbles of chalk, yellowish brown	7.3	7.8
	Intermalminated sand, silt, clay, and chalk gravel seams, yellowish brown	0.7	8.5
	Clay, silty, with pebbles of pellets of chalk, grey becoming dark grey from 15.1 m	9.4	17.9
Kesgrave Sands and Gravels	Pebbly sand, gravel in uppermost 1.0 m becomes sand with some pebbles Gravel: fine and coarse with a trace of cobble grade at top, well rounded and angular flint; with rounded quartzite and quartz; and a trace of igneous, metamorphic, sandstone, chalk, limestone and ironstone at top Sand: medium with coarse and fine, subangular to subrounded quartz with some angular flint	3.1	21.0
London Clay	Clay, silty, firm, dark grey	0.3+	21.3

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
5	76	19	17.9-18.9*	6	4	26	11	23	27	3
			18.9-19.9*	6	18	66	9	1	0	0
			19.9-21.0*	3	13	63	16	4	1	0
			Mean	5	12	52	12	9	9	1

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
17.9-21.0	27	33	17	22	trace	trace	trace	0	0	trace	1

TL 52 SE 24 5722 2244 Fanns Wood, Takeley

Block D

Surface level +97.8 m
Water struck at +92.3 m
December 1980

Waste 19.0 m
Bedrock 0.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.5	0.5
Boulder Clay	Clay, silty, with some chalk pellets, yellowish brown	0.8	1.3
	Clay, silty, with pellets and pebbles of chalk, yellowish brown mottled grey	2.9	4.2
	Clay, silty, with pellets and pebbles of chalk, grey	1.3	5.5
	Chalk rubble with interstitial silty clay, grey	2.4	7.9
	Clay, silty, with chalk and some flint pebbles, grey becoming dark grey	10.7	18.6
	Clay, sandy, silty, with some chalk and flint pebbles, dark yellowish brown	0.4	19.0
London Clay	Clay, silty, dark greyish black	0.4+	19.4

TL 52 SE 25 5748 2041 Bullocks, Great Canfield

Block D

Surface level +90.7 m
Water struck at +82.4 m
November 1980

Waste 9.0 m
Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.4	0.4
Boulder Clay	Clay, silty, with some pebbles of chalk and flint, yellowish brown	0.5	0.9
	Clay, silty, with pellets and pebbles of chalk and some flint, becomes very silty and soft below 2.0 m, yellowish brown mottled light grey	2.9	3.8
	Chalk rubble in a soft puggy matrix, creamy white	0.2	4.0
	Clay, silty, with pellets and pebbles of chalk and flint, brownish grey becoming dark grey	4.0	8.3
Kesgrave Sands and Gravels	Gravel	0.7	9.0
	Gravel: fine and coarse, well rounded flint; with angular flint, rounded quartzite, and rounded quartz; with a trace of chalk and sandstone Sand: medium with coarse and some fine, subangular to subrounded quartz with angular flint, yellowish brown		
London Clay	Clay, silty, yellowish brown becomes very dark grey from 9.5 m	0.8+	9.8

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand			Gravel	
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
3	39	58	8.3-9.0*	3	3	25	11	29	29	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
8.3-9.0	18	50	13	17	1	1	0	0	0	0	0

TL 52 SE 26

5897 2433

Brookend, Broxted

Block D

Surface level +96.9 m

Water struck at +92.7 m and +86.1 m

December 1980

Waste 14.0 m
Bedrock 0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.1	0.1
Boulder Clay	Clay, silty, with pellets and pebbles of chalk and some flint, dark yellowish brown mottled grey	4.1	4.2
	Chalk rubble in soft puggy matrix, white	1.7	5.9
	Clay, silty, with some chalk pellets, yellowish brown	0.2	6.1
	Clay, silty, with pellets and pebbles of chalk and some flint, grey becoming dark grey	4.7	10.8
Kesgrave Sands and Gravels	Pebbly sand, with some clay fragments in upper 1.0 m Gravel: fine and coarse with a trace of cobble grade in upper 1.0 m, angular and well rounded flint; with rounded quartz and quartzite; and a trace of sandstone, ironstone, fossil debris and chalk in uppermost 1.0 m Sand: medium with fine and coarse, subangular to subrounded quartz with some angular flint, greyish brown	3.2	14.0
London Clay	Clay, silty, very dark grey	0.5+	14.5

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand			Gravel	
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
4	73	23	10.8-11.8*	3	5	39	14	24	13	2
			11.8-12.8*	3	8	54	12	13	10	0
			12.8-14.0*	6	30	39	6	4	5	0
			Mean	4	15	48	10	13	9	1

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
10.8-14.0	32	30	19	13	3	1	0	1	0	1	0

TL 52 SE 27 5825 2402 Cobb's Lane, Broxton Block D

Surface level +103.3 m Waste 19.7 m
 Water struck at +87.3 m Bedrock 1.2 m+
 November/December 1980

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.2	0.2
Boulder Clay	Clay, silty, with pellets and pebbles of chalk, yellowish brown mottled grey	2.5	2.7
	Clay, silty, with pebbles and pellets of chalk and some flint, grey becomes dark grey and yellowish brown towards base	7.1	9.8
	Chalk rubble in a soft puggy matrix, white	0.8	10.6
	Clay, silty, with pellets and pebbles of chalk with some flint, grey becoming dark grey and yellowish brown at base	5.4	16.0
Kesgrave Sands and Gravels	Pebbly sand Gravel: coarse and fine, well rounded flint, rounded quartz and angular flint; with some quartzite and sandstone; with a trace of chalk at top Sand: medium with some coarse and fine, subangular to subrounded quartz and a trace of angular flint, greyish brown	3.7	19.7
London Clay	Clay, silty, very dark grey	1.2+	20.9

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand			Gravel	
				-1/16	+1/16 - 1/4	+1/4 - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
4	85	11	16.0-17.0*	5	10	57	5	8	15	0
			17.0-18.0*	3	6	68	10	6	17	0
			18.0-19.0*	3	6	84	5	1	1	0
			19.0-19.7*	4	14	71	7	2	2	0
			Mean	4	8	70	7	4	7	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
16.0-19.7	25	34	32	5	3	1	0	0	0	0	trace

Surface level +99.4 m
 Water struck at +85.4 m
 November 1980

Waste 15.7 m
 Bedrock 0.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.1	0.1
Boulder Clay	Clay, silty, with pellets and pebbles of chalk, pale yellowish brown mottled pale grey, chalk cobbles at base	2.6	2.7
	Clay, silty, with pellets and pebbles of chalk, grey	2.3	5.0
	Clay, sandy, silty, with some chalk pellets, greyish brown	1.7	6.7
	Clay, silty, with abundant chalk pellets and some black shale, grey becoming dark grey	7.3	14.0
Kesgrave Sands and Gravels	Sandy gravel Gravel: coarse and fine, well rounded flint; with angular flint and rounded quartz; with some quartzite, sandstone and phosphate nodules; with a trace of chalk, ironstone, igneous and metamorphic Sand: medium with fine and coarse, subangular to subrounded quartz with some angular flint, brownish grey	1.7	15.7
London Clay	Clay, silty, very dark grey	0.7+	16.4

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
8	67	25	14.0-15.0*	10	6	40	15	7	22	0
			15.0-15.7*	6	13	52	11	8	10	0
			Mean	8	9	45	13	8	17	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartzite	Sandstone	Chalk	Limestone	Fossil debris	Phosph. nodules	Ironstone	Others
	Ang.	W R									
14.0-15.7	25	40	23	5	2	1	0	0	2	1	1

Surface level +94.5 m
 Water struck at +85.5 m
 December 1980

Overburden 6.5 m
 Mineral 6.4 m
 Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil and made ground	0.5	0.5
Boulder Clay	Clay, silty, dark yellowish brown	0.3	0.8
	Clay, silty, with pellets and pebbles of chalk, dark yellowish brown mottled grey	5.7	6.5

Kesgrave Sands and Gravels	Sandy gravel Gravel: fine with coarse and a trace of cobble grade at base, angular flint; with well rounded flint and rounded quartz; with some quartzite and sandstone; and a trace of igneous, metamorphic and chalk Sand: medium with coarse and some fine, angular to subrounded quartz, with angular flint, orange brown	6.4	12.9
London Clay	Clay, silty, dark yellowish brown becoming dark grey from 13.1 m	0.6+	13.5

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
5	60	35	6.5-6.9	19	7	45	8	12	9	0
			6.9-7.9*	5	2	29	16	30	17	0
			7.9-8.9*	11	4	14	14	35	22	0
			8.9-10.0*	3	3	35	12	20	27	0
			10.0-11.0*	1	3	60	9	17	10	0
			11.0-12.0*	1	4	54	30	10	1	0
			12.0-12.9*	4	15	42	16	16	6	1
			Mean	5	5	39	16	21	14	trace

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
6.5-12.9	37	23	23	11	4	trace	0	0	0	0	2

TL 52 SE 30 5827 2115 Old Railway, Little Canfield Block D

Surface level +88.8 m Waste 5.6 m
 Water struck +83.9 m Bedrock 0.6 m+
 November 1980

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, with flint pebbles, dark yellowish brown	0.4	0.7
	Clay, silty, sandy, extremely pebbly with angular flint, yellowish brown mottled light grey	0.9	1.6
	Clay, silty, with pebbles of flint and chalk, yellowish brown mottled grey becoming yellowish brown	3.3	4.9

Kesgrave Sands and Gravels	Sandy gravel, with some chalk and limestone contamination from above Gravel: fine with coarse, angular and well rounded flint; with rounded quartz; and some chalk, sandstone and quartzite; with a trace of limestone Sand: coarse and medium with fine, angular to subrounded quartz with some angular flint and quartz, yellow	0.7	5.6
London Clay	Clay, silty, dark yellowish brown becomes very dark grey from 5.8 m	0.6+	6.2

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{8}$	+ $\frac{1}{8}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
7	58	35	4.9-5.6*	7	11	23	24	22	13	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
4.9-5.6	36	33	16	3	4	7	1	0	0	0	trace

TL 52 SE 31 5873 2008 Copt Hall, Little Canfield

Block D

Surface level +89.2 m
Water struck at +81.6 m, +74.1 and +73.3
November 1980

Overburden 15.9 m
Mineral 6.4 m
Bedrock 1.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, with chalk pellets and pebbles, yellowish brown	1.8	2.1
	Silt, clayey, some chalk and flint pebbles, fine sandy in parts, banded yellowish brown and pale grey	0.9	3.2
	Clay, silty, with pellets and pebbles of chalk and some flint, pale yellowish brown becoming greyish brown	4.4	7.6
	Clay, silty, with pellets and pebbles of chalk and some flint, grey	8.3	15.9
Kesgrave Sands and Gravels	Gravel Gravel: fine and coarse with a trace of cobble grade, angular and well rounded flint and rounded quartzite; well rounded quartz; with a trace of sandstone, chalk, limestone, igneous, metamorphic, fossil debris and phosphatic nodules Sand: medium with fine and coarse, angular to subrounded quartz and some angular flint, grey becoming yellowish brown	6.4	22.3

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand			Gravel	
				- $\frac{1}{8}$	+ $\frac{1}{8}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
2	36	62	15.9-16.8	4	9	13	8	40	26	0
			16.8-17.8	2	13	7	4	39	35	0
			17.8-18.8	2	11	16	11	24	36	0
			18.8-19.8	3	12	24	11	29	19	2
			19.8-20.8	2	11	20	12	32	23	0
			20.8-21.8	2	8	10	8	35	37	0
			21.8-22.3	1	13	20	9	23	34	0
			Mean	2	11	16	9	32	30	trace

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
15.9-22.3	32	26	17	23	1	1	trace	trace	trace	0	trace

TL 52 SE 32**5952 2430****Perryfield Ponds, Little Easton****Block D**

Surface level +89.3 m
 Water struck at +87.2 m
 November 1980

Overburden 1.9 m
 Mineral 3.7 m
 Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, with some flint pebbles, dark yellowish brown	1.8	2.1
Kesgrave Sands and Gravels	a Sandy gravel Gravel: coarse and fine, rounded quartz, angular and well rounded flint; with rounded quartzite; and some igneous metamorphic and sandstone Sand: medium and coarse and fine, subangular to subrounded quartz, greyish brown	1.9	4.0
	b Sand, with a trace of pebbles Gravel: a trace of fine, angular and well rounded flint, quartz and ironstone Sand: medium with some fine and a trace of coarse, subangular to rounded quartz, orange brown	1.6	5.6
London Clay	Clay, silty, dark yellowish brown becomes very dark grey from 5.8 m	0.6+	6.2

GRADING

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines		Sand			Gravel	
					-16	+16 - 4	+4 - 1	+1 - 4	+4 - 16	+16 - 64	+64 mm
a	2	70	28	2.1-3.1*	1	2	41	16	19	21	0
				3.1-4.0*	4	14	61	6	4	11	0
				Mean	2	8	51	11	12	16	0
b	3	97	0	4.0-5.0*	4	15	80	1	trace	0	0
				5.0-5.6*	2	25	72	0	1	0	0
				Mean	3	19	77	1	trace	0	0
a+b	3	81	16	Mean	3	13	61	7	7	9	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartzite	Sandstone	Chalk	Limestone	Fossil debris	Phosph. nodules	Ironstone	Others
	Ang.	W R									
2.1-4.0	28	25	29	11	3	0	0	0	0	4	
4.0-5.6	Very small sample										

TL 52 SE 33 5976 2363 Easton Lodge, Little Easton Block D

Surface level +94.8 m Waste 12.4 m
 Water struck at +83.8 m Bedrock 0.5 m+
 November 1980

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.3	0.3
Boulder Clay	Clay, silty, with some flint pebbles, dark yellowish brown	0.8	1.1
	Clay, silty, with pellets and pebbles of chalk and some flint, yellowish brown mottled light grey	2.9	4.0
	Clay, silty, with some chalk pellets, greyish brown	2.8	6.8
	Clay, silty, with a thin sand seam at base, with some pellets and pebbles of chalk, grey	4.2	11.0
	Clay, silty, with pellets of chalk, stiff, dark grey becoming black	0.6	11.6
Kesgrave Sands and Gravels	Gravel Gravel: coarse and fine, well rounded flint and rounded quartz; with angular flint; with some quartzite, sandstone, igneous and metamorphic; and a trace of ironstone Sand: medium and coarse with some fine, subangular to subrounded quartz and some angular flint, yellowish brown	0.8	12.4
London Clay	Clay, silty, dark yellowish brown becomes very dark grey from 12.7 m	0.5+	12.9

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines	Sand			Gravel		
				- $\frac{1}{8}$	+ $\frac{1}{8}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
3	36	61	11.6-12.4*	3	3	19	14	30	31	0

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
11.6-12.4	22	33	30	9	3	0	0	0	0	1	2

TL 52 SE 34

5951 2274

Near Stone Hall, Little Canfield

Block D

Surface level +94.5 m
Water struck at +85.2 m
November 1980

Overburden 7.0 m
Mineral 7.5 m
Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.2	0.2
Boulder Clay	Clay, silty, with some chalk and flint pebbles, yellowish brown	1.5	1.7
	Clay, silty, with pellets and pebbles of chalk and flint, greyish brown	0.4	2.1
	Clay, silty, with pellets and pebbles of chalk and some flint, yellowish brown mottled pale grey	4.9	7.0
Kesgrave Sands and Gravels	Pebbly sand Gravel: fine and coarse with a trace of cobble grade, angular flint, rounded quartz and well rounded flint; with some quartzite and sandstone; and a trace of igneous, metamorphic, ironstone, chalk and fossil debris Sand: medium with fine and some coarse, subangular to subrounded quartz, with some flint, yellowish brown	7.5	14.5
London Clay	Clay, silty, firm, dark yellowish brown becomes very dark grey from 14.8 m	0.6+	15.1

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand		Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
5	83	12	7.0-8.0	10	24	62	2	2	trace	0
			8.0-9.0	7	9	46	8	21	9	0
			9.0-9.3	13	53	30	2	2	0	0
			9.3-10.3*	5	12	77	3	3	trace	0
			10.3-11.3*	2	15	54	7	9	11	2
			11.3-12.3*	3	8	55	16	12	6	0
			12.3-13.3*	3	24	63	5	2	1	2
			13.3-14.5*	3	37	42	14	4	trace	0
			Mean	5	20	55	8	7	4	1

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
7.0-14.5	34	28	29	6	2	trace	0	trace	0	trace	1

TL 52 SE 35 5963 2145 Strood Hall, Great Dunmow

Block D

Surface level +86.4 m
Water struck at +84.6 m
November 1980

Overburden 1.5 m
Mineral 2.0 m
Bedrock 1.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	1.5	1.5
Kesgrave Sands and Gravels	Gravel, 'clayey' in uppermost 0.3 m Gravel: fine and coarse with a trace of cobble grade, angular and well rounded flint and rounded quartz; with rounded quartzite; and some sandstone; with a trace of igneous, metamorphic and ironstone Sand: medium with coarse and a trace of fine, subangular to subrounded quartz with some flint, yellowish brown	2.0	3.5
London Clay	Clay, silty, yellowish brown becomes dark grey from 4.2 m	1.5+	5.0

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand		Gravel		
				- $\frac{1}{16}$	+ $\frac{1}{16}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
6	47	47	1.5-1.8*	11	6	32	8	24	19	0
			1.8-2.8*	8	3	25	21	29	14	0
			2.8-3.5*	1	2	28	14	23	30	2
			Mean	6	3	27	17	26	20	1

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
1.5-3.5	28	26	24	16	4	0	0	0	0	1	1

TL 52 SE 36 5929 2084 Near the Rectory, Little Canfield

Block D

Surface level +89.2 m
Water struck at +81.3 m
November 1980

Waste 9.5 m
Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Topsoil	0.4	0.4
Boulder Clay	Clay, silty, with pebbles of flint and some chalk, dark yellowish brown	1.1	1.5
	Clay, silty, with pellets and pebbles of chalk and some flint, pale yellowish brown mottled light grey	4.2	5.7
	Clay, silty, with some chalk pellets and flint pebbles, dark grey	2.2	7.9
Kesgrave Sands and Gravels	Gravel: Gravel: fine with coarse and a trace of cobble grade, well rounded flint, rounded quartz and angular flint; with rounded quartzite; with some sandstone; and a trace of igneous and metamorphic Sand: medium and coarse with some fine, subangular to subrounded quartz, with some angular flint, greenish grey	1.6	9.5
London Clay	Clay, silty, firm, dark yellowish brown becomes very dark grey	0.8+	10.3

GRADING

Mean for deposit percentages			Depth below surface (m)	percentages						
Fines	Sand	Gravel		Fines		Sand		Gravel		
				- $\frac{1}{8}$	+ $\frac{1}{8}$ - $\frac{1}{4}$	+ $\frac{1}{4}$ -1	+1 -4	+4 -16	+16 -64	+64 mm
2	35	63	7.9-8.9*	2	2	14	13	40	28	1
			8.9-9.5*	2	4	24	17	28	24	1
			Mean	2	3	18	14	36	26	1

COMPOSITION

Depth below surface (m)	Percentage by weight in the 8-16 mm fraction										
	Flint		Quartz	Quartz-ite	Sand-stone	Chalk	Lime-stone	Fossil debris	Phosph. nodules	Iron-stone	Others
	Ang.	W R									
7.9-9.5	23	31	26	16	3	0	0	0	0	0	1

IGS REGISTRY RECORDS

NW 8, 9, 10, 25, 30, 31, 32, 33, 49, 54, 57, 58, 59, 62, 65, 68, 69, 71; NE 2, 4, 6, 8;

SW 6, 7, 13, 18, 45, 46, 57, 58, 68, 69, 71, 72; SE 4, 7.

OTHER RECORDS

Information from 78 other boreholes was also used in the assessment of resources. It was obtained from the minerals industry and private companies and is held in confidence by IMAU.

The following reports of the Institute relate particularly to bulk mineral resources

Reports of the Institute of Geological Sciences

Assessment of British Sand and Gravel Resources

- 1 The sand and gravel resources of the country south-east of Norwich, Norfolk: Resource sheet TG 20. E. F. P. Nickless. Report 71/20 ISBN 0 11 880216 X £1.15
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THE SAND AND GRAVEL RESOURCES OF THE
COUNTRY AROUND STANSTED MOUNTFITCHET, ESSEX

Scale 1:25 000 or about 2 1/4 Inches to 1 Mile

ORDNANCE SURVEY
SHEET TL52
PROVISIONAL EDITION

This map should be read in conjunction with the accompanying report which contains details of the assessment of the resources.

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EXPLANATION OF SYMBOLS AND ABBREVIATIONS

- DRIFT**
- Attkum - silt, clay and fine sand with seams of fine gravel and organic debris; yellowish brown A-64
 - First Terrace - clayey and sandy flint gravels; yellowish brown 1T-36
 - Head - locally derived, variable, softfaced, silty, sandy clay with pebbles; brown H-42
 - Boulder Clay - silty clay with some fine sand, with flint and chalk erratics; dark grey weathering to ochre brown BC-38
 - Glacial Silt - laminated sandy silt and silty fine sand with some chalk pellets; pale grey GSI-8
 - Glacial Sand and Gravel - 'clayey' sandy gravel, predominantly of flint; yellowish brown GS-70
 - Keegrave Sands and Gravels - sand, 'clayey' sand, and sandy gravel predominantly of angular and well rounded flint, and quartz; yellowish brown K-7
- SOLID**
- Red Crag - sand and pebbly sand, pebbles predominantly of well rounded flint, orange brown and reddish brown (proved in boreholes only)
 - London Clay - silty, fine sandy clay; dark bluish grey and olive green
 - Woolwich and Reading Beds - stiff, waxy, vividly colour-mottled clay overlying pale greenish grey silty fine sand silty fine sand with a nodular flint pebble bed (Bullhead Bed) at the base, olive green
 - Thanet Beds - Lower London Tertiaries
 - Upper Chalk - soft, white, well jointed chalk with some seams of nodular flint
- Note: Middle Chalk (MC) has been proved in some deep wells
- Worked-out area (sand and gravel) W0-12
 - Made Ground MG-2
- BOUNDARY LINES**
- Geological boundary, Drift
 - Geological boundary, Solid
 - Inferred boundary between recognised categories of deposits
 - Resource Block boundary
 - Broken lines denote uncertainty
- BOREHOLE DATA**
- SITE LOCATIONS**
- Industrial Minerals Assessment Unit (I.M.A.U.) Boreholes
 - Other Boreholes
- I.M.A.U. BOREHOLES**
- Borehole Registration Number: NW78
Borehole Site: O.D. (Newlyn)
Grading Diagram: (see diagram)
Geological Classification: (see diagram)
- Note: Figures underlined denote thicknesses used in the assessment of resources. The + sign indicates that the base of the deposit was not reached. The Geological Classification is given only for mineral and bedrock.
- Borehole Registration Number**
- Each I.M.A.U. borehole is identified by a Registration Number, e.g. NW78. The first letter refers to the quarter sheet, and the figures to the I.G.S. serial number for that quarter. The unique designation for borehole NW78 is TL52 NW78.
- Grading Diagrams**
- Each grading diagram shows the mean particle size distribution of a distinct deposit of mineral. The height of the diagram is proportional to the mineral thickness. The widths of the divisions show the proportions of Fines, Sand and Gravel.
- OTHER BOREHOLES**
- The layout of information is the same as for I.M.A.U. boreholes although data available may not be as comprehensive. They are registered in the same series. The final depth of deep boreholes is given in metres above (+) or below (-) O.D. (Newlyn).
- CATEGORIES OF DEPOSITS**
- Exposed mineral CAT-E6
 - Continuous or almost continuous spread of mineral beneath overburden CAT-C1
 - Sand and Gravel either not potentially workable (see Report) or absent CAT-A2
- RESOURCE BLOCKS**
- For the purpose of assessment the mineral is divided into Resource Blocks (see Report). Each is designated by a letter. Detailed records may be consulted on application to the Head, Industrial Minerals Assessment Unit, Institute of Geological Sciences, Nottingham, NG12 5GG.

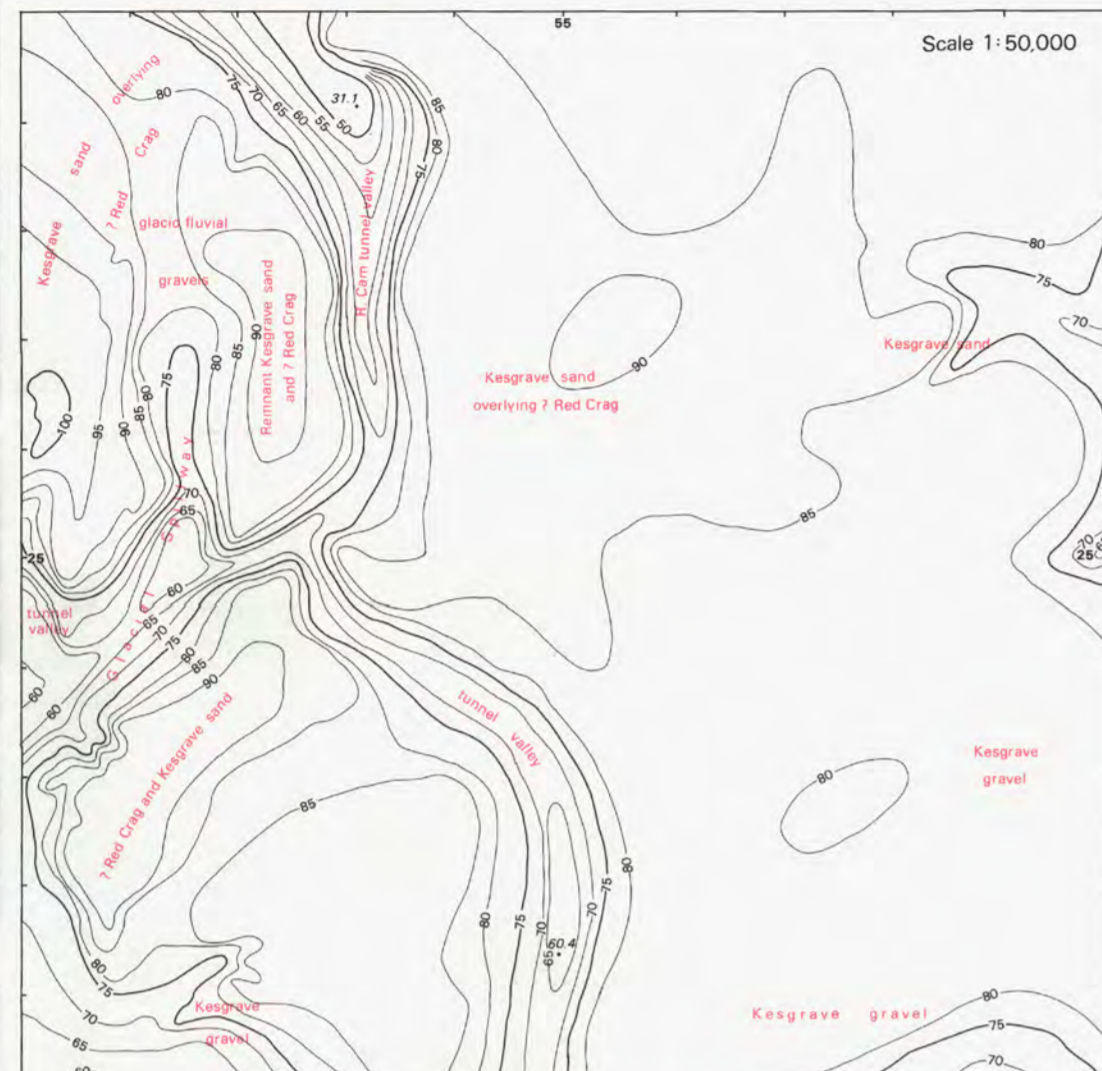
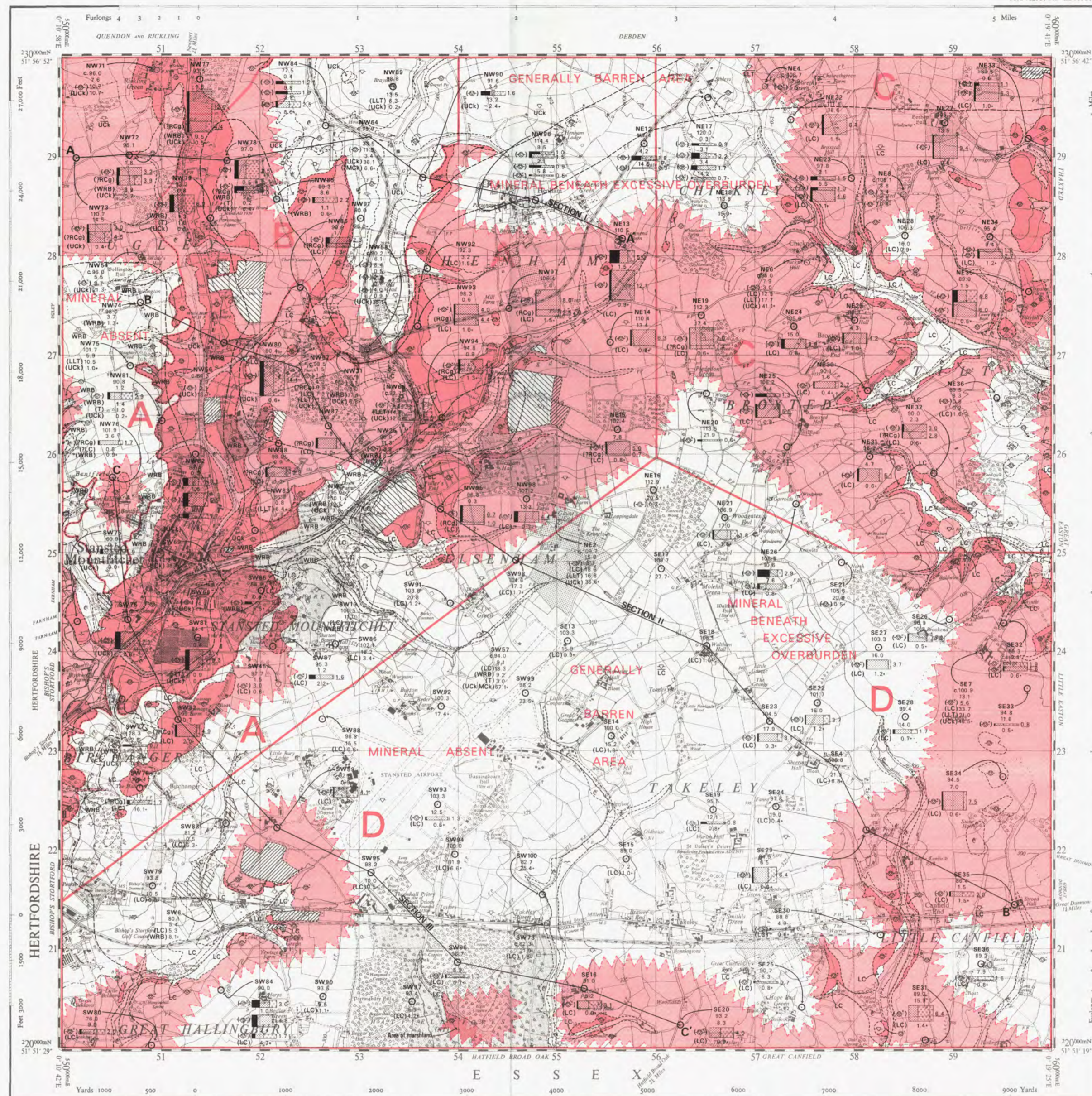
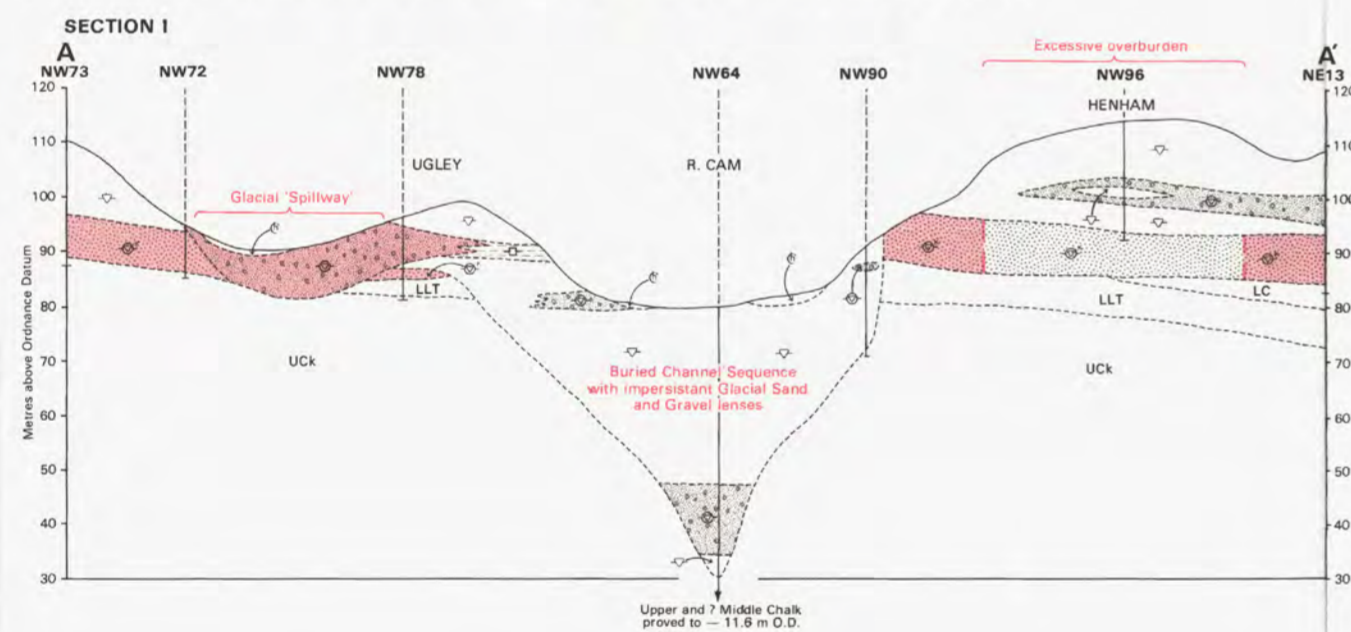


FIGURE 1: Sketch map showing contours at five-metre intervals on the Tertiary and Upper Cretaceous surface (bedrock)



GENERALISED SECTIONS SHOWING RELATIONSHIPS OF THE DRIFT DEPOSITS

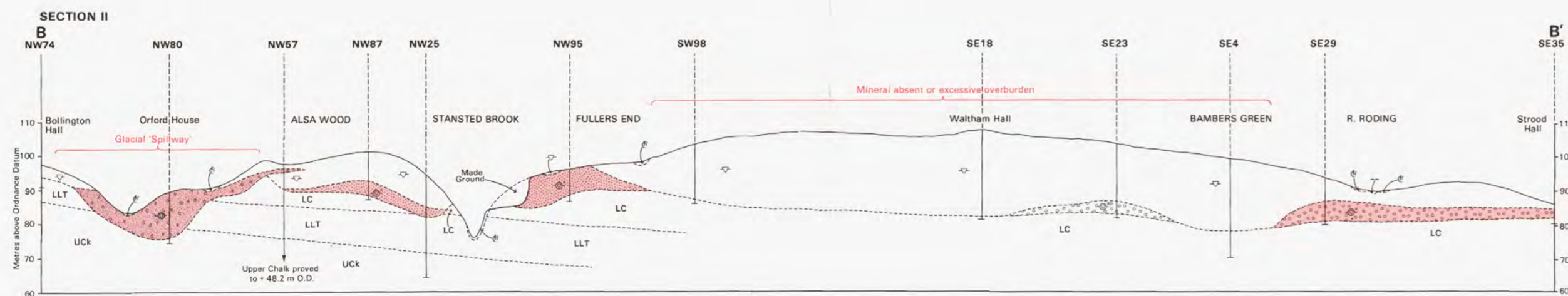


KEY TO SECTIONS

- Glacial Sand and Gravel
 - Glacial Silt
 - Keegrave Sands and Gravels (Sand facies)
 - Keegrave Sands and Gravels (Gravel facies)
 - Potentially workable sand and gravel (Mineral) exposed or beneath overburden
- Red Crag deposits where present are included within these categories (see individual borehole arrays for details)

SCALE OF SECTIONS

Horizontal 1:25,000
Vertical approximately X25



Data quoted for an individual borehole refer strictly to that site, unless corrections are noted for drifts about the thickness and grading elsewhere in the deposit, wherever in mineral is available as sand and gravel. However, estimates of the volume and mean grading of the mineral are made in each Resource Block as given in the Report.

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TL43	TL53	TL63
TL42	TL52	TL52
TL41	TL51	TL61

Diagram showing the relation of the Resource Grid 1:25,000 sheets with the 1:50,000 Geological Sheets 222 and 240.

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