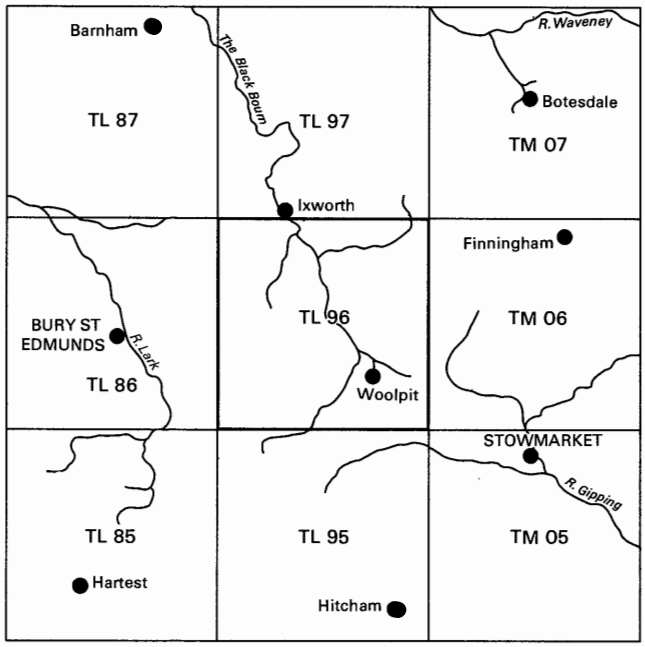
INSTITUTE OF GEOLOGICAL SCIENCES

Natural Environment Research Council

Mineral Assessment Report 127



The sand and gravel resources of the country around Woolpit, Suffolk

Description of 1:25 000 sheet TL96

M. R. Clarke

ISBN 0 11 884327 3*

London Her Majesty's Stationery Office 1983

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.

Any enquiries concerning this report may be addressed to
Head, Industrial Minerals Assessment Unit,
Institute of Geological Sciences,
Keyworth, Nottingham NG12 5GG.

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 co-operation of the Sand and Gravel Association of Great Britain.

This report describes the sand and gravel resources of the country around Woolpit, Suffolk, shown on the accompanying 1:25 000 resource map TL 96. The survey was conducted by Mr M. R. Clarke, Mr C. A. Auton and Mr M. P. Hawkins in 1979. The work is based upon a geological survey at 1:10 560 scale undertaken in 1977 and 1978 by Dr C. R. Bristow of the East Anglia and South East England Field Unit.

Mr G. I. Coleman, ARICS (Land Agent) was responsible for negotiating access to land for drilling. The ready co-operation of landowners and tenants in this work is gratefully acknowledged.

P. A. Sabine
Acting Director

Institute of Geological Sciences
Exhibition Road
London SW7 2DE

13 January 1983

CONTENTS

The sand and gravel resources of the country around Woolpit, Suffolk

Description of 1:25 000 sheet TL 96

M. R. Clarke

SUMMARY

The geological maps of the Institute of Geological Sciences, pre-existing borehole information and 87 boreholes drilled for the Industrial Minerals Assessment Unit form the basis of the assessment of the sand and gravel resources of the country around Woolpit, Suffolk.

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 4.5 km^2 and 16.4 km^2 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 96 NW 1). 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 1).

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

CLARKE, M. R. 1983. The sand and gravel resources of the country around Woolpit, Suffolk. Description of 1:25 000 sheet TL 96. **Miner. Assess. Rep. Inst. Geol. Sci.**, No. 127.

Author

M. R. Clarke, B.Sc
Institute of Geological Sciences
Nicker Hill, Keyworth,
Nottingham NG12 5GG

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 $\frac{1}{16}$ 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.

Rocks, which are usually consolidated and devoid of potentially workable sand and gravel for example the Upper Chalk, 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 $\frac{1}{16}$ 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 $\frac{1}{16}$ mm and 4 mm respectively (see Appendix C).

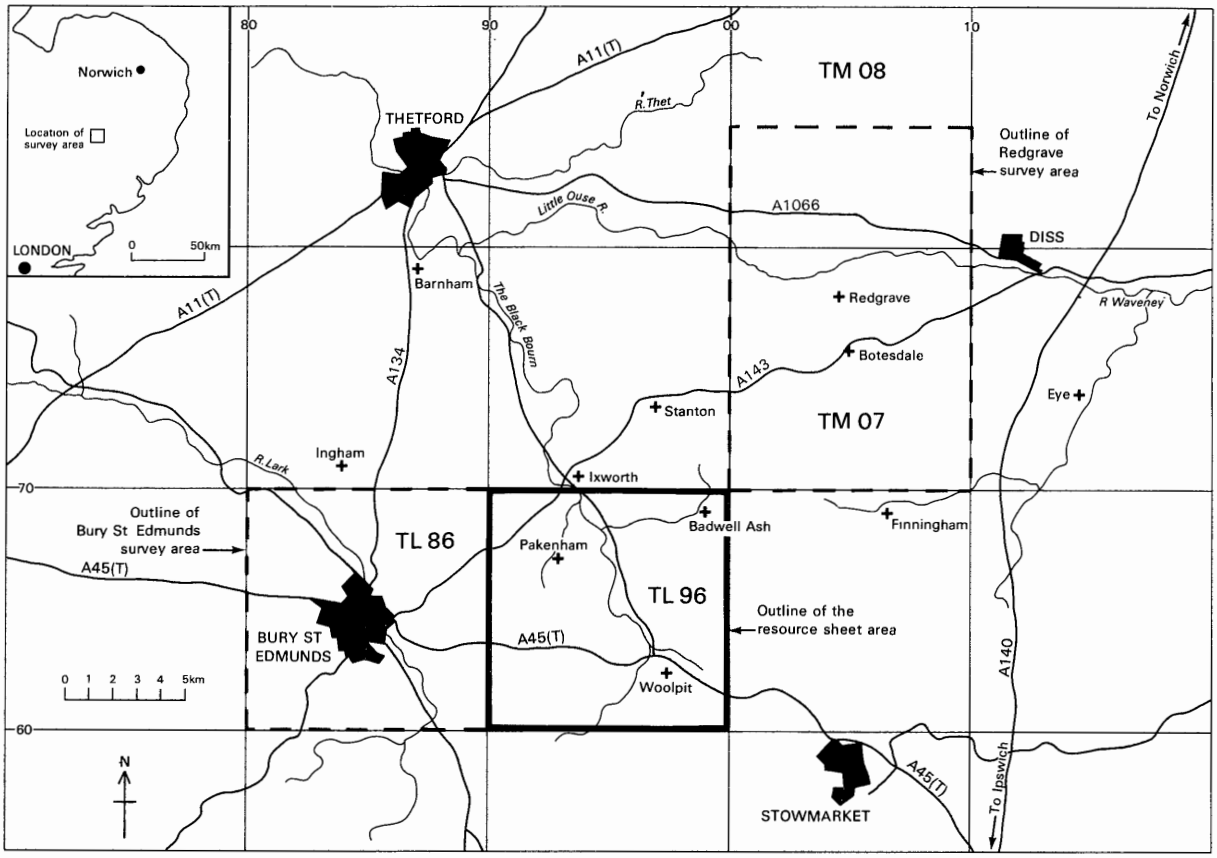


Figure 1 The location of the resource sheet area and its relationship to adjacent survey areas.

The volume and other characteristics are assessed within resource blocks, each of which, ideally, contains approximately 10 km^2 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

This report describes the assessment of resources of sand and gravel in 100 km^2 of ground around the village of Woolpit, Suffolk, shown on the 1:25 000 sheet TL 96. The area is entirely rural, and comprises arable farmlands with scattered communities, such as Woolpit [974 624] and Pakenham Street [928 673]. The nearest large town is Bury St Edmunds which lies 5 km to the west of the district; Stowmarket is 6 km to the south-east.

The resource sheet area (Figure 1) adjoins that centred on Bury St Edmunds (Hawkins, 1981) and, at its north-eastern corner, abuts the Redgrave survey area (Auton, 1982).

Deposits of Glacial Sand and Gravel and River Terrace Deposits contain the main resources of coarse aggregate (+4 mm-size material) which forms only 30 per cent of the estimated mineral resources of the area. Substantial resources, principally of fine and medium sands are found in the Crag which occurs at depth throughout much (60.3 km^2) of the area. The total estimated volume of mineral (388 million m^3; Table 4) is thus made up of the generally gravel-bearing Drift deposits and the extensive sandy deposits of the Crag; the mineral is assessed in four resource blocks (A to D).

The computer-generated contours used in this report have been prepared using a distance-weighted interpolation (after Falconer, 1971) available in the GINOSURF program library, to provide a local-fit paraboloid surface grid of the weighted data points. For example, the contours representing the surface of the Chalk were constructed using (on average) the nearest 14 data points for each grid node (Diagram A on margin of the Map).

Topography

The Woolpit area is characterised by undulating ground ranging from about +30 m OD. in the north to +76 m OD. in the south; the highest land near Bradfield St George [915 600] rises to over +84 m OD. The Black Bourn river, which rises from springs near Drinkstone [959 617], flows northwards across the area following a pronounced valley, which is nearly 1 km wide where it leaves the district, in the north at Mickle Mere [935 700]. Small tributaries flowing from near Badwell Ash [990 690] in the east and Pakenham Street in the west, have also contributed to the dissection of the landscape (Figure 2).

Geology

The geological succession of mapped deposits is shown in Table 1 and a brief account of each deposit is given below. The complex succession of Drift deposits rests mainly upon Crag (bedrock) sands of early Pleistocene age. The oldest exposed formation, the Upper Chalk, crops out in the north-west and has been proved at depth in water wells sunk elsewhere within the survey area.

No modern account of the geology of this district is available but the area is covered, in part, by the Stowmarket and Diss memoirs of the Geological Survey (Whitaker, Bennet and Blake, 1881; Bennett 1884).

SOLID

Upper Chalk The soft white chalk with scattered nodular flints characteristic of the Upper Chalk, crops

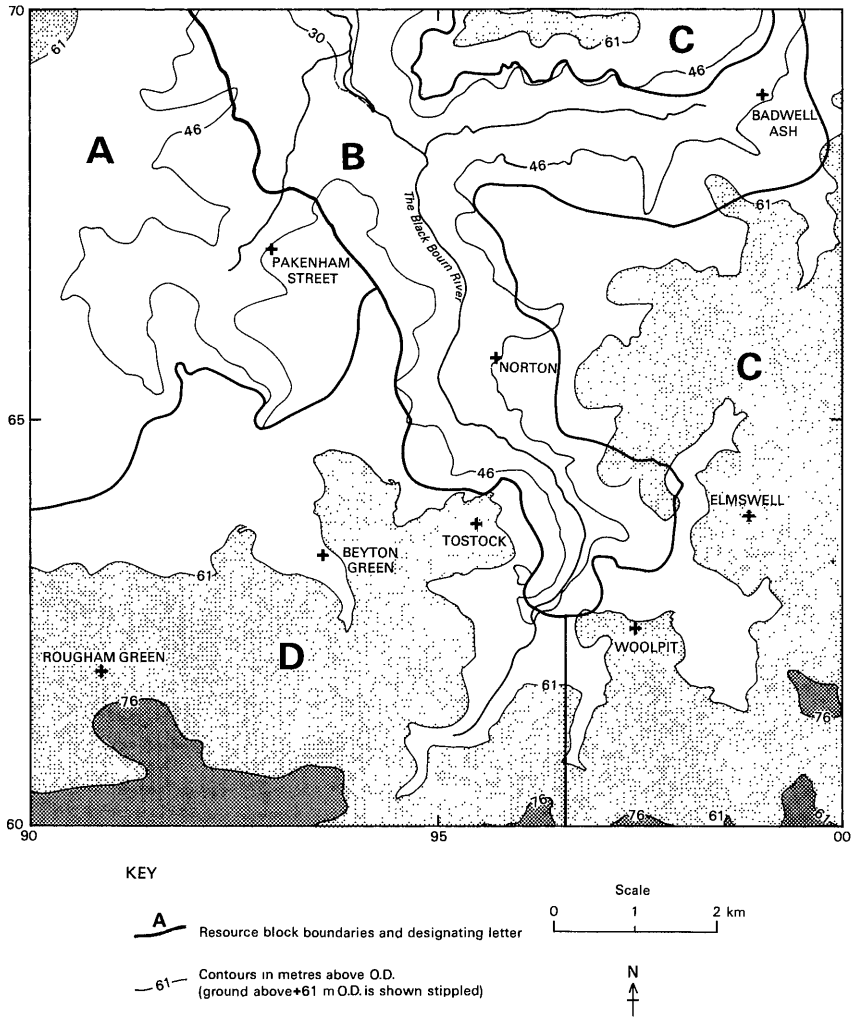


Figure 2 The topography of the resource sheet area and the resource block boundaries.

out mainly in the north-western part of the area, where it occurs at or near the surface (between +40 to +50 m OD) beneath a thin or discontinuous cover of drift deposits. To the south and south-east of Tostock [954 636] the surface of the Chalk progressively decreases in elevation, and has been proved in numerous deep wells in the southern part of the area to lie at heights of about +30 m OD. (see Figure 3). The height of the Chalk surface at outcrop and the records of numerous boreholes have been used to delineate the position of two major (drift-filled) channels which have been excavated in the Chalk. Their form is represented by the computer-generated contours on the surface of the Chalk shown on the border of the resource sheet as Diagram A. These channels are thought to have been caused by sub-glacial erosion in tunnel valleys (Woodland, 1970). The larger of these features, with a NW-SE orientation, appears to have controlled the late-glacial drainage of this area; the course of the present-day Black Bourn river now reflects the alignment of the underlying drift-filled channel.

The Upper Chalk in the area has a maximum proved thickness of 90.8 m in a borehole (NW 30) at the West Suffolk Water Board's, Stow Road Pumping Station, [9401 6972]. The Chalk is an important aquifer in the district and supplies many of the local communities.

Table 1 Geological succession of deposits in the Woolpit area.

DRIFT	
Recent and Pleistocene	Peat
	Alluvium
	River Terrace Deposits
	Cover Sand
	Head
	Head Gravel
	Glacial Silt and Lacustrine Deposits
	Boulder Clay
	Glacial Sand and Gravel
	Kesgrave Sands and Gravels
	Ingham Sand and Gravel
SOLID	
Pleistocene	Crag
Cretaceous	Upper Chalk

Crag Deposits of Crag occur beneath drift over much of the resouce sheet area. They crop out near their junction with the underlying Chalk in the west, around Rougham Hall [911 640] and along the northern slopes of the tributary stream from Badwell Ash to Stowlangtoft [957 682]. The sub-drift extent and distribution of the Crag has been strongly controlled by the position of the buried glacial channels. The limits of the Crag shown in Diagram B on the resource map margin have been produced by the intersection of contours on the base of the Crag and the margins of these buried channels, which have been identified from the computer-generated contours for the Chalk surface (see Diagram A on the resource map).

At and near to its outcrop, the Crag is oxidised and characterised by orange and pale yellow fine- and

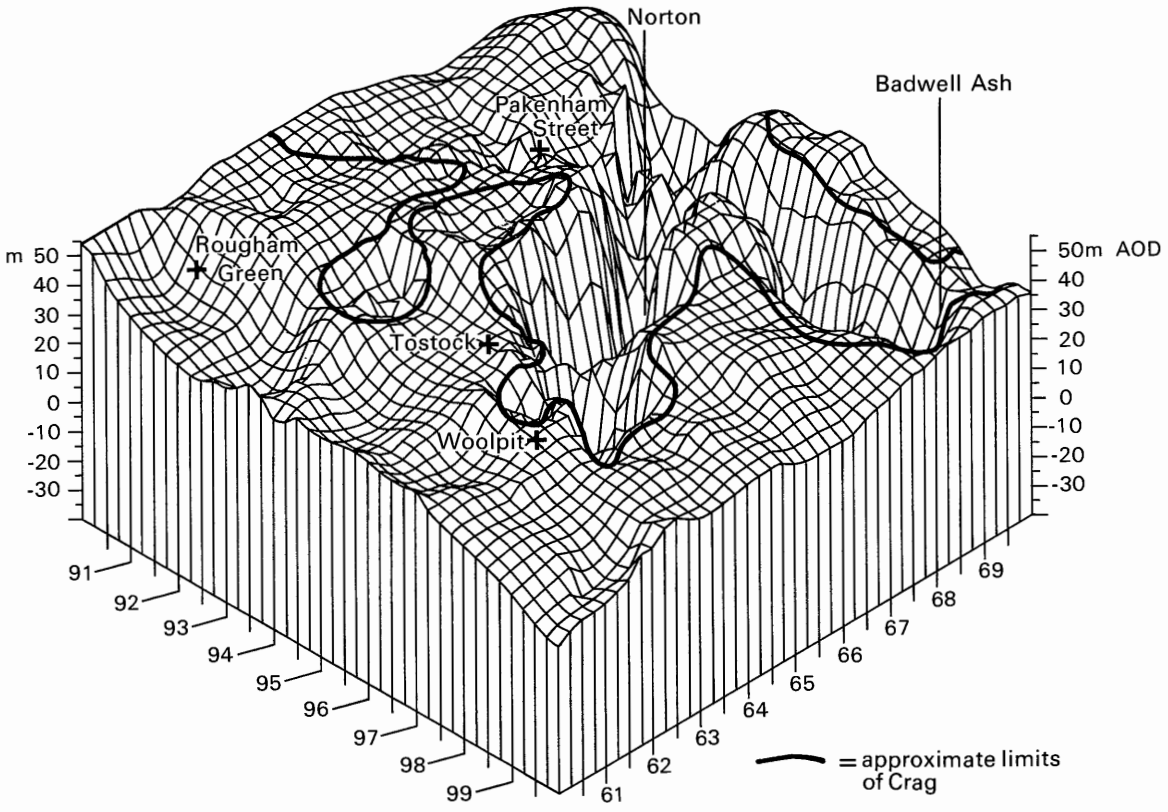


Figure 3 Computer-generated isometric view of the Chalk surface from the south-east showing the dissection caused by glacial action.

medium-grained quartz sands. In part they are micaceous and locally contain thin, pale grey clay laminae and partings, up to 2 cm thick. With increasing depth of burial and particularly below the water table, the sands are greenish grey to bright green, reflecting the abundant presence of glauconite. The unweathered green Crag commonly contains comminuted shell debris with occasional unbroken shells. It also contains assemblages of early Pleistocene foraminifera, dominated by the species *Elphidium*, typical of deposits of Red Crag found elsewhere in East Anglia (B. M. Funnell, University of East Anglia, personal communication, July, 1981).

Twenty-four assessment boreholes proved that the Crag ranges in thickness from 0.3 m (in borehole SW 100) to 16.7 m (in borehole SW 111) and has a mean thickness of 6.2 m. A computer-generated isopachyte map (Diagram B on the margin of the resource map) shows the general trends in thickness of Crag in the resource sheet area.

The base of the Crag closely reflects the form of the depositional basin within which the deposits lie; in the north-west, the base of Crag lies at about +55 m OD, but drops uniformly to below +25 m OD in the south-east corner of the area. A separate assessment of the mineral resources of the Crag in resource blocks C and D has been made (Table 4).

DRIFT

Ingham Sand and Gravel Sand and gravel deposits rich in well-rounded pebbles of 'Bunter' quartzite (derived from the Triassic Sherwood Sandstone Group of the Midlands) and vein quartz, have been described (Clarke and Auton, 1982) from a pit at Ingham [851 713] to the north of Bury St Edmunds. Similar deposits not previously recorded from this part of Suffolk have been proved in at least one assessment borehole in the Woolpit area (borehole NW 54). These Bunter-rich sands and gravels (containing 30 per cent by weight of quartzite), lie between +24.9 and 22.3 m OD, beneath the 2nd terrace of the Black Bourn. Although they clearly post-date the Crag, the exact age of the deposits of Ingham Sand and Gravel and their relationship to other deposits in this area is not clear. They have been assessed with the overlying terrace deposits, but because they do not outcrop, they are not shown on the resource map.

Kesgrave Sands and Gravels Although not mapped at the surface in this sheet area, the Kesgrave Sands and Gravels have been recognised on adjacent resource sheets, and have been described (Rose and Allen, 1977) from a pit at Badwell Ash [995 692]. Similar deposits, rich in rounded vein quartz and quartzite pebbles have been proved in twelve assessment boreholes. The base of the deposits was proved to have a limited altitudinal range of between +39.2 m (borehole SE 134) and +45.0 m OD (in borehole NE 36). The Kesgrave Sands and Gravels are found mainly in the northern and eastern parts of the resource sheet area where they commonly overlie the Crag (for example in boreholes SE 150 and NE 53) although in boreholes NE 36 and NE 41 they apparently rest directly on Chalk bedrock.

These quartz-rich sands and gravels, which have been described from other parts of Suffolk and from Essex, have previously been attributed to periglacial aggradation of a proto-Thames braided stream (Rose and Allen, 1977; Hey, 1980). However, in the Woolpit area they may represent the deposits of separate, but contemporaneous, streams which flowed eastwards across the area. There is also some indication that pebble beds within the Crag are similarly enriched in quartz and quartzite pebbles (as shown for example in boreholes SE 149 and SE 151).

The Kesgrave Sands and Gravels were proved in assessment boreholes to range in thickness from 1.4 m (recorded in borehole NE 41) to, exceptionally, 8.4 m in borehole SE 143: the calculated mean thickness is 3.5 m. Because of the somewhat variable nature of their thickness and distribution and their similarity in particle size distribution (Figure 7) to the Glacial Sand and Gravel,

the assessment of resources in the Kesgrave Sands and Gravels is combined with that of the glacial deposits.

Glacial Sand and Gravel The deposits of Glacial Sand and Gravel are intimately associated with the mapped spreads of Boulder Clay and are scattered widely throughout the sheet area.

The gravel fraction of the deposits comprises principally angular and subangular flint, with various amounts of subrounded chalk and exotic rock types such as limestone, and igneous material. The sand fraction usually comprises fine and medium quartz, but locally chalk and flint are also present. The vertical and lateral distribution of the glacial deposits is apparently somewhat irregular: within the glacial sequence they can be found at heights ranging from about +40 m OD (in borehole SE 152) to over +65 m OD (in borehole SE 147) in adjacent boreholes. However, in the south-east, between Tostock and Woolpit Wood [998 614], the mineral deposits apparently become more uniform and form an extensive unit of sand and gravel at a height of about +60 m OD (see cross-section on the margin of the resource map).

In some boreholes (for example, borehole SE 154) a complex sequence of interbedded Boulder Clay and Glacial Sand and Gravel occurs. Despite the favourable overburden to mineral thickness ratios, the beds of sand and gravel are unlikely to be potentially workable because of the abundant chalk debris which they contain. Glacial Sand and Gravel is also found within the buried glacial channels and locally forms a significant resource, as proved for example in boreholes NW 61 and SE 140.

Proved thicknesses of Glacial Sand and Gravel range from 1.0 m in borehole SE 135 to, exceptionally, 19.0 m in borehole SE 151 which may include some soliflucted material from the surrounding hillsides; the mean for the area as a whole is 5.1 m. The computer-generated isopachyte map (Diagram C on the margin of the resource map) showing the average Glacial Sand and Gravel thicknesses (cummulated) proved in assessment boreholes, demonstrates a trend of increasing thickness towards the east and south-east of the resource sheet area.

Although there are at present no active workings in these deposits, large amounts of aggregate were formerly won from them in this area. Extensive old workings occur in Glacial Sand and Gravel at Badwell Ash, Woolpit, Hesset [940 610] and Woolpit Wood.

Boulder Clay The mapped spreads of Boulder Clay comprise firm bluish grey silty clay containing a variable suite of pebble clasts, principally subangular to subrounded flints and subrounded chalk. Minor pebble lithologies include Kimmeridge shale, quartz and quartzite, various igneous rock types and occasional ironstone and calcareous sandstones. The deposits of Boulder Clay in this area are lithologically similar to the 'Chalky Boulder Clay' which covers much of East Anglia (Perrin, Rose and Davies, 1979).

At the surface, the Boulder Clay weathers to mottled brown and grey silty clay with angular flint pebbles, and is locally sandy; for example, boreholes SW 95, 102 and SE 142 all show a typical weathering profile.

The Boulder Clay forms the main overburden in the district, and ranges from 1.2 m in borehole SW 97 to over 18.9 m in borehole NE 51. In general the Boulder Clay is thickest in the southern and eastern parts of the sheet area, and thins towards the north-west where the Chalk bedrock is locally exposed. The computer-generated overburden isopachytes (shown in Diagram C on the margin of the resource map) are based upon the average thicknesses of overburden (mainly Boulder Clay) proved in assessment boreholes, and show this trend of thickness variation very clearly.

Locally, for example in boreholes NE 43 and NW 58, the Boulder Clay has been shown to descend into, and in part to fill, the buried glacial channels, where it is associated with glacial silts.

Glacial Silts and Lacustrine Deposits A thick sequence of silts and clays is associated with the system of glacially-formed buried channels. In places, for example near Hunston Hall [977 682], the glacial silts crop out on the valley sides as weathered buff and pale orange silts and fine sands. In boreholes, they are typically pale grey silts and clays and are often laminated; the greatest thickness recorded was 17.7 m in borehole NE 48, which did not reach the base of the deposits.

In general the buried channel systems are filled by sequences of grey silts and Boulder Clay, but locally sands and gravel are the predominant fill material - as shown from example by boreholes SE 140 and NW 61. However, because no information is available on the extent of the sand and gravel deposits occurring within the channel systems, a separate assessment of them has not been attempted.

A large area of lacustrine deposits in the Woolpit area [at 983 620] has been worked in the past as a major source of brick clay. These deposits have recently been named the Woolpit Beds (Bristow and Gregory, 1982). Their exact relationship to the other glacial silts in the survey area is not yet fully understood.

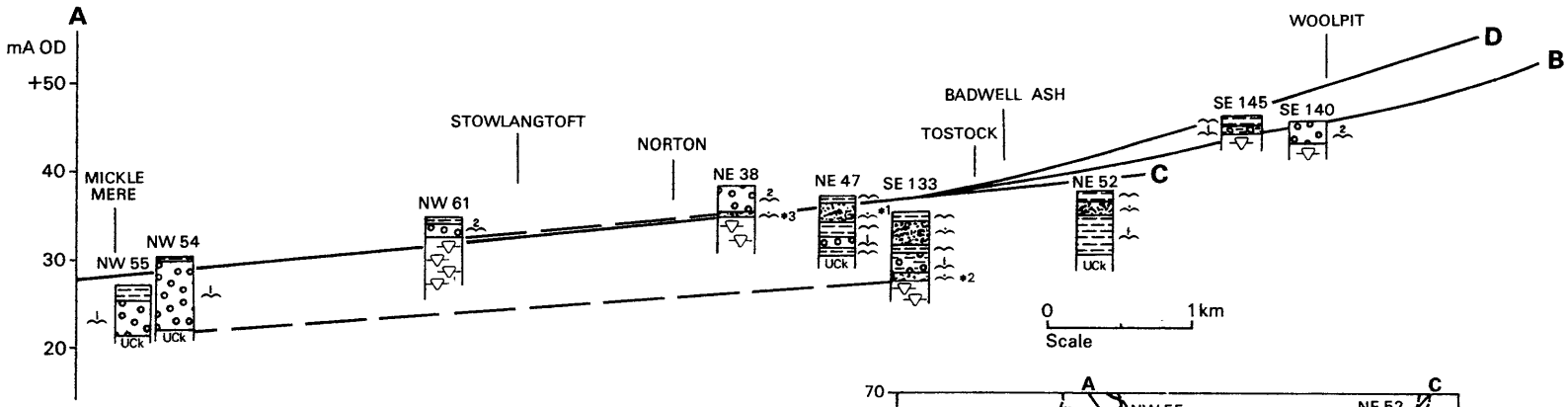
Cover Sand The Cover Sand comprises orange and brown silty fine sands which have been mapped mainly in the western part of the sheet area. Although they occur as apparently uniform spreads of material, the sands are laterally imperisistent and are often associated with periglacial cryoturbation which has locally involved both the drift and solid deposits. This mode of preservation may explain the occurrence of fine sands proved in boreholes (for example, boreholes SW 109 and SW 112) which lie outside of the main areas mapped as Cover Sand.

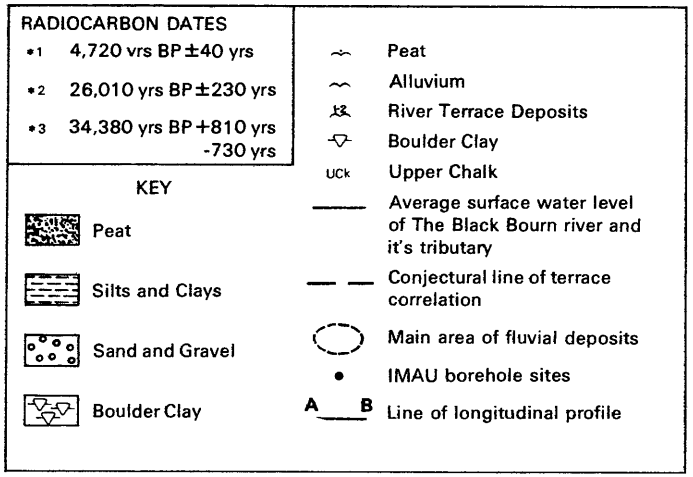
In assessment boreholes, the Cover Sand ranges in thickness from nil in borehole SW 93 to 1.6 m in borehole SW 96. However, the mean thickness for the deposits as a whole is less than one metre, and because of this, and their variable distribution, they have not been regarded as a mineral resource in this area.

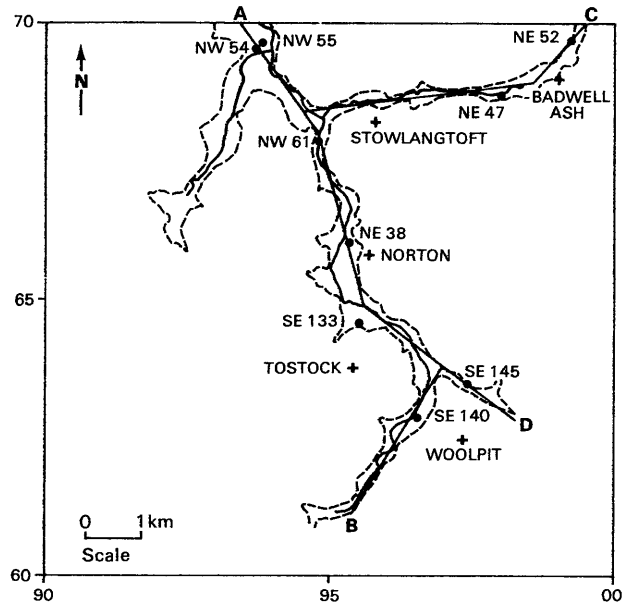
Head Gravel and Head Thin spreads of clayey sands and gravels, derived by solifluction, have been mapped mainly at the foot of slopes along minor valleys and in hollows, in this area. The nature of these deposits commonly reflects the local material from which they are derived. Although they are locally classified as mineral in some assessment boreholes (for example in boreholes NW 50, SW 104, and SW 97), they are generally either too thin, too clayey, or laterally impersistent to be regarded as a mineral resource in the context of this present survey and they have not been included in the assessment.

River Terrace Deposits Fluvial sands and gravels rich in angular and subangular flint clasts, characterise the River Terrace Deposits found in this area; the sand fraction generally comprises fine and medium quartz. The most extensive spreads of terrace deposits are associated with the Black Bourn River and its tributaries: they generally carry little overburden, though locally they are concealed beneath younger deposits of Alluvium and Peat.

Thirteen assessment boreholes proved River Terrace Deposits which ranged in thickness from 0.9 m in borehole SE 145 to 5.0 m in borehole NW 54 and which have a mean thickness of 2.3 m. Although the terrace sands and gravels are distinguished as either 1st or 2nd terrace on the geological map, they have been assessed together as one mineral deposit (contained within Resource Block B) in this report.







Location map showing the lines of the profiles

Figure 4 Profiles in the Black Bourn valley showing the stratigraphical relationships of the fluvial and other deposits.

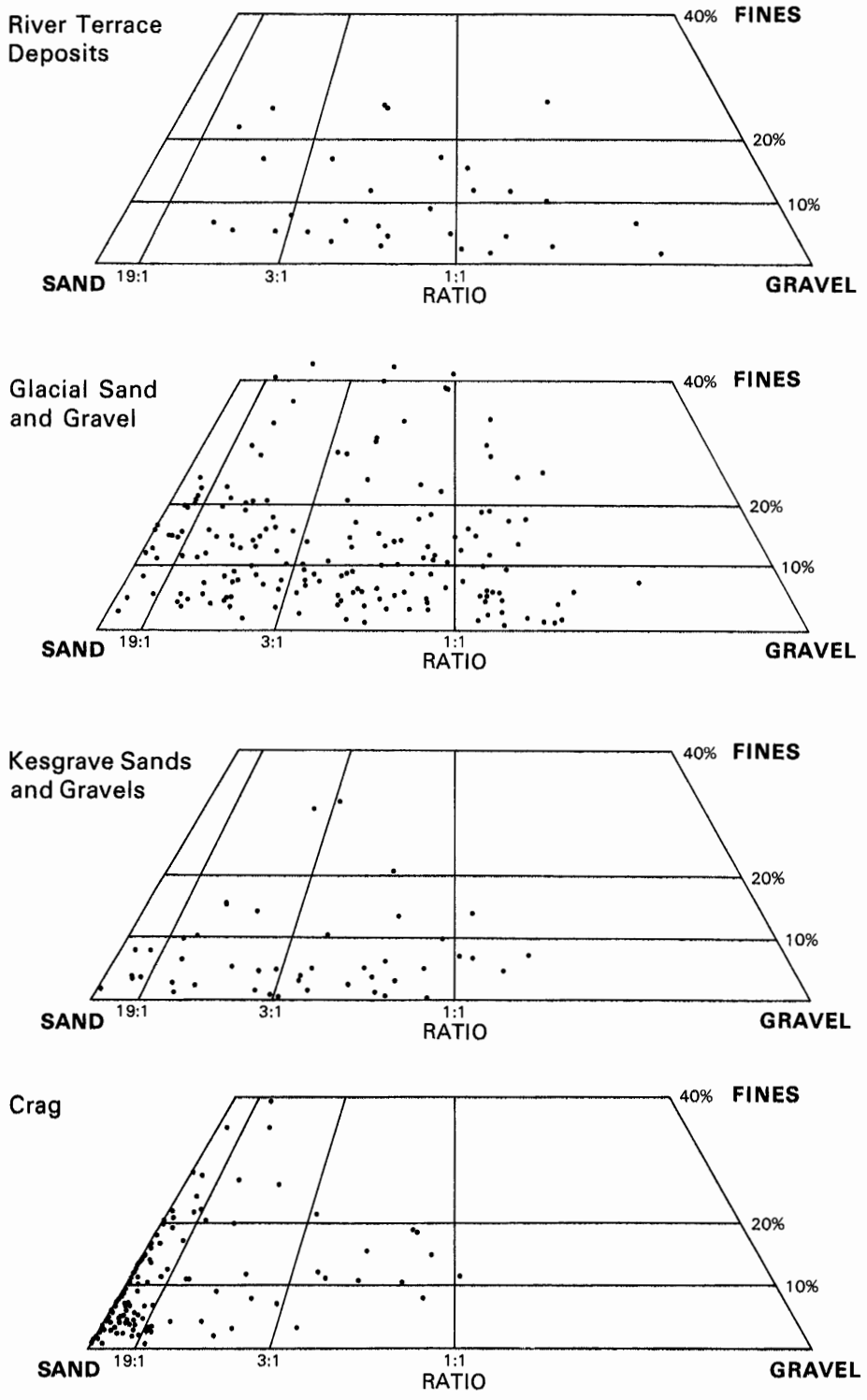


Figure 5 The range in particle size of samples of the sand and gravel deposits.

In the past, these deposits have been worked for aggregate: extensive old workings are found in the valley of the Black Bourn near Grimstone End [937 692].

Alluvium Soft silts and clays with scattered pebbles form the mapped spreads of Alluvium which floor the modern valleys in the area; they are everywhere considered to be non-mineral. In the larger water courses (for example the valley of the Black Bourn) the alluvial silts and clays generally conceal potentially workable River Terrace Deposits, as proved, for example, in boreholes NW 55 and SE 133. In the smaller valleys, however, these underlyng sands and gravels are too thin and clayey to be considered as mineral (for example in borehole SW 106) and are left uncoloured on the resource map.

Peat Deposits of peat are found commonly in the valley floors of the modern rivers and streams, associated with the alluvial silts and clays. The greatest thickness (2.6 m) was proved under a thin cover of alluvium in borehole SE 133 near Tostock railway bridge [9552 6460].

Radiocarbon dating of peat proved beneath terrace sands and gravels of the 2nd terrace of the Black Bourn (in borehole NE 38) and of peat overlying the 1st terrace sands and gravels (in borehole NE 47) yielded dates of 34,350 years and 4,270 years BP respectively. These dates suggest that the development of the modern drain-

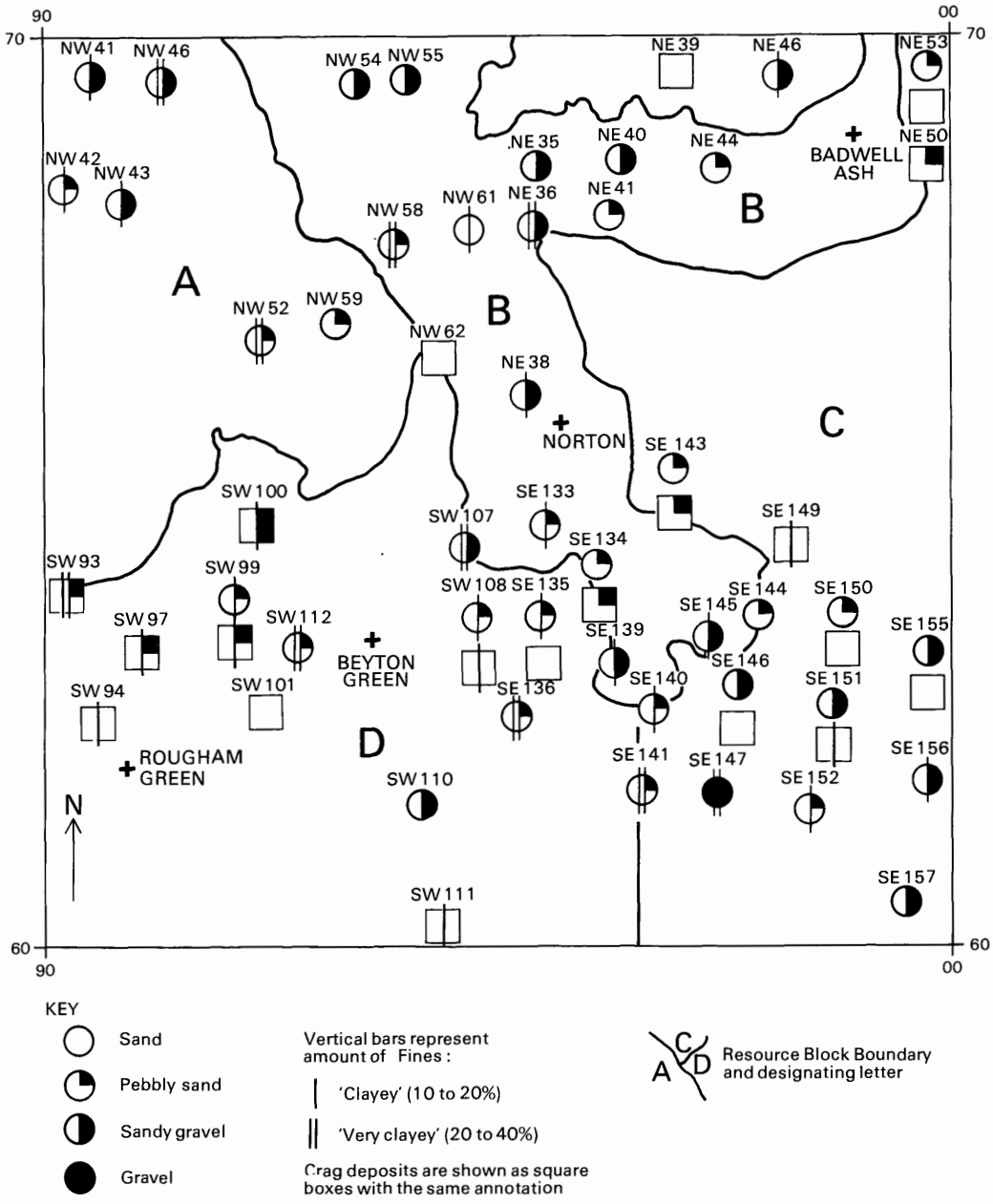


Figure 6 The mean grading of the mineral deposits proved in assessment boreholes.

age system (Figure 4) and its alluvial deposits, took place largely during the Mid to Late Devensian stage of the Pleistocene period (see Clarke and Auton, 1982).

Composition of the Sand and Gravel Deposits

Within this survey area there are four major potentially workable deposits: the Crag, Glacial Sand and Gravel, Kesgrave Sands and Gravels and River Terrace Deposits. The range in particle size distribution, by sample, of the mineral deposits is shown in Figure 5 and the overall mean grading characteristics of the mineral in each borehole are shown in Figure 6. The mean composition of each deposit, based upon the weighted borehole means of part of the fine gravel fraction (+8-16 mm) is given in Table 2. The mean grading of the sand and gravel in each deposit proved, for example, in assessment boreholes is shown graphically in Figure 7.

The results of a small number of physical tests carried out on material from assessment boreholes are given in Table 3 and discussed below.

Crag The samples of fine and medium sands of the Crag were proved to be mineral in 20 assessment boreholes: they have a mean grading of fines 10 per cent, sand 86 per cent and gravel 4 per cent. The sand fraction characteristically comprises pale yellow and orange well-rounded quartz, with fine and medium grades predominant, forming 49 per cent and 33 per cent of the deposit respectively. The pebble fraction of the Crag is generally derived from a thin, basal gravel, as seen, for example, in borehole SW 108. However, thin pebble beds also occur at various levels within the dominantly sandy strata, as, for example, in boreholes SE 146 and SE 150.

The mean composition of the Crag pebble beds, derived from pebble counts, demonstrates a high proportion of vein quartz (26 per cent) and quartzite (10 per cent) and shows similarities with that of the overlying Kesgrave Sands and Gravels (Table 2).

Comminuted shell debris and iron pan debris is often found in the +4 mm fraction: they are placed under 'others' in the pebble count results.

In general the deposits of Crag are too fine-grained

Table 2 The mean composition of the +8-16 mm gravel fraction of the mineral deposits.

Deposit	No of samples	Percentage by weight of each component						
		Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
Crag	(39)	26	15	26	10	-	10	6
Kesgrave Sands and Gravels	(38)	40	17	27	9	1	5	1
Glacial Sand and Gravel	(106)	50	6	7	6	21	4	3
River Terrace Deposits	(22)	74	8	7	6	1	4	-

to meet the specifications for building sand (BS 882/1201) but locally the sands may meet the broadest classification of a zone 4 sand. Moreover, the high content of the iron-bearing compound glauconite may make the unweathered sands unsuitable for many applications. But, where the sands have been oxidised and leached, the resultant in situ deposit may have a use as a source of foundry sand or wearing course sand, the specifications for which are more closely approached by the overall mean grading of the Crag.

Kesgrave Sands and Gravels The Kesgrave Sands and Gravels were proved to be mineral in ten assessment boreholes; samples from them provide a mean grading of fines 6 per cent, sand 70 per cent gravel 24 per cent. In contrast to that of the Crag, the sand fraction of the Kesgrave Sands and Gravels shows a predominance (45 per cent) of medium sand, with coarse and fine sand accounting for only 11 per cent and 14 per cent of the deposit respectively (Figure 7). The sand is generally orange-stained subangular quartz, but some subangular to angular flint is present in the coarse sand (+1-4 mm) fraction.

The gravel fraction forms an important part (24 per cent) of the deposit which is distinguished from that of other deposits in the area by its high content of white vein quartz; it comprises 27 per cent by weight of the pebbles studied (Table 2). Well-rounded flint and quartzite are also important constitutents, but their presence is to some extent masked by angular and subangular flint which forms 40 per cent of the material.

Glacial Sand and Gravel Although Glacial Sand and Gravel was proved in 41 assessment boreholes, the deposits are classified as non-mineral in 15 of them, mainly on account of the presence of excessively thick overburden (eg. borehole NW 60 and NE 50). In general, the boreholes reveal a wide range of particle size distribution; for example, the fines content is 4 per cent in borehole SE 144 but rises to 38 per cent for the chalky gravel proved in borehole SW 94. However, the mean grading for the Glacial Sand and Gravel as a whole, is fines 12 per cent, sand 61 per cent and gravel 27 per cent. In the sand fraction, medium sand is predominant (31 per cent) with subordinate amounts of fine sand (19 per cent) and coarse sand (11 per cent). Angular and subangular quartz and flint form the bulk of the sand fraction with the amount of angular flint increasing in the coarse sand fraction. The Glacial Sand and Gravel contains roughly equal amounts of fine and coarse gravel.

The composition of the +8 -16 mm material used for the pebble counts is very variable, being dependent principally upon the ratio of subangular flint to chalk in the deposit. These two interdependent components together often account for over 80 per cent of the fine gravel fraction from borehole samples (for example in borholes NW 46 and SW 94). The mean composition of the fine gravel for the deposit as a whole may bear little relationship to the composition of the Glacial Sand and Gravel at any particular site. However, the following general observations may be made; the chalk content is apparently highest where the deposits lie below the water table, and in those situations where they are interbedded with Boulder Clay, as for example, in borehole SE 136.

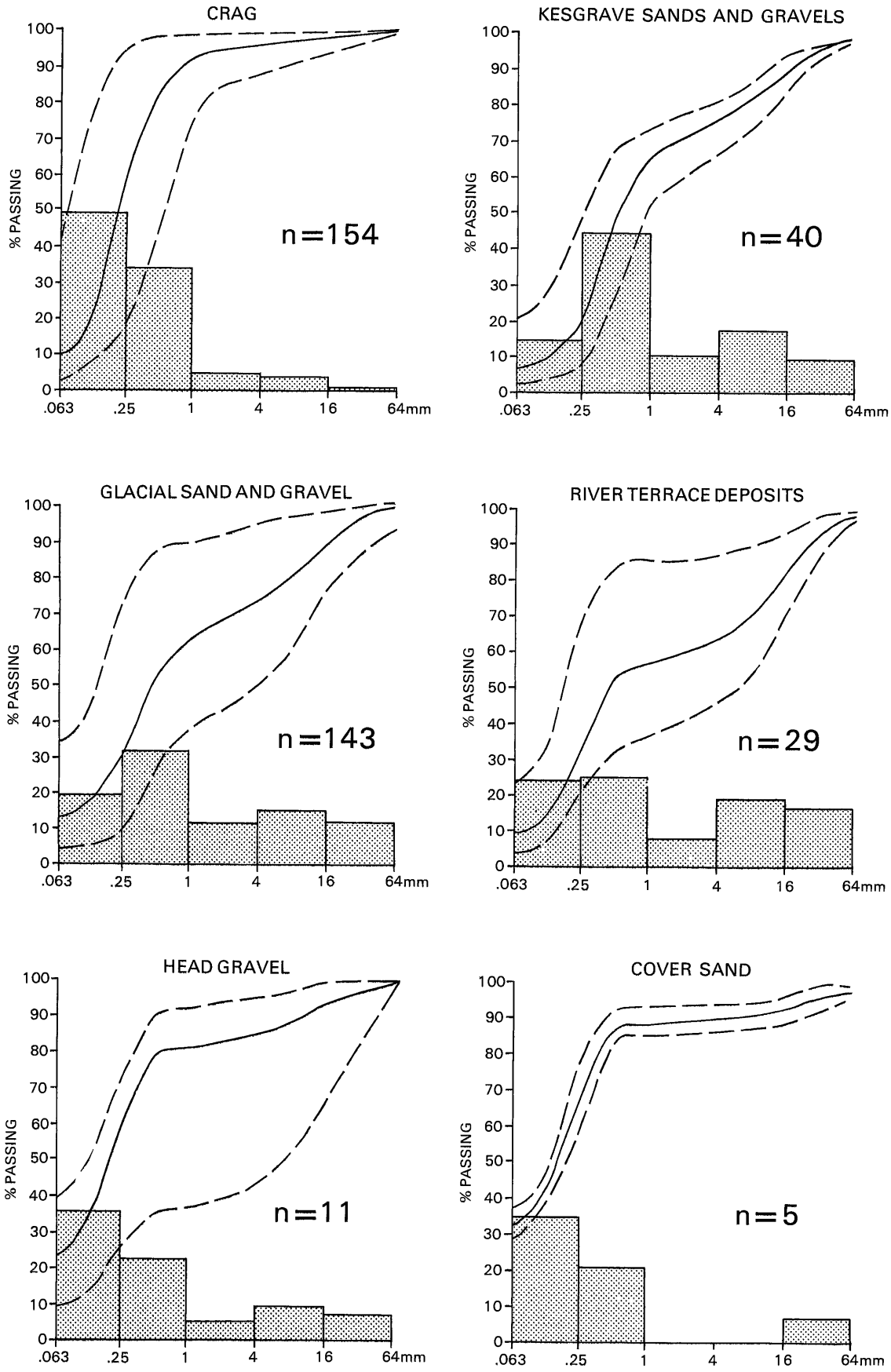
River Terrace Deposits Twelve assessment boreholes proved that the fluvial deposits associated with the Black Bourn and its tributaries contain the greatest gravel content of any deposit in the resource sheet area; their mean grading is fines 10 per cent, sand 55 per cent and gravel 35 per cent. The sand fraction comprises almost equal amounts of fine (23 per cent) and medium (24 per cent) quartz sand with a subordinate amount (8 per cent) of coarse sand, often containing some angular flint debris. The gravel fraction comprises roughly equal amounts of fine (18 per cent) and coarse (17 per cent) grades, generally consisting of subangular and angular flint.

The mean compsition of the +8-16 mm gravel fraction (Table 2) is based upon samples from ten assessment boreholes, and is made up principally of angular and subangular flint (74 per cent) with minor amounts of well-rounded flint (8 per cent), vein quartz (7 per cent), quartzite (6 per cent) and sandstone (4 per cent).

Other deposits

Cover Sand: Although not regarded as mineral within the survey area as a whole, the spreads of Cover Sand may locally fulfil the arbitrary resource criteria (p.1). The mean grading for the three boreholes proving mineral-grade material (boreholes NW 47, SW 96 and SW 112) is fines 32 per cent, sand 59 per cent, gravel 9 per cent.

Head and Head Gravel: Although the deposits of Head and Head Gravel are considered to be generally too variable in nature and extent to be potentially workable, some assessment boreholes (for example boreholes SW 104 and NW 51) proved these deposits to be locally of mineral quality; this is because they are often derived from adjacent mineral deposits. The mean grading of the samples from seven boreholes proving this deposit is fines 23 per cent, sand 62 per cent and gravel 15 per cent.



The histograms (shaded) represent the amount of material in each sieve fraction; the dashed lines represent the range in particle size, and the solid lines the cumulative mean particle size distribution for each deposit based upon the stated number (n) of samples.

Figure 7 The mean grading characteristics of the sand and gravel deposits proved in assessment boreholes.

Table 3 The results of physical and mechanical testing of the mineral deposits.

Mineral Deposit	Relative Density		Water Absorption (%)	Aggregate Impact Value	10 % Fines Values
	Oven-dried	Surface-dried			
River Terrace Deposits	2.50	2.54	1.65	25	280 kN
Glacial Sand and Gravel	2.46	2.52	2.42	24	240 kN
Glacial Sand and Gravel (Chalk-rich)	2.30	2.43	5.59	37	110 kN

The Mechanical and Physical Properties of the Mineral Deposits

The results of mechanical and physical testing of the +10-14 mm material obtained from bulked samples of River Terrace Deposits, Glacial Sand and Gravel (flint-rich) and Glacial Sand and Gravel (chalk-rich) are shown in Table 3. Although the Crag locally contains pebbles, there was insufficient material available for testing.

One of the most important parameters concerning the suitability of an aggregate for use in concrete is its shrinkage characteristics. This property has been shown (Edwards, 1970) to be inversely related to the specific gravity, and to show a linear relationship with the water absorption of the aggregate. Low values of water absorption (for example 1.21 per cent obtained for flint aggregate from the Thames Valley (Edwards, 1970) are associated with low shrinkage values. The material (from this survey area) exhibiting the lowest water absorption value (1.65 per cent) is the flint-rich aggregate obtained from the River Terrace Deposits. It contrasts strongly with the much higher water absorption value (5.59 per cent) obtained for the chalk-rich Glacial Sand and Gravel.

Similarly the relative density values for material from the survey area, suggest that the River Terrace Deposits (RD 2.54) would be likely to have the lowest shrinkage values, and the chalk-rich Glacial Sand and Gravel (RD 2.43) the highest.

The mechanical testing of the aggregate samples from the survey area shows that the material with the highest flint content, the River Terrace Deposits (see Table 3), has the greatest compressive strength (10 per cent fines value of 280 kN) and toughness (AIV value of 25) equal to high quality quartz conglomerate (Edwards, 1970). Again, the chalk-rich samples from the Glacial Sand and Gravel have mechanical properties (an AIV value of 37 and a 10 per cent fines value of 110 kN) which indicate that this material would not match the specifications for concreting aggreate unless the deleterious constituents are removed. However, the range of physical and mechanical properties exhibited by most of the samples tested from this area generally satisfy the minimum standard (BS 882) for concreting aggregates.

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 scale of 1:10 560.

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.

Areas where bedrock crops out, where boreholes indicate absence of sand and gravel beneath cover or 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 assessment of resources for the whole sheet area are summarised in Table 4 below; a separate asessment is given for the resources of Crag which occur in resource blocks C and D.

Table 4 Statistical assessment of the sand and gravel resources of the district.

Resource block	Area		Mean Thickness		Volume of Mineral	Limits at the 95 % probability level		Mean grading percentages					
	Block	Mineral	Overburden	Mineral			± volume	Fines	Sand		Gravel		
	km^2	km^2	m	m	$10^6 m^3$	± %	$10^6 m^3$	$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1-4	+4-16	+16-64 mm
A	17.3	4.5	1.7	3.6	16.2	59	9.6	14	20	30	10	16	10
B	22.4	16.4	3.2	3.4	55.8	63	35.2	10	20	35	11	12	12
C	30.3	15.0	8.8	11.2	168.0	36	60.5	8	27	38	9	11	7
D	30.0	15.1	8.2	9.8	148.0	35	51.8	14	44	29	5	4	4
A to D	**100.0**	**51.0**	**6.2**	**7.6**	**388**	**24**	**93**						
Separate Assessment of the Crag													
C	30.3	15.0	4.5	8.3	125.0	52	65.0	6	46	39	6	2	1
D	30.0	15.1	7.6	9.6	145.0	49	71.1	12	53	29	3	1	2
C + D		**30.1**	**6.0**	**9.0**	**270**	-		**10**	**50**	**33**	**4**	**2**	**1**

Accuracy of results For the four 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 35 per cent and 63 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 (388 million m^3) can be estimated to limits of ±24 per cent at the 95 per cent probability level by a calculation based on the data from the 66 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 limits of the four resource blocks (A to D) in this survey area have been drawn, primarily, with reference to the geological distribution of the mineral resources. In particular, the sub-drift limit of the Crag has been used to delineate blocks C and D. The fluvial and glacial deposits associated with, and contained within, the limits of the sub-drift buried channel system, are assessed together in resource block B; the remaining area forms block A.

Block A This block, situated in the north-western part of the sheet area is bounded in the south by the limit of the Crag, and in the east by the limits of the buried channel system.

The Chalk crops out over large parts of the block and is elsewhere concealed by only a thin cover of sandy drift, generally mapped as Cover Sand or Head. These drift deposits have been proved (for example in boreholes NW 44 and NW 45) to be generally too thin or clayey to be potentially workable, although locally, the deposits fulfil the arbitrary criteria for mineral (p.1), as seen in borehole NW 51.

The mineral deposits in this block comprise the irregularly distributed spreads of Glacial Sand and Gravel which extend over 4.5 km^2 of the total area of the block (17.3 km^2). In the extreme northwest corner of the block, the mineral is locally exposed, but elsewhere assessment boreholes showed it to be concealed by a thick cover of Boulder Clay (in borehole NW 41) or by younger drift deposits such as the Head Gravel, proved in borehole NW 42. In the south-eastern part of the block, the mineral deposits carry only a thin veneer of sandy overburden.

For the block as a whole, the mineral ranges in recorded thickness from 1.1 m to 5.8 m with a mean of 3.6 m; it has a mean grading of fines 14 per cent, sand 60 per cent and gravel 26 per cent. Overburden, generally comprising clayey sand, is usually thin, ranging from 0.2 to 0.9 m in five of the assessment boreholes. Exceptionally, however, in one borehole (NW 41), 8.0 m of Boulder Clay overburden was proved.

The total volume of mineral present is estimated to be 16.2 million m^3 ±59 per cent at the 95 per cent confidence level, the high confidence limits being due to the somewhat variable thickness of the deposits in this block, and the small number of data points (6) used in the assessment.

There is no evidence that the drift deposits in this block have been previously worked for aggregate.

Block B The somewhat sinuous shape of this block reflects the limits of the sub-drift buried channel which have been used to define it. The block covers 22.4 km^2 and although it principally contains the fluvial deposits associated with the Black Bourn River and its tributaries, numerous spreads of Glacial Sand and Gravel within the buried channel are also included in the assessment of resources.

The fluvial deposits range in thickness from 0.9 m in borehole SE 145 to 5.0 m in borhole NW 54; their mean thickness is 1.9 m. In contrast, the Glacial Sand and Gravel shows a considerable range in thickness from 1.3 m in borehole NW 58 to 12.1 m and 13.6 m proved in boreholes SE 140 and NW 61 respectively. These exceptional thicknesses of recorded mineral are interpreted as glacial material infilling the buried (sub-drift) channel (see Figure 3); the areal extent of this mineral-grade channel-fill material and its lateral relationship with the laminated silts and clays, which are more typical of the channel fill material, is unknown. The assessment of resources in this block also includes small

amounts of quartzite-rich deposits (Kesgrave Sands and Gravels and Ingham Sand and Gravel) proved in boreholes NE 36, NE 41 and NW 54.

For the block as a whole, the mineral deposits (assessed as one unit) range in recorded thickness from 0.9 m to 15.2 m+ with a mean of 3.4 m; they have a mean grading of fines 10 per cent, sand 66 per cent and gravel 24 per cent.

Overburden comprises a variety of materials, including peats and peaty silts which form part of the alluvium in the floodplain areas. In some boreholes, (for example borehole SE 140) thick Boulder Clay forms the overburden to the sand and gravel found within the buried channels. Overburden ranges in thickness from 0.2 m in borehole SE 139 to 4.3 m in borehole SE 133 and a cummulated 10.9 m (including interbedded waste) in borehole SE 140; it has a mean value of 3.2 m.

The estimated total volume of mineral in the block using data from 18 assessment boreholes and two commercial records is 55.8 million m^3 with limits of $\pm$63 per cent at the 95 per cent confidence level. These wide limits reflect the multigenetic origin of the deposits in this block, and the variable thickness of the Glacial Sand and Gravel.

Although there are no active workings for sand and gravel in this block at the present time, large areas have been worked in the 2nd and 3rd terrace deposits at Pakenham. A variety of deposits has been worked at the southern end of the block near Woolpit.

Block C This block extends over much (30.3 km^2) of the eastern part of the sheet area; its limits are defined by the limits of the Crag, and by an arbitrary N-S line at the southern end; a small part of the block occurs on the northern side of the buried channel system. Mineral in this block comprises extensive deposits of sand in the Crag (which underlies the whole of the block), and deposits of Glacial Sand and Gravel and Kesgrave Sands and Gravels which are found in a belt of mineral-bearing ground stretching between Woolpit and Woolpit Wood [997 614]. Large tracts of barren ground, where overburden of Boulder Clay exceeds three times the thickness of buried mineral, are identified in the south of the block towards Clopton Green [980 602] and in the northern part of the block between Norton and Elsmwell. The small area of fluvial deposits in this block (as proved in borehole SE 151) which lie in the headwater area of the Black Bourn valley, is considered to be not potentially workable.

The vertical and lateral variability of the deposits make them difficult to assess as a discrete mineral unit. The spreads of Glacial Sand and Gravel occur not only at the surface (as shown for example, in Woolpit Wood, by borehole SE 156), but also within (and overlain by) the Boulder Clay which occurs over much of the block (as seen in boreholes SE 152 and SE 147). Spreads of quartzite-rich Kesgrave Sands and Gravels are also recognised in this block, for example in boreholes NE 53 and SE 143, but because the lateral extent of these deposits cannot be determined on the evidence available, they have been assessed together with the other mineral deposits. Collectively, the glacial deposits in this block range in thickness from 1.3 m in borehole SE 154 to 19.0 m in borehole SE 151, and they have a calculated mean thickness of 7.1 m.

In many instances the Crag is overlain by deposits of potentially workable Glacial Sand and Gravel (as in boreholes SE 150 and 155) but, locally, the latter are absent and the Boulder Clay rests directly upon the Crag sands, as shown by boreholes NE 50 and NE 39 towards the north of the block. The thickness of the Crag increases towards the east (see contour map, Diagram B, on the margin of the resource sheet), ranging from 0.2 m in borehole SE 151 to 13.4 m in borehole SE 149; the mean thickness of the Crag is 8.3 m.

Assessing all deposits together, the mineral has a mean thickness for the block as a whole of 11.2 m, and a mean grading of fines 8 per cent, sand 74 per cent and gravel 18 per cent. Using data from 16 assessment boreholes and five commercial records, the total volume of mineral in this block is estimated to be 168 million m^3 $\pm$36 per cent at the 95 per cent confidence level. Overburden, mainly comprising Boulder Clay, has a mean thickness of 8.8 m but ranges in recorded thickness from 0.1 m in borehole SE 156 to 16.9 m in borehole SE 150. The glacial deposits have been previously worked as a source of aggregate in the north at Badwell Ash and in the south, near Woolpit Wood and Woolpit.

Block D This block extends across 30.0 km^2 of ground forming the south-western part of the sheet area; it is delineated by the limits of the Crag in the north, and by an arbitrary N-S line in the south-east. The block contains substantial resources of sand in the Crag which crops out in the north-west, around Rougham, and is concealed beneath the younger drift deposits elsewhere in the block, as demonstrated, for example in borehole SW 108. The spreads of Glacial Sand and Gravel are variable in thickness and distribution, and range in recorded thickness from 2.0 m (in borehole SE 135) to 6.9 m (in borehole SW 110); the mean is 5.8 m. The glacial deposits appear to be more widespread in the area round Tostock and Drinkstone Park where several lenses of Glacial Sand and Gravel occur at various levels within the Boulder Clay, as shown in cross section A-A at the foot of resource sheet.

The deposits of sand in the Crag, which increase in thickness southwards, have a proven range in thickness of 2.9 m in borehole SW 99 to 16.7 m in borehole SW 111 with a mean of 9.6 m. Although these sands occur at depth over most of the block, excessive thicknesses of Boulder Clay overburden render the sands generally not potentially workable in the south, and in a belt of land which trends northwards through Beyton towards Thurston.

The sinuous extension of the mineral-bearing ground from Tostock [905 640] southwards to the southern margin of the sheet coincides with the valley of the Black Bourn, where the Boulder Clay overburden is thin enough to allow the Crag to be regarded as potentially workable.

The sand and gravel resources in the block as a whole, range in recorded thickness from 3.9 m to 18.4 m, with a calculated mean of 9.8 m. The mean grading for all the mineral deposits is fines 14 per cent, sand 78 per cent and gravel 8 per cent.

Overburden which comprises mainly Boulder Clay in the eastern parts of the block also includes extensive spreads of Cover Sand and Head (both regarded as not potentially workable) in the western part. It ranges in recorded thickness from 0.2 m to 15.0 m and has a mean thickness of 8.2 m.

The estimated total volume of mineral in the block, based upon data from 13 assessment boreholes and six commercial records, is 148 million m^3 $\pm$35 per cent at the 95 per cent confidence level. Areas of worked-out ground occur in the glacial deposits at Hesset and near Drinkstone, but there are no currently active workings in the block.

List of Workings

At the present time, only one small area (see below) is being worked for aggregate, but a number of old workings exist near the villages of Woolpit, Elmswell and Badwell Ash. Numerous smaller workings for sand and gravel, for which no detailed records exist, occur throughout the area.

Location	Grid Reference	Deposit Worked
Active Pits		
Ticehurst House	956 627	Glacial Sand and Gravel
Worked Out or Abandoned Pits		
Drinkstone Mills (Woolpit)	965 625	Glacial Sand and Gravel
Hessett	940 610	Glacial Sand and Gravel
Badwell Ash	996 693	Glacial Sand and Gravel
Grimstone End	935 692 and 942 686	River Terrace Deposits
		River Terrace Deposits
Woolpit Wood	995 616	Glacial Sand and Gravel
Brick Works	983 624	Glacial Silt

REFERENCES

ALLEN, V. T. 1936. Terminology of medium-grained sediments. **Rep. Natl Res. Counc., Washington, 1935-1936,** App. 1, Rep. Comm. Sediment., 18-47.

ARCHER, A. A. 1969. Background and problems of an assessment of sand and gravel resources in the United Kingdom. **Proc. 9th Commonw. Min. & Metall. Congr., 1969,** Vol. 2: Mining and petroleum geology, 495-508.

— 1970a. Standardisation of the size classification of naturally occurring particles. **Geotechnique,** Vol. 20, 103-107.

— 1970b. Making the most of metrication. **Quarry Managers' J.,** Vol. 54, No. 6, 223-227.

ATTERBERG, A. 1905. Die rationelle Klassifikation der Sande und Kiese. **Chem. Z.,** Vol. 29, 195-198.

AUTON, C. A. 1982. The sand and gravel resources of the country around Redgrave, Suffolk; description of 1:25 000 resource sheet TM 07 and part of TM 08. **Miner. Assess. Rep. Inst. Geol. Sci.,** No. 117.

BENNETT, F. J. 1884. The geology of the country around Diss, Eye, Botesdale and Ixworth. Explanation of quarter-sheet 50 NW. **Mem. Geol. Surv. G. B.**

BRISTOW, C. R. and GREGORY, D. M. 1982. Notes on the high-level (?marine), late Anglian Woolpit Beds, Suffolk. **Trans. Suffolk. Nat. Soc.,** 18 pt. 4.

BRITISH STANDARDS INSTITUTION. 1967. **B.S.1377: Methods of testing soils for civil engineering purposes.** (London: British Standards Institution.)

— 1975. **BS 882 and 1201. Specifications for aggregates from natural resources for concrete.** (London: British Standards Institutions.)

BUREAU OF MINES AND GEOLOGICAL SURVEY. 1948. **Pp. 14-17** in **Mineral resources of the United States.** (Washington, DC: Public Affairs Press.)

CLARKE, M. R. and AUTON, C. A., 1982. The Pleistocene depositional history of the Norfolk-Suffolk borderlands. **Rep. Inst. Geol. Sci.,** No. 82/1.

EDWARDS, A. G., 1970. Scottish Aggregates: Their suitability for concrete with regard to Rock constituents. **B.R.S. Current paper.** 28/70.

FALCONER, K. J. 1971. A general purpose algorithm for contouring over scattered data points. **National Physical Laboratory Report NAC 6,**

HARRIS, P. M., THURRELL, R. G., HEALING, R. A., and ARCHER, A. A. 1974. Aggregates in Britain. **Proc. R. Soc.,** Ser. A, Vol. 339, 329-353.

HAWKINS, M. P. 1981. The sand and gravel resources of the country around Bury St Edmunds, Suffolk: description of 1:25 000 resource sheet TL 86 **Miner. Assess. Rep. Inst. Geol. Sci.,** No. 72.

HEY, R. W. 1980. Equivalents of the Westland Green Gravels in Essex and East Anglia. **Proc. Geol. Assoc.,** Vol. 91 279-90.

HULL, J. H. 1981. Methods of calculating the volume of resources of sand and gravel. **Appendix** (pp. 192-193) to **THURRELL, R. G.** 1981. Quarry resources and reserves: the identification of bulk mineral resources: the contribution of the Institute of Geological Sciences. **Quarry Management,** for March 1981, 181-193.

GINOSURF User Manual - Issue 1. - Computer Aided Design Centre.

LANE, E. W., and others. 1947. Report of the sub-committee on sediment terminology. **Trans. Am. Geophys. Union,** Vol. 28, 936-938.

PERRIN, R. M. S., ROSE, J. and DAVIES, H. 1979. The distribution variation, and origins of Pre-Devensian tills in Eastern England. **Phil. Trans. Roy. Soc. (Lond). Ser. B** Vol. 287, 535-570.

PETTIJOHN, F. J. 1975. **Sedimentary rocks.** 3rd edition. (London: Harper and Row.)

ROSE, J. and ALLEN, P., 1977. Middle Pleistocene stratigraphy in south-east Suffolk. **J. Geol. Soc. London.,** Vol. 133, 83-102.

THURRELL, R. G. 1971. The assessment of mineral resources with particular reference to sand and gravel. **Quarry Managers' J.,** Vol. 55, 19-25.

— 1981. Quarry resources and reserves: the identification of bulk mineral resources: the contribution of the Institute of Geological Sciences. **Quarry Management,** for March 1981, 181-193.

TWENHOFEL, W. H. 1937. Terminology of the fine-grained mechanical sediments. **Rep. Natl Res. Counc., Washington, 1936-37,** App. 1, Rep. Comm. Sediment., 81-104.

UDDEN, J. A. 1914. Mechanical composition of clastic sediments. **Bull. Geol. Soc. Am.,** Vol. 25, 655-744.

WENTWORTH, C. K. 1922. A scale of grade and class terms for clastic sediments. **J. Geol.,** Vol. 30, 377-392.

— 1935. The terminology of coarse sediments. **Bull. Natl. Res. Counc. Washington,** No. 98, 225-246.

WHITAKER, W., BENNET, F. J. and BLAKE, J. H., 1881. The geology of the neighbourhood of Stowmarket. Explanation of quarter-sheet 50 SW. **Mem. Geol. Surv. G. B.**

WILLMAN, H. B. 1942. Geology and mineral resources of the Marseilles, Ottawa and Streator quadrangles. **Bull. Illinois State Geol. Surv.,** No. 66, 343-344.

WOODLAND, A. W. 1970. The buried tunnel-valleys of East Anglia. **Proc. Yorkshire. Geol. Soc.,** Vol. 37, 521-578.

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.

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.

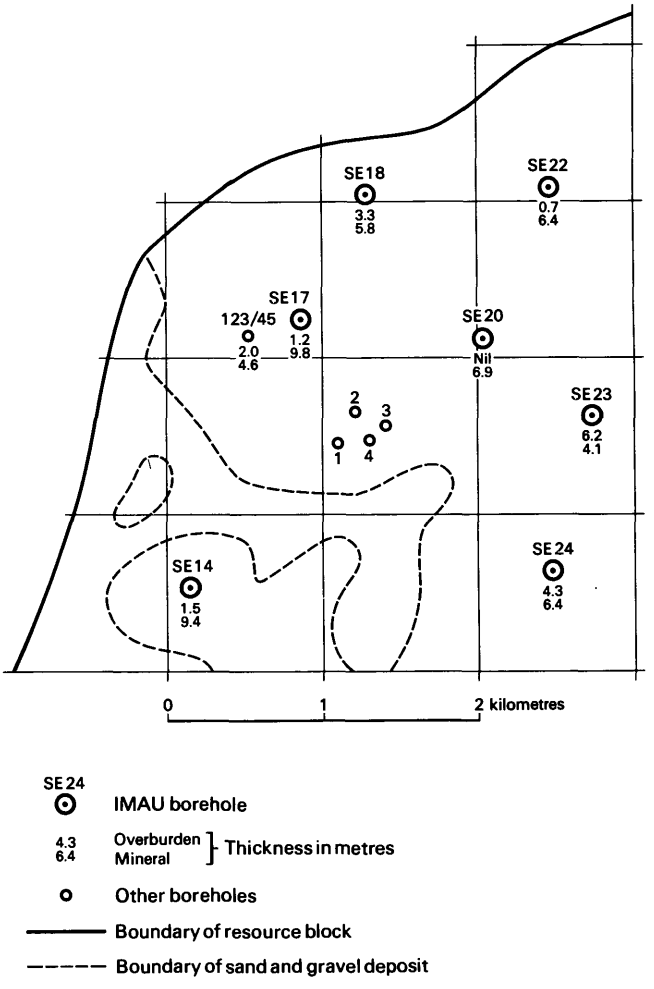
The drilling machine employed should be capable of providing a continuous sample representative of all unconsolidated deposits, so that the in-situ grading can be determined, if necessary, to a depth of 30 m (100 ft) at a diameter of about 200 mm (8 in), beneath different types of overburden. It should 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 depth. The samples, each weighing between 25 and 45 kg, 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

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

4 The above relationship may be transposed such that

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

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 $l_{m_1}, l_{m_2}, \ldots l_{m_n}$, then the best estimate of mean thickness, $\bar{l}_m$, is given by

$$\Sigma (l_{m_1} + l_{m_2} \ldots l_{m_n}) / n .$$

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_{m_1} to l_{m_n}.

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 $S_A / S_{\bar{l}_m} \leqq 0.\dot{3}$ is assumed in all cases. It follows from Equation [2] that

$$S_{\bar{l}_m} \leqq S_V \leqq 1.05\, S_{\bar{l}_m} \qquad [3]$$

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:

$$L_{\bar{l}_m} \leqq L_V \leqq 1.05\, L_{\bar{l}_m}.$$

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 l_o	Overburden wl_o	Mineral l_m	Mineral wl_m	Remarks
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	½	1.2	1.6	9.8	7.2	Hydrogeology Unit record
123/45	½	2.0		4.6		
1	¼	2.7	2.6	7.3	5.8	Close group of four boreholes (commercial)
2	¼	4.5		3.2		
3	¼	0.4		6.8		
4	¼	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	$\lvert(wl_m - \overline{wl}_m)\rvert$	$(wl_m - \overline{wl}_m)^2$
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_V is calculated as

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

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

$= 20.3$

$\simeq 20$ 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 fine gravel (+4 -16 mm) from larger pebbles. The boundary at 64 mm distinguishes pebbles from cobbles.

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 $\frac{1}{16}$ 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, 1975), 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: no 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
	Cobble		
64 mm			
		Coarse	Gravel
16 mm	Pebble		
		Fine	
4 mm			
		Coarse	
1 mm			
	Sand	Medium	Sand
$\frac{1}{4}$ mm			
		Fine	
$\frac{1}{16}$ mm			
	Fines (silt and clay)		Fines

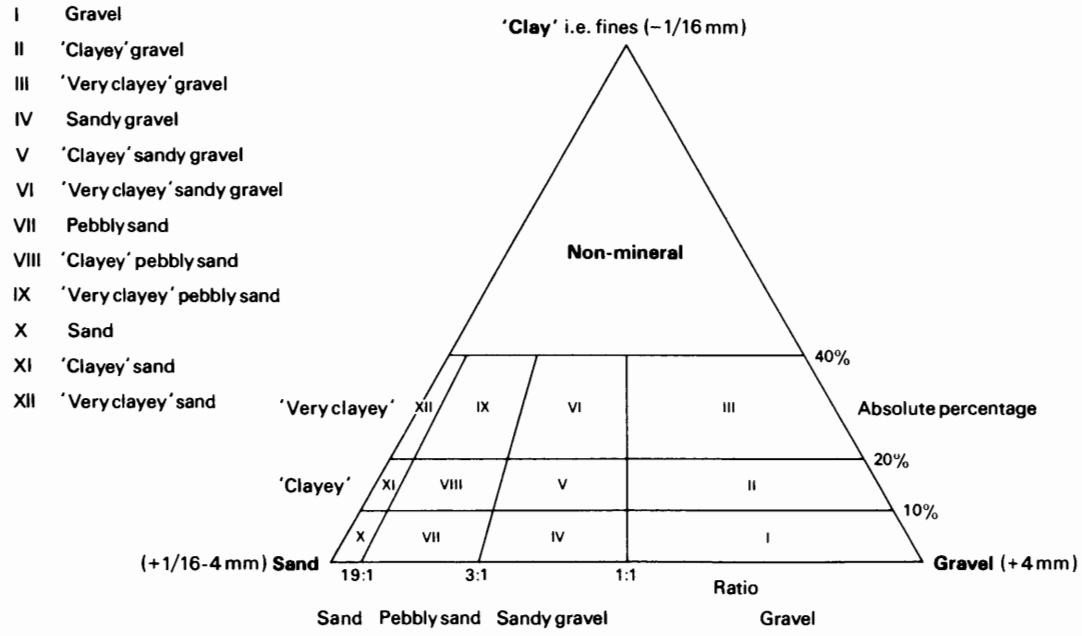


Diagram showing the descriptive categories used in the classification of sand and gravel

APPENDIX D

EXPLANATION OF THE BOREHOLE RECORDS

Annotated fictitious example

CK 66 NW 5[1] **6191 6962**[2] **Northfields**[3] **Block B**

Surface level c.+49.7 m (+163ft)[4]
Water struck at +45.9 m[5]
October 1972[6]

Overburden[7]	2.8 m
Mineral	5.4 m
Waste	1.1 m
Mineral	1.4 m
Bedrock	0.7 m+[8]

LOG

Geological classification	Lithology[9]	Thickness m	Depth m
	Soil	0.2	0.2
Alluvium	Clay, silty, dark brown	2.6	2.8
River Terrace Deposits	**a** Gravel Gravel: fine to coarse, with cobbles towards base, angular to rounded flint and limestone with ironstone and some quartz and chalk Sand: medium with coarse and some fine, quartz and limestone	5.4	8.2
Boulder Clay	Clay, sandy and pebbly, red-brown	1.1	9.3
Glacial Sand and Gravel	**b** Sand, 'clayey' in part: fine, subangular to rounded, quartz with some coal	1.4	10.7
Lias	Mudstone, blue-grey, fossiliferous	0.7+	11.4

GRADING[10]

	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	5	46	49	2.8-3.9	20	14	62	2	2	0	0
				3.8-4.8	2	2	12	18	42	24	0
				4.8-5.8	1	3	24	13	35	24	0
				5.8-6.8	0	4	21	20	26	29	0
				6.8-8.2	4	3	23	10	23	30	7
				Mean	**5**	**5**	**28**	**13**	**25**	**22**	**2**
b	5	95	0	9.3-10.3	3	73	23	1	0	0	0
				10.3-10.7	9	85	5	1	0	0	0
				Mean	**5**	**77**	**17**	**1**	**0**	**0**	**0**
a+b	**5**	**56**	**39**	**Mean**	**5**	**20**	**26**	**10**	**20**	**17**	**2**

COMPOSITION[11]

Depth below surface (m)	Percentages by weight in the +4-16 mm fraction					
	Flint	Quartz	Limestone	Chalk	Ironstone	Others
3.8-4.8	41	5	50	1	3	trace
4.8-5.8	39	3	45	5	8	trace
5.8-6.8	45	2	42	5	6	trace
6.8-8.2	19	6	61	3	11	trace
Mean	**35**	**4**	**51**	**3**	**7**	**trace**

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

1 Borehole Registration Number
Each Industrial Minerals Assessment Unit (IMAU) borehole is identified by a Registration Number. This consists of two statements.

a The number of the 1:25 000 sheet on which the borehole lies, here CK 66.
b The quarter of the 1:25 000 sheet on which the borehole lies and the number of the borehole in a series for that quarter, here NW 5.

Thus the full Registration Number is CK 66 NW 5.

2 National Grid Reference
All National Grid References fall in the 100 km square identified by the first two letters of the Registration Number. Grid references are given to eight figures, accurate to within 10 m.

3 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 the borehole lies is stated.

4 Surface level
The surface level at the borehole site is given in metres and feet above Ordnance Datum. All measurements were made in metres; approximate conversions to feet are given in brackets.

5 Groundwater conditions
If groundwater was present the level at which it was encountered is normally given (in metres relative to Ordnance Datum).

6 Type of drill and date of drilling
The type of rig used, the diameter of the casing and the month and year of completion of drilling are stated.

7 Overburden, mineral, waste and bedrock
Mineral is sand and gravel which, as part of a deposit, falls within the arbitrary definition of potentially workable material (see p. 1). Bedrock is the 'formation', 'country rock' or 'rock head' below which potentially workable sand and gravel will not be found. Waste is any material other than bedrock or mineral. Where waste occurs between the surface and mineral it is classified as overburden.

8 The plus sign (+) indicated that the base of the deposit was not reached during drilling.

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

10 Grading data
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 or at every 1 m of depth.

For each bulk sample the percentages of fines (-$\frac{1}{16}$ mm), fine sand (+$\frac{1}{16}$-$\frac{1}{4}$ mm), medium sand (+$\frac{1}{4}$-1 mm), coarse sand (+1-4 mm), fine gravel (+4-16 mm), coarse gravel (+16-64 mm) and cobble gravel (+64 mm) are stated. Due to the diameter of the casing (152 mm), cobble gravel, which is rarely present in this district, is likely to be unrepresentatively sampled.

The mean grading of groups of samples making up an identified bed of mineral are also given in detail and in summary. Where more than one bed is recognised the mean grading for the whole of the mineral in the borehole may be given. Where necessary, in calculating mean gradings, data for individual samples are weighted by the thickness represented.

Fully representative sampling of sand and gravel is difficult to achieve, particularly where groundwater levels are high. Comparison between boreholes and adjacent exposures commonly suggests that in borehole samples the proportion of sand may be higher and the proportion of fines and coarse gravel may be lower.

11 Composition
Details of the composition of the fine gravel fractions from selected samples or groups of samples may be given. The category 'others' includes igneous and sedimentary rocks which usually occur only in trace amounts.

APPENDIX E

INDUSTRIAL MINERALS ASSESSMENT UNIT BOREHOLE RECORDS

TL 96 NW 41 **9056 6971** **Fox Spinney, Pakenham** **Block A**

Surface level +61.7 m (+202 ft)
Water level not recorded
Shell and auger 152 mm diameter
August 1979

Overburden 8.0 m
Mineral 4.3 m
Waste 4.8 m
Bedrock 1.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, silty clay with scattered flints	0.4	0.4
Boulder Clay	Clay, silty, orange and brown with scattered subangular flints. Becoming mottled grey and brown silty clay below 0.8 m, and firm grey silty clay with pebbles of chalk and flint below 3.0 m	7.6	8.0
Glacial Sand and Gravel	'Clayey' sandy gravel Gravel: fine with some coarse subangular flint, subrounded chalk, and well rounded flint, vein quartz and quartzite Sand: medium with coarse subangular quartz and flint yellow and orange	4.3	12.3
Boulder Clay	Clay, silty, firm, brownish grey with pebbles of chalk and flint	4.8	17.1
Upper Chalk	Chalk, soft, white	1.5+	18.6

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
12	54	34	8.0-9.0	8	6	47	12	20	7	0
			9.0-10.0	9	6	38	16	19	12	0
			10.0-11.0	11	6	43	16	16	8	0
			11.0-12.0	14	4	9	21	35	17	0
			12.0-12.3	34	4	8	16	27	11	0
			Mean	**12**	**5**	**32**	**17**	**23**	**11**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
8.0-11.0	54	8	4	8	22	-	4

TL 96 NW 42 **9022 6830** **South of Paltrey Farm, Pakenham** **Block A**

Surface level +51.2 m (+167 ft)
Water level not recorded
Shell and auger 152 mm diameter
August 1979

Overburden 0.3 m
Mineral 5.8 m
Waste 1.9 m
Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy with scattered flints	0.3	0.3
Glacial Sand and Gravel	'Clayey' pebbly sand Gravel: fine with some coarse subangular flint, with some well rounded flint, vein quartz and quartzite Sand: fine and medium subangular quartz and flint	5.8	6.1
Glacial Silt	Silt, clayey, orange brown with scattered subangular flint pebbles	1.9	8.0
Upper Chalk	Chalk, silty, soft, buff and white	1.0+	9.0

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
14	68	18	0.3-1.3	7	37	21	9	20	6	0
			1.3-2.3	21	37	30	4	5	3	0
			2.3-3.3	23	40	31	3	3	0	0
			3.3-4.3	15	37	27	6	12	3	0
			4.3-5.3	9	30	22	8	19	12	0
			5.3-6.1	9	29	25	7	15	15	0
			Mean	**14**	**36**	**26**	**6**	**12**	**6**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.3-2.3	75	9	5	5	-	6	-

TL 96 NW 43 **9088 6818** **South of Highfields Farm, Pakenham** **Block A**

Surface level +54.1 m (+177 ft)
Water not struck
Shell and auger 152 m diameter
August 1979

Overburden 0.2 m
Mineral 4.8 m
Bedrock 1.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy with scattered flints	0.2	0.2
Glacial Sand and Gravel	'Clayey' sandy gravel Gravel: fine and coarse subangular chalk and flint, well rounded flint, vein quartz and quartzite Sand: medium with fine and coarse subangular quartz and flint, yellowish brown	4.8	5.0
Upper Chalk	Chalk, soft, white, occasional flint cobbles	1.5+	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	+64 mm
18	45	37	0.2-1.2	13	29	22	7	16	13	0
			1.2-2.2	12	16	22	10	20	20	0
			2.2-3.4	15	6	22	13	23	21	0
			3.4-4.4	28	8	13	10	24	17	0
			4.4-4.8	30	7	15	9	19	20	0
			4.8-5.0	7	24	55	3	7	4	0
			Mean	**18**	**14**	**21**	**10**	**20**	**17**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
2.2-3.4	65	8	10	11	3	3	-

TL 96 NW 44 **9025 6682** **near Barton Mere Farm, Great Barton** **Block A**

Surface level +49.2 m (+161 ft)
Water not struck
Shell and auger 152 mm diameter
August 1979

Waste 3.0 m
Bedrock 2.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy with scattered flints	0.3	0.3
Cover Sand	**a** 'Very clayey' pebbly sand Gravel: fine subangular flint and chalk	0.7	1.0
Silt	Silt, chalky with fine subangular flint pebbles	0.2	1.2
Head Gravel	**b** Clay, sandy, with scattered fine and coarse subangular flint and chalk pebbles	1.0	2.2
Silt	Silt, chalky and sandy with occasional subangular flint pebbles	0.8	3.0
Upper Chalk	Chalk, soft, silty	2.0+	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
a	37	59	4	0.3-1.0	37	43	14	2	3	1	0
b	40	49	11	1.2-2.2	40	33	13	3	6	5	0
a+b	**39**	**53**	**8**	**Mean**	**39**	**37**	**13**	**3**	**5**	**3**	**0**

TL 96 NW 45 **9043 6563** **near East Barton, Great Barton** **Block A**

Surface level +53.4 m (+175 ft)
Water not struck
Shell and auger 152 mm diameter
August 1979

Waste 3.5 m
Bedrock 2.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, clayey sand with scattered flints	0.3	0.3
Cover Sand	'Very clayey' sandy gravel Gravel: mainly fine subangular flint with some well rounded vein quartz Sand: fine with medium and coarse subangular quartz, orange brown	0.8	1.1
Boulder Clay	Clay, silty, buff and brown with abundant chalk and flint pebbles	2.4	3.5
Upper Chalk	Chalk, soft, white	2.0+	5.5

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
23	52	25	0.3-1.1	23	35	13	4	9	16	0

TL 96 NW 46 **9132 6967** **Great Queach, Pakenham** **Block A**

Surface level +58.2 m (+190 ft)
Water struck at +56.6 m
Shell and auger 152 mm diameter
July 1979

Overburden 0.9 m
Mineral 1.1 m
Waste 4.1 m
Bedrock 2.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy clay with scattered flints	0.3	0.3
Boulder Clay	Clay, silty and sandy, mottled orange and brown with pebbles of chalk and flint	0.6	0.9
Glacial Sand and Gravel	'Very clayey' sandy gravel Gravel: fine with some coarse subangular chalk and flint, with some well rounded flint and quartzite Sand: fine with medium and coarse subangular quartz and flint	1.1	2.0
Boulder Clay	Clay, silty, firm, dark brownish grey with scattered flint and chalk pebbles	4.1	6.1
Upper Chalk	Chalk, soft, white, becoming hard rock below 8.2 m	2.6+	8.7

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
26	46	28	0.9-1.1	12	49	24	6	9	0	0
			1.1-1.7	33	17	14	10	18	8	0
			1.7-2.0	19	8	13	17	30	13	0
			Mean	**26**	**20**	**15**	**11**	**20**	**8**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
1.1-1.7	30	4	-	5	59	2	-

TL 96 NW 47 **9159 6864** **West of Old Hall, Pakenham** **Block A**

Surface level +50.8 m (+166 ft)
Water not struck
Shell and auger 152 mm diameter
August 1979

Overburden 0.3 m
Mineral 2.2 m
Waste 1.6 m
Bedrock 1.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy with scattered flints	0.3	0.3
Cover Sand	'Very clayey' pebbly sand Gravel: coarse with some fine subangular flint, and occasional flint cobbles Sand: fine with medium subangular quartz, orange-brown	2.2	2.5
Boulder Clay	Clay, silty and sandy, orange brown with scattered chalk and flint pebbles	1.6	4.1
Upper Chalk	Chalk, soft, white	1.5+	5.6

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
28	59	13	0.3-1.3	30	39	19	2	3	7	0
			1.3-2.5	27	36	19	2	3	7	6
			Mean	**28**	**38**	**19**	**2**	**3**	**7**	**3**

TL 96 NW 48 **9118 6756** **North-east of Mere Farm, Pakenham** **Block A**

Surface level +47.1 m (+154 ft)
Water not struck
Shell and auger 152 mm diameter
August 1979

Waste 2.0 m
Bedrock 1.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy with scattered flints	0.2	0.2
Cover Sand	'Very clayey' pebbly sand, with scattered flints Sand: fine and medium subangular quartz	0.7	0.9
Boulder Clay	Clay, silty, brownish orange-brown, with scattered flint and chalk. Becoming darker, brownish grey, with depth	1.1	2.0
Upper Chalk	Chalk, soft, white	1.5 +	3.5

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
25	69	6	0.2-0.9	25	44	23	2	3	3	0

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.2-0.9	59	20	12	9	-	-	-

TL 96 NW 49 **9172 6643** **East of Thurston Grange, Thurston** **Block A**

Surface level +49.8 m (+163 ft)
Water not struck
Shell and auger 152 mm diameter
August 1979

Waste 2.0 m
Bedrock 2.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, clayey sand, with scattered flints	0.3	0.3
Boulder Clay	Clay silty, brown with scattered flint; chalk pebbles present below 1.1 m	1.7	2.0
Upper Chalk	Chalk, soft, white	2.0+	4.0

TL 96 NW 50 **9267 6948** **West of Mill Cottages, Pakenham** **Block B**

Surface level +33.5 m (+109 ft)
Water level not recorded
Shell and auger 152 mm diameter
August 1979

Overburden 0.2 m
Mineral 1.3 m
Waste 17.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy with scattered flints	0.2	0.2
Head Gravel	Gravel Gravel: coarse and fine subangular flint, and well rounded chalk and quartzite Sand: fine and medium subangular quartz with some flint	1.3	1.5
Boulder Clay	Clay, silty and sandy, orange brown with scattered flint	1.5	3.0
	Clay, silty, firm, brownish grey with pebbles of chalk and flint	7.0	10.0
	Clay silty, reddish brown, with pebbles of chalk, flint and mudstone	8.6+	18.6

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
9	35	56	0.2-1.5	9	16	12	7	23	31	2

TL 96 NW 51 **9240 6808** **North of Manor Farm, Pakenham** **Block A**

Surface level +37.5 m (+123 ft)
Water not struck
Shell and auger 152 mm diameter
July 1979

Overburden 0.2 m
Mineral 1.2 m
Bedrock 1.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy with scattered flints	0.2	0.2
Head Gravel	'Clayey' pebbly sand Gravel: fine and coarse subangular flint Sand: fine with medium subangular quartz, orange brown	1.2	1.4
Upper Chalk	Chalk, soft, white	1.1+	2.5

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
13	81	6	0.2-1.2	13	57	21	3	3	3	0

TL 96 NW 52 **9242 6666** **South of Nether Hall, Pakenham** **Block A**

Surface level +36.0 m (+118 ft)
Water struck at +34.3 m
Shell and auger 152 mm diameter
July 1979

Overburden 0.7 m
Mineral 1.3 m
Bedrock 0.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, silty sand, dark brown	0.2	0.2
Alluvium	Clay, silty and sandy, mottled orange and grey	0.5	0.7
River Terrace Deposits	'Very clayey' pebbly sand Gravel: coarse and fine subangular flint Sand: fine with medium subangular quartz and flint	1.3	2.0
Upper Chalk	Chalk, soft, becoming hard rock	0.7+	2.7

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
25	59	16	0.7-1.7	25	40	19	3	3	10	0
			1.7-2.0	25	21	19	8	15	12	0
			Mean	**25**	**36**	**19**	**4**	**6**	**10**	**0**

TL 96 NW 53 **9226 6545** **South-west of Manor Farm, Thurston** **Block D**

Surface level +52.9 m (+173 ft)
Water not struck
Shell and auger 152 mm
September 1979

Waste 8.1 m
Bedrock 2.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy clay with scattered flints	0.5	0.5
Boulder Clay	Clay, silty, mottled orange and brown with scattered flints, becoming firm brownish grey silty clay with pebbles of chalk and flint below 1.4 m	5.7	6.2
Kesgrave Sands and Gravels	'Clayey' pebbly sand Gravel: fine with coarse subangular flint, well rounded vein quartz, quartzite and flint Sand: medium with fine and coarse subrounded quartz with some subangular flint	1.3	7.5
Silt	Silt, chalky and sandy, bright orange, with pebbles of and chalk	0.6	8.1
Upper Chalk	Chalk, hard rock	2.0+	10.1

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
15	66	19	6.2-7.2	14	18	42	11	13	2	0
			7.2-7.5	20	16	24	8	13	19	0
			7.5-8.1	No grading data available						
			Mean	**15**	**17**	**39**	**10**	**13**	**6**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
6.2-7.5	49	13	22	10	1	5	-

TL 96 NW 54 **9368 6956** **Watermill, Pakenham** **Block B**

Surface level +30.4 m (+99 ft)
Water struck at +27.9 m
Shell and auger 152 mm diameter
September 1979

Overburden 0.5 m
Mineral 7.6 m
Bedrock 2.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy with scattered flints	0.5	0.5
River Terrace Deposits	**a** Sandy gravel Gravel: fine and coarse subangular flint with some well rounded vein quartz, quarztite and flint Sand: medium with fine and some coarse subangular flint, orange brown	5.0	5.5

Ingham Sand and Gravel	**b** Sandy gravel Gravel: fine and medium subangular flint and well rounded quartzite with some well rounded vein quartz and flint Sand: medium with some fine and coarse subangular quartz	2.6	8.1
Upper Chalk	Chalk, hard rock, white	2.0+	10.1

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
a	4	70	26	0.5-1.5	5	33	29	6	15	12	0
				1.5-2.5	5	29	37	7	14	8	0
				2.5-3.5	5	17	58	3	6	11	0
				3.5-4.5	3	12	48	7	17	11	2
				4.5-5.5	3	10	39	10	25	13	0
				Mean	**4**	**20**	**43**	**7**	**15**	**11**	**trace**
b	3	51	46	5.5-6.5	0	8	28	9	24	31	0
				6.5-7.5	7	10	47	12	15	9	0
				7.5-8.1	1	4	18	9	28	40	0
				Mean	**3**	**8**	**33**	**10**	**22**	**24**	**0**
a+b	**4**	**62**	**34**	**Mean**	**4**	**16**	**38**	**8**	**18**	**16**	**trace**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.5-5.5	72	6	9	7	trace	4	1
5.5-8.1	41	6	14	30	1	7	trace

TL 96 NW 55 **9377 6966** **Mickle Mere, Pakenham** **Block B**

Surface level +27.0 m (+88 ft)
Water struck at +25.0 m
Shell and auger 152 mm diameter
August 1979

Overburden 2.0 m
Mineral 3.6 m
Bedrock 1.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy and peaty	0.1	0.1
Made Ground and Alluvium	Silt, clayey and sandy with scattered flints and some brick rubble	1.9	2.0
River Terrace Deposits	Sandy Gravel, with interbedded clayey silt from 3.0 m to 3.8 m Gravel: fine and coarse subangular flint with traces of well rounded vein quartz and quartzite Sand: medium and fine with some coarse subangular quartz and flint, grey	3.6	5.6
Upper Chalk	Chalk, soft, white	1.5+	7.1

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
6	50	44	2.0-3.0	12	22	23	11	25	7	0
			3.8-4.8	2	15	23	7	24	29	0
			4.8-5.6	3	13	24	11	27	22	0
			Mean	**6**	**17**	**23**	**10**	**24**	**20**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
2.0-5.6	83	7	3	3	-	4	-

TL 96 NW 56 **9377 6873** **South of Grimstone End, Pakenham** **Block B**

Surface level +34.8 m (+114 ft)
Water level not recorded
Shell and auger 152 mm diameter
July 1979

Waste 18.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, silty sand, dark brown	0.3	0.3
Cover Sand	'Very Clayey' pebbly sand (non-mineral) Gravel: fine subangular flint Sand: fine and medium subangular quartz, orange brown	0.5	0.8
Boulder Clay	Clay, silty, with scattered flint and chalk pebbles, mottled orange and brown becoming bluish grey below 3.7 m. Mainly bluish grey silt between 5.5 m and 11.7 m. Thin beds of chalky gravel at intervals	17.9+	18.7

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
33	46	21	0.3-0.8	23	37	20	4	5	11	0
			3.0-3.7	52	13	8	7	10	10	0
			11.7-12.0	19	32	24	13	9	3	0
			15.6-15.8	18	9	13	12	35	13	0
			Mean	**33**	**23**	**15**	**8**	**12**	**9**	**0**

TL 96 NW 57 **9326 6824** **Pakenham Fen, Pakenham** **Block B**

Surface level +31.7 m (+104 ft)
Water struck at +13.7 m
Shell and auger 152 mm diameter
August 1979

Waste 17.9 m
Bedrock 0.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy and peaty	0.1	0.1
Silt	Sandy and peaty, dark brown	0.9	1.0
Boulder Clay	Clay, silty, with scattered chalk and flint pebbles. Dark grey, firm	9.0	10.0
	Clay, silty with abundant subrounded chalk pebbles, reddish brown and buff near base	7.9	17.9
Upper Chalk	Chalk, soft white, becoming hard rock below 18.3 m	0.7+	18.6

TL 96 NW 58 **9391 6773** **South of Maulkin's Hall, Pakenham** **Block B**

Surface level +47.6 m (+156 ft)
Water struck at +43.0 m
Shell and auger 152 mm diameter
June 1979

Overburden 0.6 m
Mineral 1.3 m
Waste 16.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy	0.2	0.2
Cover Sand	Silt, sandy, brownish orange	0.4	0.6
Glacial Sand and Gravel	'Very clayey' pebbly sand Gravel: fine subangular flint Sand: fine with some medium subangular quartz, mottled orange and grey	1.3	1.9
Glacial Silt	Clays and silts, mottled brown and pale bluish grey, laminated in parts with interbedded fine gravel and sand between 4.2 m and 5.2 m	4.1	6.0
Boulder Clay	Clay, silty, firm, with scattered flint and chalk pebbles, bluish grey	12.5+	18.5

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
33	60	7	0.6-1.9	33	38	19	3	6	1	0

TL 96 NW 59 **9322 6682** **West of Pakenham Wood, Pakenham** **Block A**

Surface level +50.1 m (+164 ft)
Water level not recorded
Shell and auger 152 mm diameter
July 1979

Overburden 0.3 m
Mineral 4.4 m
Bedrock 3.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy, dark brown	0.3	0.3
Glacial Sand and Gravel	Pebbly sand Gravel: fine with some coarse subangular flint, with some chalk and well rounded flint, vein quartz, quartzite and sandstone Sand: medium with some fine and coarse subangular quartz, with some flint,orange	4.4	4.7
Upper Chalk	Chalk, soft, white	3.3+	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	+64 mm
7	73	20	0.3-1.3	6	11	33	10	20	20	0
			1.3-1.8	6	8	42	10	21	13	0
			1.8-2.8	3	16	78	1	1	1	0
			2.8-3.1	5	22	70	1	2	0	0
			3.1-4.1	8	13	47	10	13	9	0
			4.1-4.7	13	13	53	8	9	4	0
			Mean	**7**	**13**	**53**	**7**	**11**	**9**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.3-4.7	68	8	7	7	2	8	-

TL 96 NW 60 **9361 6549** **Green Farm, Thurston** **Block A**

Surface level +52.9 m (+173 ft)
Water level not recorded
Shell and auger 152 mm diameter
July 1979

Waste 11.8 m
Bedrock 1.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy, orange-brown	0.2	0.2
Boulder Clay	Clay, silty, with scattered flints, mottled orange and grey. Becoming firm bluish grey silty clay with chalk and flint pebbles below 4.6 m	8.7	8.9

Glacial Sand and Gravel	Gravel Gravel: fine and coarse subangular flint with some well rounded flint, vein quartz and quartzite Sand: medium and coarse subangular quartz and flint	1.9	10.8
Boulder Clay	Clay, silty, orange brown with pebbles of flint and vein quartz	0.2	11.0
Glacial Sand and Gravel	'Clayey' sand, pebbly in top 10 cm Sand: fine and medium subangular quartz	0.8	11.8
Chalk	Chalk, soft, white	1.3+	13.1

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
10	57	33	0.8-1.0	20	52	24	2	2	0	0
			8.9-9.9	8	7	22	16	31	16	0
			9.9-10.8	6	9	16	17	32	20	0
			11.0-11.8	15	40	40	3	2	0	0
			Mean	**10**	**20**	**25**	**12**	**21**	**12**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
8.9-10.8	70	8	10	8	1	3	-

TL 96 NW 61 **9474 6787** **Bull House, Pakenham** **Block B**

Surface level +34.6 m (+113 ft)
Water level not recorded
Shell and auger 152 mm diameter
August 1979

Overburden 0.8 m
Mineral 1.6 m
Waste 6.0 m
Mineral 13.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy, with scattered flint, peaty	0.8	0.8
River Terrace Deposits	**a** Sandy gravel Gravel: fine with some coarse subangular flint Sand: fine and medium with some coarse subangular quartz and flint, orange-brown	1.6	2.4
Boulder Clay	Clay, silty, dark grey with scattered chalk and flint pebbles	6.0	8.4
Channel-fill Deposits	**b** 'Clayey' sand Sand: medium with some coarse subangular quartz with some flint. Traces of fine flint and chalk gravel at intervals	13.6+	22.0

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	5	58	37	0.8-1.8	6	24	25	8	22	15	0
				1.8-2.4	5	12	27	18	32	6	0
				Mean	**5**	**20**	**26**	**12**	**26**	**11**	**0**
b	10	89	1	8.4-9.4	8	3	59	28	2	0	0
				9.4-10.4	2	3	75	19	1	0	0
				10.4-11.4	8	3	69	19	1	0	0
				11.4-12.4	5	3	70	20	1	1	0
				12.4-13.4	6	2	70	21	1	0	0
				13.4-14.4	11	2	64	23	0	0	0
				14.4-15.4	6	2	66	25	1	0	0
				15.4-16.4	5	2	65	27	1	0	0
				16.4-17.4	7	2	66	23	1	1	0
				17.4-18.4	7	2	67	22	1	1	0
				18.4-19.4	6	2	85	7	0	0	0
				19.4-20.4	2	3	85	10	0	0	0
				20.4-21.4	61	2	34	3	0	0	0
				21.4-22.0	6	4	80	10	0	0	0
				Mean	**10**	**2**	**68**	**19**	**1**	**trace**	**0**
a+b	**10**	**86**	**4**	**Mean**	**10**	**4**	**64**	**18**	**3**	**1**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
8.4-21.4	63	-	trace	3	28	3	3

TL 96 NW 62 **9437 6645** **North of Great Green Farm, Thurston** **Block D**

Surface level +57.9 m (+189 ft)
Water not struck
Shell and auger 202 mm diameter
June 1979

Overburden 6.0 m
Mineral 4.0 m
Bedrock 2.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, silty sand, pale brown	0.2	0.2
Boulder Clay	Clay, silty, mottled orange and brown with scattered flints. Becoming, firm bluish grey silty clay with chalk and flint pebbles below 3.6 m	5.8	6.0
Crag	Sand, pebbly near top and base Sand: medium with some fine subrounded quartz, pale brown and orange	4.0	10.0
Upper Chalk	Chalk, soft, white, with pockets of reddish brown sand	2.4+	12.4

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	90	4	6.0-6.4	20	26	38	6	5	5	0
			6.4-7.4	4	9	76	5	2	4	0
			7.4-8.4	4	14	80	1	1	0	0
			8.4-9.4	4	13	82	1	0	0	0
			9.4-9.8	0	16	64	4	8	8	0
			9.8-10.0	11	13	61	7	5	3	0
			Mean	**6**	**14**	**73**	**3**	**2**	**2**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
6.0-10.0	41	7	39	13	trace	trace	-

TL 96 NE 34 **9545 6972** **near Kiln Plantation, Stowlangtoft** **Block C**

Surface level +61.6 m (+202 ft)
Water not struck
Shell and auger 202 mm diameter
June 1979

Waste 12.9 m
Bedrock 4.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, clayey sand	0.3	0.3
Cover Sand	**a** 'Very clayey' pebbly sand with scattered subangular to well rounded flints and vein quartz Sand: fine and medium quartz, orange brown	0.7	1.0
Boulder Clay	Clay, dark bluish grey with scattered subangular flint and well rounded chalk pebbles. Becoming less pebbly with depth	8.8	9.8
Crag	**b** Silty sand; (non-mineral) mainly fine subrounded quartz, pale yellow. Pebbles of flint, vein-quartz and quartzite at base	3.1	12.9
Upper Chalk	Chalky silt, buff, becoming soft white chalk below 17.4 m	4.7+	17.6

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
a	31	65	4	0.3-1.0	31	42	22	1	2	2	0
b	40	59	1	9.8-10.8	44	55	1	0	0	0	0
				10.8-11.8	36	63	1	0	0	0	0
				11.8-12.9	39	50	6	0	1	4	0
				Mean	**40**	**56**	**3**	**trace**	**trace**	**1**	**0**
a+b	**38**	**59**	**3**	**Mean**	**38**	**53**	**6**	**trace**	**1**	**2**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.3-0.7	50	20	20	-	4	-	6
11.8-12.9	9	16	18	55	-	-	2

TL 96 NE 35 **9547 6858** **East of Bridge Farm, Stowlangtoft** **Block B**

Surface level +32.2 m (+105 ft)
Water struck at +30.8 m
Shell and auger 202 mm diameter
July 1979

Overburden 0.3 m
Mineral 10.7 m
Waste 4.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, clayey sand with scattered subangular flints	0.3	0.3
River Terrace Deposits	**a** Gravel, silty in top 1.0 m Gravel: fine and medium subangular to subrounded flint, with some rounded flint, vein quartz and quartzite Sand: fine to coarse subangular quartz with some flint, orange-brown	3.0	3.3
Glacial Sand and Gravel	**b** Sandy gravel Gravel: fine and medium subangular to flint and sub-rounded chalk with some vein quartz, quartzite and sandstone Sand: medium with some fine and coarse subangular quartz and flint, brownish grey	7.7	11.0
Boulder Clay	Clay, silty, firm brownish grey with scattered flint and chalk pebbles	4.3+	15.3

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	7	40	53	0.3-1.4	17	30	20	8	13	12	0
				1.4-2.3	2	3	11	6	29	49	0
				2.3-3.3	3	4	16	15	31	29	2
				Mean	**7**	**14**	**16**	**10**	**24**	**28**	**1**
b	7	50	43	3.3-4.1	6	7	22	11	18	30	6
				4.1-5.1	12	9	23	15	26	15	0
				5.1-6.1	6	10	19	13	29	23	0
				6.1-7.1	6	9	22	13	28	22	0
				7.1-8.1	5	9	22	10	21	31	2
				8.1-9.1	5	9	27	15	23	21	0
				9.1-10.1	7	14	31	12	19	17	0
				10.1-11.0	8	23	42	14	9	4	0
				Mean	**7**	**11**	**26**	**13**	**22**	**20**	**1**
a+b	**7**	**47**	**46**	**Mean**	**7**	**12**	**23**	**12**	**22**	**23**	**1**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
1.1-3.3	64	11	7	10	3	5	trace
4.1-11.0	30	4	5	6	43	10	3

TL 96 NE 36 **9542 6798** **Stowlangtoft Spinney, Stowlangtoft** **Block B**

Surface level +47.8 m (+156 ft)
Water not struck
Shell and auger 202 mm diameter
June 1979

Overburden 0.3 m
Mineral 2.5 m
Bedrock 1.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy, pale brown	0.3	0.3
Kesgrave Sands and Gravels	'Very clayey' sandy gravel Gravel: fine subangular to well rounded flints, well rounded vein quartz and quartzite Sand: fine and medium subrounded quartz orange-brown, chalky silt bands at intervals	2.5	2.8
Upper Chalk	Chalky silt, soft, white	1.2+	4.0

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
23	56	21	0.3-1.3	10	31	27	4	6	22	0
			1.3-1.8	29	28	23	5	5	10	0
			1.8-2.8	32	21	23	6	10	8	0
			Mean	**23**	**26**	**25**	**5**	**7**	**14**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.3-2.8	45	12	28	12	-	4	0

TL 96 NE 37 **9587 6680** **Hall's Farm, Norton** **Block B**

Surface level +50.6 m (+166 ft)
Water not struck
Shell and auger 152 mm diameter
July 1979

Waste 7.0 m
Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Made Ground	Clay and brick rubble	1.1	1.1
Boulder Clay	Clay, silty greenish grey, becoming mottled brown and grey below 2.0 m, and buff to brown soft silty clay with chalk pebbles below 4.3 m	5.9	7.0
Upper Chalk	Chalk, soft, white	1.0+	8.0

TL 96 NE 38 **9533 6604** **West of Watling's Farm, Norton** **Block B**

Surface level +38.1 m (+125 ft)
Water struck at +35.9 m
Shell and auger 202 mm diameter
June 1979

Overburden 0.2 m
Mineral 2.6 m
Waste 11.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy, dark brown	0.2	0.2
River Terrace Deposits	'Clayey' sandy gravel, silty in top 1.0 m Gravel: fine and coarse angular to subangular flint with some vein quartz and quartzite Sand: fine and medium subangular quartz and flint, orange	2.6	2.8

Glacial Silt	Silt, peaty, becoming greenish grey	0.7	3.5
Boulder Clay	Clay, silty, bluish grey with scattered chalk and flint pebbles. Silty between 5.0 m and 6.4 m. Thin sand partings at intervals	11.0+	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
a	14	44	42	0.2-1.2	26	10	9	5	20	30	0
				1.2-2.2	7	29	25	7	15	17	0
				2.2-2.8	5	17	22	10	30	16	0
				Mean	**14**	**19**	**18**	**7**	**20**	**22**	**0**
b	77	23	0	5.0-6.4	77	20	2	1	0	0	0
a+b	**37**	**36**	**27**	**Mean**	**37**	**19**	**12**	**5**	**13**	**14**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.2-2.8	83	6	4	6	-	trace	1

TL 96 NE 39 **9701 6984** **Langham Thicks, Langham** **Block C**

Surface level +61.8 m (+202 ft)
Water not struck
Shell and auger 202 mm diameter
June 1979

Overburden 9.2 m
Mineral 6.7 m
Bedrock 1.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, clayey sand	0.3	0.3
Boulder Clay	Sandy clay, mottled orange and brown with occasional subangular flints	1.7	2.0
	Clay, silty, dark bluish grey with scattered flint and chalk pebbles	7.2	9.2
Crag	Sand, with flakes of muscovite Sand: mainly fine with some medium subrounded quartz. Pebbles of vein quartz and quartzite between 10.5 m and 10.7 m, and at base	6.7	15.9
Upper Chalk	Chalk, soft, white	1.1+	17.0

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	89	3	9.2-10.2	16	80	4	0	0	0	0
			10.2-11.2	12	84	3	1	0	0	0
			11.2-12.2	6	65	21	6	2	0	0
			12.2-13.2	3	56	40	1	0	0	0
			13.2-14.2	4	88	8	0	0	0	0
			14.2-15.2	6	90	4	0	0	0	0
			15.2-15.6	3	32	45	2	7	11	0
			15.6-15.9	10	26	19	7	18	20	0
			Mean	**8**	**72**	**15**	**2**	**1**	**2**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
11.2-15.9	24	32	16	9	-	19	-

TL 96 NE 40 **9642 6865** **Stowlangtoft Park, Stowlangtoft** **Block B**

Surface level +35.7 m (+117 ft)
Water struck at +33.8 m
Shell and auger 202 mm diameter
June 1979

Overburden 0.6 m
Mineral 2.4 m
Waste 21.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy, dark brown	0.6	0.6
River Terrace Deposits	Sandy gravel Gravel: fine and medium subangular flint with some well rounded flint, vein quartz, quartzite and chalk. Occasional cobbles of flint Sand: fine and medium with some coarse subangular quartz and flint, yellowish brown	2.4	3.0
Boulder Clay	Clay, silty, brown, becoming firm bluish grey silty clay with pebbles of chalk and flint	17.2	20.2
Glacial Silt	Silt, laminated, clayey, light grey with buff coloured partings	4.2+	24.4

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	49	43	0.6-1.6	8	35	29	4	10	11	3
			1.6-2.6	10	12	12	9	29	28	0
			2.6-3.0	4	11	18	12	27	24	4
			Mean	**8**	**22**	**20**	**7**	**21**	**20**	**2**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.6-3.0	70	7	10	6	4	2	1

TL 96 NE 41 **9627 6804** **Street Farm, Stowlangtoft** **Block B**

Surface level +47.1 m (+154 ft)
Water not struck
Shell and auger 202 mm diameter
June 1979

Overburden 1.8 m
Mineral 1.0 m
Waste 0.9 m
Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy	0.4	0.4
Boulder Clay	Sandy clay, mottled orange and brown	1.4	1.8
Kesgrave Sands and Gravels	**a** 'Clayey' pebbly sand Gravel: mainly fine subangular flint and well rounded vein quartz Sand: fine and medium subangular quartz	1.0	2.8
	Sandy clay, mottled orange and brown, with scattered flints and vein quartz pebbles. Silty at base	0.5	3.3
	b Gravel Gravel: fine with some coarse, subangular flint and well rounded vein quartz and quarzite Sand: medium and coarse subangular quartz, orange	0.4	3.7
Upper Chalk	Chalk, soft, white, silty	1.0+	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
a	10	81	9	1.8-2.8	10	35	38	8	6	3	0
b	7	44	49	3.3-3.7	7	6	21	17	34	15	0
a+b	**9**	**70**	**21**	**Mean**	**9**	**26**	**33**	**11**	**14**	**7**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
1.8-2.8	45	14	26	15	-	-	-
3.3-3.7	32	12	34	21	-	-	1

TL 96 NE 42 **9721 6691** **North of Hill Farm, Norton** **Block C**

Surface level +58.5 m (+191 ft)
Water not struck
Shell and auger 152 mm diameter
July 1979

Waste 18.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, clayey, dark brown	0.2	0.2
Boulder Clay	Clay, silty, buff and pale brown with pebbles of chalk to 1.0 m depth. Thin bed of sand from 1.0 m to 1.2m. Then firm greyish brown silty clay with pebbles of chalk and flint	18.5+	18.7

TL 96 NE 43 **9632 6553** **Rookery Farm, Norton** **Block B**

Surface level +52.4 m (+171 ft)
Water struck at +48.1 m and +43.8 m
Shell and auger 152 mm diameter
July 1979

Waste 18.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, clayey with scattered flint pebbles	0.6	0.6
Boulder Clay	Clay, brown and buff with abundant pebbles of chalk, becoming dark grey silty clay below 5.5 m	6.8	7.4
Glacial Silt	Silt, grey and brown, laminated with sandy partings	4.7	12.1
Boulder Clay	Clay, firm with abundant fine chalk	2.0	14.1
Glacial Silt	Silt, laminated, grey	4.6+	18.7

TL 96 NE 44 **9744 6857** **near Hunston Cottage, Hunston** **Block B**

Surface level +40.5 m (+132 ft)
Water struck at +39.0 m
Shell and auger 202 mm diameter
July 1979

Overburden 1.0 m
Mineral 1.2 m
Waste 16.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Made Ground	Sand, ash and brick rubble	1.0	1.0
River Terrace Deposits	Pebbly sand Gravel: fine and coarse subangular flint Sand: fine and medium subangular quartz, brown	1.2	2.2
Boulder Clay	Clay, silty, dark grey with pebbles of chalk and flint	16.9+	19.1

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
6	81	13	1.0-2.2	6	39	37	5	8	5	0

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
1.0-2.2	87	5	2	-	-	6	-

TL 96 NE 45 **9753 6569** **Norton Hall, Norton** **Block C**

Surface level +65.7 m (+215 ft)
Water struck at +47.3 m
Shell and auger 152 mm diameter
July 1979

Waste 18.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy clay with scattered flint pebbles	0.3	0.3
Boulder Clay	Clay, silty, buff and brown with abundant pebbles of chalk. Becoming dark grey silty clay below 4.0 m and orange brown sandy clay below 16.6 m	18.4+	18.7

TL 96 NE 46 **9811 6967** **East of The Old Rectory, Langham** **Block C**

Surface level +52.0 m (+170 ft)
Water not struck
Shell and auger 202 mm diameter
June 1979

Overburden 4.5 m
Mineral 7.0 m
Bedrock 0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Made Ground	Clay and flint cobbles	0.5	0.5
Boulder Clay	Clay, silty, sandy in parts, mottled pale brown and grey	4.0	4.5
Glacial Sand and Gravel	**a** 'Clayey' gravel Gravel: fine and coarse subangular flint with chalk and scattered vein quartz Sand: medium with some coarse and fine subangular quartz and flint	3.9	8.4
Kesgrave Sands and Gravels	**b** Pebbly sand Gravel: mainly fine, subangular flint and well rounded vein quartz Sand: medium with some coarse subrounded to subangular quartz, orange	3.1	11.5
Upper Chalk	Chalk, soft, white	0.5+	12.0

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	16	40	44	4.5-5.5	23	7	22	15	26	7	0
				5.5-6.5	19	7	24	12	23	15	0
				6.5-7.5	19	5	20	11	25	20	0
				7.5-8.4	1	4	17	14	22	42	0
				Mean	**16**	**6**	**21**	**13**	**24**	**20**	**0**
b	5	75	20	8.4-8.9	10	5	26	16	25	18	0
				8.9-9.1	No grading data available						
				9.1-10.1	5	4	51	24	15	1	0
				10.1-11.1	3	3	71	13	8	2	0
				11.1-11.5	3	2	46	22	20	7	0
				Mean	**5**	**4**	**53**	**18**	**15**	**5**	**0**
a+b	**11**	**55**	**34**	**Mean**	**11**	**5**	**35**	**15**	**20**	**14**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
4.5-8.4	37	9	7	5	39	3	-
8.4-11.5	35	19	37	6	-	3	-

TL 96 NE 47 **9796 6873** **South-east of Hall Farm, Langham** **Block B**

Surface level +37.0 m (+121 ft)
Water struck at +33.5 m
Shell and auger 202 mm diameter
June 1979

Waste 6.6 m
Bedrock 11.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, peaty	0.2	0.2
Alluvium	Clay,silty,soft, mottled grey and brown	0.5	0.7
Peat	Peat, soft, fibrous, dark brown with wood fragments	2.3	3.0
Silt	Silt, soft,greenish grey, shelly above 4.5 m	1.9	4.9
River Terrace Deposits	Gravel Gravel: mainly coarse with some fine subangular to subrounded flint with some chalk, scattered cobbles of flint	1.0	5.9
Silt	Silt, clayey, with fine chalk pebbles	0.7	6.6
Upper Chalk	Chalk, silty, soft, white	11.0+	17.6

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	22	72	4.9-5.9	6	12	7	3	13	59	0

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
4.9-5.9	65	19	1	6	3	6	-

TL 96 NE 48 **9795 6846** **East of Dairy Farm, Hunston** **Block B**

Surface level +45.0 m (+147 ft)
Water not struck
Shell and auger 152 mm diameter
July 1979

Waste 18.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy, with scattered flints	0.2	0.2
Cover Sand	'Very clayey' sand Sand: mainly fine and medium subangular to subrounded quartz, with scattered flint pebbles	0.8	1.0
Glacial Silt	Silt, laminated in parts, orange and buff, becoming grey below 3.8 m. Sandy partings at intervals	17.7+	18.7

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	69	7	0.2-1.0	24	41	25	3	6	1	0

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.2-1.0	87	-	12	-	-	trace	-

TL 96 NE 49 **9908 6731** **Brown's Wood, Great Ashfield** **Block C**

Surface level +64.7 m (+212 ft)
Water struck at +46.2 m
Shell and auger 152 mm diameter
July 1979

Waste 18.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, clayey, sandy with scattered flint pebbles	0.3	0.3
Boulder Clay	Clay, silty, mottled brown and grey, becoming grey silty clay below 3.0 m. Pebbles of flint and chalk scattered throughout	17.2	17.5
Glacial Silt	Silt, clayey, orange and brown with sandy partings	1.2+	18.7

TL 96 NE 50 **9986 6858** **North of Ashfield House, Badwell Ash** **Block C**

Surface level +55.6 m (+182ft)
Water struck at +50.2 m
Shell and auger 152 mm diameter
July 1979

Overburden 13.5 m
Mineral 8.7 m
Bedrock 0.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, clayey sand with scattered flints	0.4	0.4
Boulder Clay	Clay, silty, brown and buff with scattered flint and chalk pebbles. Becoming dark grey silty clay below 4.0 m	10.3	10.7
Glacial Sand and Gravel	**a** 'Clayey' pebbly sand Gravel: fine with some coarse subangular flint with some well rounded flint, vein quartz, quartzite, chalk and sandstone Sand: medium with some fine and coarse subangular quartz and flint, brown	1.3	12.0
Boulder Clay	Clay, silty, pale brownish grey with pebbles of flint and chalk	1.5	13.5
Crag	**b** Pebbly sand, mainly sand below 17.4 m Gravel: fine with some coarse subangular flint, well rounded vein quartz and quartzite Sand: medium with fine subrounded quartz, orange becoming greenish grey below 19.4 m. Shell debris present below 20.4 m	8.7	22.2
Upper Chalk	Chalk, soft, white, becoming hard rock below 22.6 m	0.9+	23.1

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
a	11	68	21	10.7-11.6	9	9	44	12	21	5	0
				11.6-12.0	15	17	49	8	10	1	0
				Mean	**11**	**11**	**46**	**11**	**17**	**4**	**0**
b	4	89	7	13.5-14.5	3	25	66	1	2	3	0
				14.5-15.4	7	8	52	12	17	4	0
				15.4-16.4	1	7	72	13	6	1	0
				16.4-17-4	2	5	58	19	14	2	0
				17.4-18.4	3	62	31	3	1	0	0
				18.4-19.4	3	52	40	5	0	0	0
				19.4-20.4	3	36	57	3	1	0	0
				20.4-21.4	7	33	53	6	1	0	0
				21.4-22.2	11	29	49	4	2	5	0
				Mean	**4**	**29**	**53**	**7**	**5**	**2**	**0**
a+b	**5**	**87**	**8**	**Mean**	**5**	**27**	**52**	**8**	**6**	**2**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
10.7-12.0	60	8	8	6	9	8	1
13.5-17.4	34	14	33	6	-	11	2

TL 96 NE 51 **9944 6564** **near Button Haugh Green, Elmswell** **Block C**

Surface level +69.0 m (+226 ft)
Water not struck
Shell and auger 152 mm diameter
July 1979

Waste 19.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Made Ground	Sand and clay with flint cobbles	0.4	0.4
Boulder Clay	Clay, silty, mottled orange and brown, becoming bluish grey below 0.7 m; and dark grey below 5.0 m. Flint and chalk pebbles scattered throughout. Thin bed of sand between 1.1 m and 1.3 m, and of chalky gravel between 14.0 m and 14.1 m	18.9+	19.3

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
12	88	0	1.1-1.3	12	62	25	1	trace	0	0

TL 96 NE 52 **9915 6973** **Brook Farm, Langham** **Block B**

Surface level +37.3 m (+122 ft)
Water struck at +34.1 m
Shell and auger 152 mm diameter
September 1979

Waste 7.0 m
Bedrock 1.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy clay	0.3	0.3
Alluvium	Silty clay, mottled grey and brown, peaty	0.7	1.0
Peat	Peat, dark brown, with some orange mottles	1.4	2.4
Silt	Silt, soft, yellowish green and grey, with gastropod shells. Some scattered fine chalk pebbles near base	4.6	7.0
Upper Chalk	Chalk, soft, white	1.5+	8.5

TL 96 NE 53 **9978 6967** **Ladywood Barn, Badwell Ash** **Block C**

Surface level +53.8 m (+176 ft)
Water struck at +42.4 m
Shell and auger 152 mm diameter
August 1979

Overburden 8.4 m
Mineral 6.6 m
Waste 1.0 m
Bedrock 2.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy clay with scattered flints	0.3	0.3
Boulder Clay	Clay, silty, orange brown with flint, chalk and occasional quartzite pebbles. Becoming dark grey, firm silty clay below 3.5 m	6.7	7.0
Glacial Silt	Silt, clayey, reddish brown with pebbles of well-rounded vein quartz	1.4	8.4
Kesgrave Sands and Gravels	**a** Pebbly sand, silty at base Gravel: fine with some medium subangular flint, well rounded vein quartz and flint Sand: medium with fine and some coarse sub-angular quartz and flint	3.0	11.4
Crag	**b** Sand, micaceous Sand: fine and medium subrounded quartz with thin grey clay laminae at intervals	3.6	15.0
	Silt, firm, laminated, pale grey	1.0	16.0
Upper Chalk	Chalk, hard rock	2.0+	18.0

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	8	69	23	8.4-9.4	4	5	43	12	22	14	0
				9.4-10.4	5	8	46	18	14	9	0
				10.4-11.4	15	51	17	7	5	5	0
				Mean	**8**	**21**	**35**	**13**	**14**	**9**	**0**
b	6	92	2	11.4-12.4	9	65	23	1	2	0	0
				12.4-13.4	7	43	44	5	1	0	0
				13.4-14.4	4	31	58	5	2	0	0
				14.4-15.0	6	42	45	5	2	0	0
				Mean	**6**	**46**	**42**	**4**	**2**	**0**	**0**
a+b	7	**82**	**11**	**Mean**	**7**	**35**	**39**	**8**	**7**	**4**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
8.4-11.4	39	18	33	5	-	4	1
13.4-15.0	10	4	15	30	-	-	41

TL 96 SW 93 **9013 6378** **North of Rookery House, Rougham** **Block D**

Surface level +57.9 m (+189 ft)
Water level not recorded
Shell and auger 152 mm diameter
August 1979

Overburden 0.2 m
Mineral 3.9 m
Bedrock 1.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy with scattered pebbles of flint and vein quartz	0.2	0.2
Crag	'Very clayey' pebbly sand Gravel: mainly fine sub-angular flint and well rounded vein quartz, with some quartzite Sand: fine with some medium sub-rounded quartz Silt band from 2.6 m to 3.5 m	3.9	4.1
Upper Chalk	Chalk, soft, white	1.4+	5.5

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
30	65	5	0.2-0.4	22	52	19	3	4	0	0
			0.4-1.2	24	54	18	2	2	0	0
			1.2-1.6	26	44	15	3	6	6	0
			1.6-2.6	48	40	3	2	3	4	0
			3.5-3.9	5	59	36	0	0	0	0
			3.9-4.1	27	30	33	3	3	4	0
			Mean	**30**	**47**	**16**	**2**	**3**	**2**	**0**

TL 96 SW 94 **9064 6259** **North of Almshouses, Rougham** **Block D**

Surface level +68.9 m (+226 ft)
Water level not recorded
Shell and auger 152 mm diameter
August 1979

Overburden 8.3 m
Mineral 9.3 m
Bedrock 1.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Made Ground	Concrete rubble and sandy clay	0.4	0.4
Cover Sand	Silt, sandy with scattered pebbles of flint	0.6	1.0
Boulder Clay	Clay, silty, buff and orange brown with pebbles of chalk and flint. Thin beds of soft orange brown clay at intervals, and a thin bed of chalky gravel from 4.1 m to 4.4 m	7.3	8.3
Crag	**a** 'Clayey' sand, with pebbles of flint vein quartz and quartzite below 16.3 m Sand: fine with some medium subrounded quartz, micaceous, pale yellow. Grey silty laminae at intervals	9.3	17.6
Upper Chalk	Chalk, soft, white	1.1+	18.7

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
	45	47	8	0.4-1.0	45	32	13	2	8	0	0
	38	33	29	4.1-4.4	38	14	11	8	19	10	0
a	14	83	3	8.3-9.3	15	84	1	0	0	0	0
				9.3-10.3	10	87	3	0	0	0	0
				10.3-11.3	16	81	3	0	0	0	0
				11.3-12.3	11	76	13	0	0	0	0
				12.3-13.3	10	86	4	0	0	0	0
				13.3-14.3	28	61	11	0	0	0	0
				14.3-15.3	12	82	6	0	0	0	0
				15.3-16.3	19	55	22	3	1	0	0
				16.3-17.3	8	20	45	10	7	10	0
				17.3-17.6	15	18	28	8	11	20	0
				Mean	**14**	**69**	**12**	**2**	**1**	**2**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
4.1-4.4	65	-	1	5	20	9	-

TL 96 SW 95 **9078 6043** **near Bradfield St George** **Block D**

Surface level +77.1 m (+252 ft)
Water level not recorded
Shell and auger 152 mm diameter
August 1979

Waste 18.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy with scattered flints	0.3	0.3
Boulder Clay	Clay, silty, sandy, orange brown, with scattered pebbles of flint and chalk and thin beds of silt, sand and chalky gravel. Below 5.5 m becoming firm dark grey silty clay with pebbles of chalk and flint	18.5+	18.8

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
46	45	9	0.3-0.8	43	31	12	4	6	4	0
			0.8-1.2	50	23	11	6	6	4	0
			1.6-2.2	42	31	14	4	7	2	0
			Mean	**46**	**29**	**12**	**4**	**6**	**3**	**0**

TL 96 SW 96 **9125 6447** **Newhall Covert, Rougham** **Block D**

Surface level +51.5 m (+168 ft)
Water level not recorded
Shell and auger 152 mm diameter
July 1979

Overburden 0.1 m
Mineral 1.6 m
Waste 1.4 m
Bedrock 0.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy, pale brown	0.1	0.1
Cover Sand	'Very clayey' pebbly sand Gravel: fine and coarse subangular flint Sand: fine and medium subangular quartz, orange	1.6	1.7
Boulder Clay	Clay, sandy, pale brown with scattered flint and chalk pebbles	1.4	3.1
Upper Chalk	Chalk, soft, white	0.9+	4.0

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
39	56	5	0.1-1.5	39	38	17	1	1	4	0
			1.5-1.7	36	36	15	3	9	1	0
			Mean	**39**	**38**	**17**	**1**	**2**	**3**	**0**

TL 96 SW 97 **9113 6327** **Rougham Hall, Rougham** **Block D**

Surface level +60.0 m (+196 ft)
Water level not recorded
Shell and auger 152 mm diameter
August 1979

Overburden 0.3 m
Mineral 3.4 m
Waste 1.2 m
Mineral 7.3 m
Bedrock 1.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, silty and sandy, pale brown	0.3	0.3
Head	**a** 'Clayey' pebbly sand Gravel: fine subangular flint, with traces of vein quartz, quartzite and chalk Sand: fine and medium subangular quartz. Sandy clay between 0.8 m and 1.5 m	3.4	3.7
Boulder Clay	Clay, silty, orange brown with pebbles of chalk and flint. Chalky gravel at base	1.2	4.9
Crag	**b** 'Clayey' pebbly sand Sand: fine with some medium subrounded quartz, micaceous, pale yellow. Dark orange clayey bands at intervals. Below 10.9 m, pebbles of well rounded flint and quartzite and subangular flint abundant	7.3	12.2
Upper Chalk	Chalk, soft, white	1.3+	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	18	74	8	0.3-0.8	23	47	18	2	7	3	0
				1.5-2.5	14	37	31	6	12	0	0
				2.5-3.7	20	41	33	2	4	0	0
				Mean	**18**	**40**	**30**	**4**	**7**	**1**	**0**
b	13	79	8	4.9-5.9	11	86	2	1	0	0	0
				5.9-6.9	8	91	1	0	0	0	0
				6.9-7.9	8	91	1	0	0	0	0
				7.9-8.9	14	81	5	0	0	0	0
				8.9-9.9	21	43	31	4	1	0	0
				9.9-10.9	16	50	29	4	1	0	0
				10.9-11.9	8	18	26	6	16	26	0
				11.9-12.2	19	13	29	4	8	27	0
				Mean	**13**	**63**	**14**	**2**	**3**	**5**	**0**
a+b	**14**	**78**	**8**	**Mean**	**14**	**56**	**19**	**3**	**4**	**4**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.3-3.7	75	8	3	8	1	3	2

TL 96 SW 98 **9121 6133** **East of Rougham Green Farm, Rougham** **Block D**

Surface level +77.1 m (+252 ft) Waste 18.5 m+
Water level not recorded
Shell and auger 152 mm diameter
August 1979

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Cover Sand	'Clayey' sand Sand: fine with some medium subangular quartz	0.3	0.7
Boulder Clay	Clay, silty, mottled orange-brown and grey with pebbles of flint and chalk. Becoming firm bluish grey silty clay below 5.9 m. Chalky gravel between 9.4 m and 10.4 m and grey laminated silt between 10.4 m and 13.6 m	17.8+	18.5

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
14	53	33	0.4-0.7	32	53	11	2	1	1	0
			9.4-10.4	9	15	19	15	16	26	0
			Mean	**14**	**24**	**17**	**12**	**13**	**20**	**0**

TL 96 SW 99 **9214 6383** **Rougham Place, Rougham** **Block D**

Surface level +56.9 m (+186 ft)
Water not struck
Shell and auger 152 mm diameter
August 1979

Overburden 0.7 m
Mineral 3.2 m
Mineral 2.9 m
Bedrock 2.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy, pale brown	0.1	0.1
Head Gravel	**a** 'Clayey' sand Sand: fine and medium subangular quartz pale brown, with scattered fine subangular flints, and well rounded vein quartz	0.6	0.7
Glacial Sand and Gravel	**b** 'Clayey' pebbly sand Gravel: fine and coarse subangular flint and well rounded flint, vein quartz, quartzite and chalk Sand: medium with some fine and coarse subangular quartz	3.2	3.9
Crag	**c** 'Clayey' pebbly sand, gravelly at base Gravel: fine and medium subangular flint, well rounded vein quartz, quartzite and flint Sand: fine with traces of medium subrounded quartz	2.9	6.8
Upper Chalk	Chalk, soft, white	2.0+	8.8

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	19	77	4	0.1-0.7	19	53	21	3	4	0	0
b	19	62	19	0.7-1.9	20	24	37	7	9	3	0
				2.0-2.9	20	24	49	3	2	2	0
				2.9-3.9	15	8	20	12	20	22	3
				Mean	**19**	**19**	**36**	**7**	**10**	**8**	**1**
c	12	79	9	3.9-4.9	10	87	1	1	1	0	0
				4.9-5.9	14	86	0	0	0	0	0
				5.9-6.3	12	61	17	6	4	0	0
				6.3-6.8	12	19	19	6	11	29	4
				Mean	**12**	**71**	**6**	**2**	**3**	**5**	**1**
a+b	**19**	**64**	**17**	**Mean**	**19**	**24**	**34**	**6**	**9**	**7**	**1**
b+c	**15**	**70**	**15**	**Mean**	**15**	**44**	**21**	**5**	**7**	**7**	**1**
a+c	**13**	**79**	**8**	**Mean**	**13**	**68**	**9**	**2**	**3**	**4**	**1**
a+b+c	**16**	**70**	**14**	**Mean**	**16**	**45**	**21**	**4**	**7**	**6**	**1**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
1.9-3.9	59	7	8	10	10	6	-
3.9-6.8	46	7	15	13	-	19	-

TL 96 SW 100 **9235 6455** **Thurston House, Thurston** **Block D**

Surface level +53.9 m (+176 ft)
Water not struck
Shell and auger 152 mm diameter
August 1979

Waste 4.3 m
Bedrock 2.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy clay, with some brick rubble	0.4	0.4
Head Gravel	Silty sand, fine and medium subangular quartz, orange brown	0.7	1.1
Boulder Clay	Clay, silty, firm bluish grey with pebbles of chalk and flint. Thin bed of fine and medium sand from 1.6 m to 2.2 m	2.9	4.0
Crag	'Clayey' sandy gravel Gravel: fine and medium subangular flint and well rounded vein quartz and quartzite Sand: fine with some medium subrounded quartz, pale orange	0.3	4.3
Upper Chalk	Chalk, silty, buff	2.6+	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
42	53	5	0.4-1.1	25	52	18	3	2	0	0
			1.6-2.2	15	25	51	5	3	1	0
			2.2-3.1	82	8	7	2	1	0	0
			4.0-4.3	11	5	34	18	16	16	0
			Mean	**42**	**24**	**24**	**5**	**3**	**2**	**0**

TL 96 SW 101 **9246 6250** **North of High Rougham, Rougham** **Block D**

Surface level +66.3 m (+217 ft)
Water level not recorded
Shell and auger 152 mm diameter
August 1979

Overburden 5.7 m
Mineral 13.3 m
Bedrock 1.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Made Ground	Soil, sandy clay and brick rubble	0.6	0.6
Boulder Clay	Clay, silty, orange brown with pebbles of flint and chalk. Below 3.6 m, chalk pebbles abundant	5.1	5.7
Crag	Sand Sand: fine with some medium subrounded quartz, micaceous, orange. Pebbles of flint, vein quartz and quartzite present below 18.7 m	13.3	19.0
Upper Chalk	Chalk, soft, white	1.5+	20.5

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
9	91	0	5.7-6.7	6	39	55	0	0	0	0
			6.7-7.7	6	52	42	0	0	0	0
			7.7-8.7	10	83	7	0	0	0	0
			8.7-9.7	7	82	11	0	0	0	0
			9.7-10.7	2	36	62	0	0	0	0
			10.7-11.7	5	43	49	2	1	0	0
			11.7-12.7	22	73	5	0	0	0	0
			12.7-13.7	11	84	5	0	0	0	0
			13.7-14.7	9	72	19	0	0	0	0
			14.7-15.8	14	59	27	0	0	0	0
			15.8-16.7	10	38	50	2	0	0	0
			16.7-17.7	8	76	15	1	0	0	0
			17.7-18.7	8	44	46	2	0	0	0
			18.7-18.9	15	24	15	7	11	28	0
			18.9-19.0	No grading data available						
			Mean	**9**	**60**	**30**	**1**	**trace**	**trace**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
18.7-18.9	47	4	19	7	-	14	9

TL 96 SW 102 **9258 6047** **Breach Wood, Hessett** **Block D**

Surface level +85.2 m (+279 ft)
Water not struck
Shell and auger 152 mm diameter
August 1979

Waste 18.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy with scattered flints	0.1	0.1
Boulder Clay	Clay silty and sandy, pale brown with scattered flint and chalk pebbles. Becoming firm bluish grey silty clay with flint and chalk pebbles below 5.1 m. Chalky gravel between 11.8 m and 12.1 m	18.6+	18.7

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
31	57	12	0.1-0.6	31	37	16	4	8	4	0

TL 96 SW 103 **9339 6469** **East of Stockhold Green, Thurston** **Block D**

Surface level +56.9 m (+186 ft)
Water not struck
Shell and auger 152 mm diameter
August 1979

Waste 14.6 m
Bedrock 2.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy, dark brown	0.5	0.5
Boulder Clay	**a** Clay, silty, buff and pale brown above 2.6 m, becoming firm bluish grey silty clay with flint and chalk pebbles. Thin beds of sand and chalky gravel at intervals, more silty towards base	12.0	12.5
Kesgrave Sands and Gravels	**b** 'Clayey' sandy gravel Gravel: fine and coarse subangular flint and well rounded flint, vein quartz and quartzite Sand: fine and medium subangular quartz, pale brown	2.1	14.6
Upper Chalk	Chalk, soft, white	2.2+	16.8

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	59	34	7	8.2-8.6	30	11	24	11	17	7	0
				8.9-9.9	79	10	10	1	0	0	0
				9.9-10.7	50	17	23	3	7	0	0
				Mean	**59**	**13**	**17**	**4**	**6**	**1**	**0**
b	12	68	20	12.5-13.5	14	23	20	7	13	20	3
				13.5-14.6	10	26	47	9	4	4	0
				Mean	**12**	**25**	**35**	**8**	**8**	**11**	**1**
a+b	**35**	**51**	**14**	**Mean**	**35**	**19**	**26**	**6**	**7**	**6**	**1**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
12.5-14.6	53	21	19	6	-	trace	-

TL 96 SW 104 **9321 6413** **near Thurston Planch, Thurston** **Block D**

Surface level +49.8 m (+163 ft)
Water not struck
Shell and auger 152 mm diameter
August 1979

Overburden 0.1 m
Mineral 1.4 m
Waste 0.7 m
Bedrock 1.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy with scattered flints	0.1	0.1
Head	**a** 'Very clayey' pebbly sand Gravel: fine and coarse subangular flint with traces of well rounded vein quartz, quartzite and chalk Sand: medium and fine subangular quartz, orange brown	1.4	1.5
	b Silt, sandy, subrounded fine quartz sand with scattered flints	0.7	2.2
Upper Chalk	Chalk, soft, white	1.4+	3.6

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
a	25	68	7	0.1-0.8	27	41	21	2	2	7	0
				0.8-1.5	23	15	52	3	5	2	0
				Mean	**25**	**29**	**37**	**2**	**3**	**4**	**0**
b	**51**	**45**	**4**	**Mean**	**51**	**30**	**13**	**2**	**4**	**0**	**0**
a+b	**33**	**60**	**7**	**Mean**	**33**	**29**	**29**	**2**	**4**	**3**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.1-1.5	74	1	4	5	11	5	0

TL 96 SW 105 **9352 6296** **South-west of Grange Farm, Beyton** **Block D**

Surface level +62.8 m (+206 ft)
Water struck at +51.8 m
Shell and auger 152 mm diameter
August 1979

Waste 20.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy, pale brown	0.1	0.1
Head	'Very clayey' pebbly sand Sand: fine subangular quartz with scattered flints	0.8	0.9
Boulder Clay	Clay, silty, soft, orange brown with chalk and flint pebbles. Becoming firm bluish grey silty clay below 7.6 m	8.6	9.5
Glacial Silt	Silt, fine, yellowish brown, becoming bluish grey below 15.2 m	6.9	16.4
Boulder Clay	Clay, silty, firm, bluish grey with pebbles of flint and chalk	3.6+	20.0

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
71	27	2	0.1-0.9	24	49	17	2	5	3	0
			9.5-10.5	80	17	2	1	0	0	0
			11.5-12.5	81	19	0	0	0	0	0
			12.5-13.5	85	15	0	0	0	0	0
			13.5-14.5	83	17	0	0	0	0	0
			Mean	**71**	**22**	**4**	**1**	**1**	**1**	**0**

TL 96 SW 106 **9395 6267** **Brook Farm, Beyton** **Block D**

Surface level +59.0 m (+193 ft)
Water struck at +51.4 m and +43.1 m
Shell and auger 202 mm diameter
September 1979

Waste 17.4 m
Bedrock 2.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Peat	Dark brown organic matter	0.3	0.3
Alluvium	Silt, soft, peaty, becoming sandy at base	0.4	0.7
River Terrace Deposits	**a** 'Clayey' gravel Gravel: fine and coarse subangular flint, with traces of well rounded vein quartz, quartzite and chalk Sand: fine, medium and coarse subangular quartz, pale brown	0.9	1.6

Boulder Clay	Clay, silty, bluish grey, with flint and chalk pebbles. Becoming brownish grey below 12.5 m, with a thin quartzite rich gravel between 14.5 m and 15.2 m **(b)**	14.3	15.9
Kesgrave Sands and Gravels	**c** Gravel Gravel: fine and coarse subangular flint and well rounded vein quartz, flint and quartzite Sand: fine to coarse subangular quartz, pale brown	1.5	17.4
Upper Chalk	Chalk, soft, white	2.1+	19.5

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	12	42	46	0.7-1.6	12	19	13	10	23	23	0
b	13	54	33	14.5-15.2	13	16	28	10	19	14	0
c	6	38	56	15.9-16.9	5	4	20	17	28	26	0
				16.9-17.4	8	8	19	9	12	44	0
				Mean	**6**	**5**	**19**	**14**	**23**	**33**	**0**
a+b+c	**9**	**43**	**48**	**Mean**	**9**	**12**	**19**	**12**	**23**	**25**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.7-1.6	78	4	trace	6	10	1	-
14.5-15.2	62	7	13	16	2	-	-
15.9-17.4	39	13	29	11	4	4	-

TL 96 SW 107 **9467 6435** **near Woodend Green Farm, Tostock** **Block B**

Surface level +59.5 m (+195 ft)
Water not struck
Shell and auger 152 mm diameter
June 1979

Waste 13.3 m
Bedrock 0.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, clayey sand, pale brown	0.2	0.2
Boulder Clay	Clay, silty and sandy with scattered flints. Becoming (below 1.5 m) bluish grey silty clay with pebbles of of flint and chalk	11.2	11.4
Glacial Sand and Gravel	'Very clayey' sandy gravel Gravel: fine and coarse subangular flint and chalk with some well rounded vein quartz, quartzite and sandstone Sand: medium with some fine and coarse subangular quartz and flint, pale grey-brown	1.9	13.3
Upper Chalk	Chalk, soft, white	0.7+	14.0

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
23	52	25	11.4-12.4	31	18	19	9	14	9	0
			12.4-13.3	15	9	32	16	18	10	0
			Mean	**23**	**14**	**26**	**12**	**16**	**9**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
11.4-13.3	52	3	6	11	19	8	1

TL 96 SW 108 **9481 6346** **near Lower Wood, Tostock** **Block D**

Surface level +66.1 m (+216 ft)
Water struck at +63.9 m and +44.3 m
Shell and auger 202 mm diameter
August 1979

Overburden 0.1 m
Mineral 4.0 m
Waste 10.1 m
Mineral 14.4 m
Bedrock 1.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy, dark brown	0.1	0.1
Glacial Sand and Gravel	**a** 'Clayey' pebbly sand Gravel: fine with some coarse subangular flint, with some well rounded flint and vein quartz Sand: medium with some fine and coarse subangular quartz, orange-brown	4.0	4.1
Boulder Clay	Clay, silty, firm greyish brown with pebbles of chalk and flint. Becoming bluish grey silty clay below 5.2 m	10.1	14.2
Crag	**b** 'Clayey' sand Sand: fine and medium subrounded quartz, orange, with laminated silty clay partings. Pebbles of vein quartz, flint and quartzite abundant at base	14.4	28.6
Upper Chalk	Chalk, soft, white	1.4+	30.0

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
a	12	73	15	0.1-1.2	16	48	24	4	5	3	0
				1.2-2.2	13	12	44	15	13	3	0
				2.2-3.2	9	6	50	17	14	4	0
				3.2-4.1	11	7	38	23	16	3	2
				Mean	**12**	**19**	**40**	**14**	**12**	**3**	**trace**
b	10	87	3	14.2-15.2	12	80	8	0	0	0	0
				15.2-16.2	18	50	32	0	0	0	0
				16.2-16.4	No grading data available						
				16.4-17.2	6	81	13	0	0	0	0
				17.2-18.2	9	75	16	0	0	0	0
				18.2-19.2	4	38	58	0	0	0	0
				19.2-20.2	6	65	29	0	0	0	0
				20.2-21.2	11	81	8	0	0	0	0
				21.2-21.8	11	33	55	1	0	0	0
				21.8-22.8	7	49	43	1	0	0	0
				22.8-23.8	6	50	42	2	0	0	0
				23.8-24.8	6	41	52	1	0	0	0
				24.8-25.8	6	30	55	4	5	0	0
				25.8-26.8	35	17	34	7	3	4	0
				26.8-27.8	4	32	43	12	6	3	
				27.8-28.6	12	16	43	14	11	4	0
				Mean	**10**	**49**	**35**	**3**	**2**	**1**	**0**
a+b	**11**	**84**	**5**	**Mean**	**11**	**43**	**36**	**5**	**4**	**1**	**trace**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.1-4.1	71	12	9	2	1	5	-
25.8-28.6	22	10	35	29	4	-	-

TL 96 SW 109 **9442 6267** **East of Brook Farm, Beyton** **Block D**

Surface level +70.2 m (+230 ft)
Water struck at +59.1 m and 53.1 m
Shell and auger 152 mm diameter
August 1979

Waste 20.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy	0.3	0.3
Cover Sand	'Very clayey' pebbly sand Gravel: fine and coarse subangular flint Sand: fine with some medium subangular quartz, orange brown	0.7	1.0
Boulder Clay	Clay, silty, brownish grey, sandy in parts with a silt bed between 15.9 m and 16.1 m	16.1	17.1
Glacial Sand and Gravel	'Clayey' sandy gravel Gravel: fine and coarse subangular flint and chalk, with some well rounded vein quartz, quartzite and sandstone Sand: fine and medium with some coarse subangular quartz and flint, chalky	1.7	18.8

Boulder Clay	Clay, silty, very firm, grey, fine well rounded chalk pebbles abundant	1.6+	20.4

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
25	57	18	0.3-1.0	25	44	20	2	5	4	0
			15.9-16.1	85	12	1	1	1	0	0
			17.1-17.3	8	7	5	8	19	53	0
			17.3-18.3	20	38	21	10	7	4	0
			18.3-18.8	15	10	25	16	16	18	0
			Mean	**25**	**30**	**19**	**8**	**8**	**10**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
17.1-18.8	32	2	2	6	33	4	21

TL 96 SW 110 **9421 6153** **East of Hessett** **Block D**

Surface level +67.3 m (+220 ft)
Water struck at +61.8 m
Shell and auger 152 mm diameter
September 1979

Overburden 6.0 m
Mineral 6.9 m
Waste 5.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy with scattered flints	0.4	0.4
Cover Sand	'Very clayey' pebbly sand Gravel: fine subangular flints and well rounded vein quartz and quartzite Sand: fine with some medium subangular quartz, orange	0.4	0.8
Boulder Clay	Clay, sandy and silty with scattered flints, becoming (below 1.7 m) firm greyish brown silty clay with pebbles of chalk and flint. Very clayey chalky gravel from 2.5 m to 3.2 m, and silt between 5.5 m and 6.0 m	5.2	6.0
Glacial Sand and Gravel	**a** Sandy gravel Gravel: fine and coarse subangular flint and chalk, well rounded vein quartz, quartzite and sandstone Sand: medium with some coarse subangular quartz and flint	6.9	12.9
Boulder Clay	Clay, silty, firm bluish grey with pebbles of flint and chalk. Chalky gravel between 14.0 and 14.5 m **(b)**	5.1+	18.0

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
	38	48	14	0.4-0.8	35	46	13	2	4	0	0
				2.5-3.2	39	17	13	11	20	0	0
				Mean	**38**	**27**	**13**	**8**	**14**	**0**	**0**
a	4	53	43	6.0-7.0	6	13	26	21	27	7	0
				7.0-8.0	3	5	22	18	21	31	0
				8.0-9.0	2	4	42	18	16	18	0
				9.0-10.0	3	3	54	14	13	11	2
				10.0-11.0	10	4	34	17	20	15	0
				11.0-12.0	2	3	17	18	29	29	2
				12.0-12.9	2	4	29	13	18	34	0
				Mean	**4**	**5**	**31**	**17**	**21**	**21**	**1**
b	8	67	25	14.0-14.5	8	8	44	15	11	14	0
a+b	**4**	**55**	**41**	**Mean**	**4**	**5**	**33**	**17**	**20**	**20**	**1**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.4-0.8	60	-	29	10	-	1	-
6.0-12.9	53	6	11	9	11	4	6

TL 96 SW 111 **9440 6029** **East of Monk Wood, Hessett** **Block D**

Surface level +62.8 m (+206 ft)
Water struck at 46.1 m
Shell and auger 152 mm diameter
September 1979

Overburden 1.3 m
Mineral 1.1 m
Waste 8.9 m
Mineral 16.7 m
Bedrock 2.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, silty sandy clay	0.3	0.3
Alluvium	Clay, silty and sandy, with scattered subangular flints	1.0	1.3
Head Gravel	**a** 'Very clayey' pebbly sand Gravel: fine subangular flint with some well rounded chalk and quartzite Sand: fine with some medium subangular quartz, orange-brown	1.0	2.4
Boulder Clay	Clay, silty, mottled brown and grey with pebbles of flint and chalk. Becoming firm bluish grey clay below 6.0 m	8.9	11.3

Crag	**b** 'Clayey' sand Sand: fine and medium subangular to subrounded quartz, micaceous, orange, with thin clayey partings. Becoming pale greenish grey with shell debris below 21.3 m. Pebbles of flint, vein quartz and quartzite abundant from 11.3 m to 13.3 m	16.7	28.0
Upper Chalk	Chalk, hard rock, white	2.0+	30.0

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	29	58	13	1.3-2.4	29	37	13	8	11	2	0
b	15	83	2	11.3-12.3	20	37	33	4	5	1	0
				12.3-13.3	49	21	18	3	5	4	0
				13.3-14.3	22	50	22	3	2	1	0
				14.3-15.3	13	63	23	1	0	0	0
				15.3-16.3	35	36	23	5	1	0	0
				16.3-17.3	11	24	52	9	4	0	0
				17.3-18.3	4	26	61	7	2	0	0
				18.3-19.3	4	42	51	3	0	0	0
				19.3-20.3	4	45	50	1	0	0	0
				20.3-21.3	2	34	63	1	0	0	0
				21.3-22.3	5	31	64	0	0	0	0
				22.3-23.3	3	27	69	1	0	0	0
				23.3-24.3	13	25	59	2	1	0	0
				24.3-25.3	7	26	61	6	0	0	0
				25.3-26.0	10	24	57	8	1	0	0
				26.0-27.0	27	43	25	3	1	1	0
				27.0-28.0	21	27	26	6	2	12	6
				Mean	**15**	**34**	**46**	**3**	**1**	**1**	**trace**
a+b	**16**	**81**	**3**	**Mean**	**16**	**35**	**42**	**4**	**2**	**1**	**trace**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
1.3-2.4	64	4	3	10	18	1	-
11.3-13.3	44	12	21	8	-	15	-

TL 96 SW 112 **9282 6324** **West of Beyton Green, Beyton** **Block D**

Surface level +61.9 m (+203 ft)
Water level not recorded
Shell and auger 152 mm diameter
August 1979

Overburden 0.3 m
Mineral 1.0 m
Waste 11.0 m
Mineral 5.6 m
Waste 0.9 m
Bedrock 2.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Made Ground	Soil with brick rubble	0.3	0.3
Cover Sand	**a** 'Very clayey' pebbly sand Gravel: fine subangular flint with some well rounded vein quartz Sand: fine and medium subangular quartz	1.0	1.3

Boulder Clay	Clay, silty, orange brown, with thin beds of silt; pebbles of flint and chalk	7.7	9.0
Glacial Silt	**b** Silt, sandy and pebbly in parts, orange brown	3.3	12.3
Glacial Sand and Gravel	**c** 'Very clayey' pebbly sand Gravel: fine with some coarse subangular flint with abundant subrounded chalk Sand: fine and medium with some coarse quartz and flint, pale brown	5.6	17.9
Boulder Clay	Clay, silty, bluish grey, with abundant chalk pebbles. Thin bed of sand at base	0.9	18.8
Upper Chalk	Chalk, soft white, becoming hard rock below 20.4 m	2.2+	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	+64 mm
a	33	59	8	0.3-1.3	33	26	29	4	4	4	0
b	63	32	5	9.0-9.6	60	7	5	8	16	4	0
				9.6-10.1	28	26	28	9	9	0	0
				10.1-11.1	71	22	6	1	0	0	0
				11.1-12.3	73	21	4	2	0	0	0
				Mean	**63**	**20**	**8**	**4**	**4**	**1**	**0**
c	24	57	19	12.3-13.3	16	29	31	8	13	3	0
				13.3-13.8	9	31	39	6	13	2	0
				13.8-14.7	23	19	21	11	21	5	0
				14.7-15.8	12	15	19	13	22	19	0
				15.8-17.1	40	42	10	4	4	0	0
				17.1-17.9	37	40	10	4	5	4	0
				Mean	**24**	**29**	**20**	**8**	**13**	**6**	**0**
a+b	**57**	**38**	**5**	**Mean**	**57**	**21**	**13**	**4**	**4**	**1**	**0**
b+c	**39**	**47**	**14**	**Mean**	**39**	**26**	**15**	**6**	**10**	**4**	**0**
a+c	**26**	**58**	**16**	**Mean**	**26**	**30**	**21**	**7**	**11**	**5**	**0**
a+b+c	**38**	**49**	**13**	**Mean**	**38**	**26**	**17**	**6**	**9**	**4**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.3-1.3	63	-	28	-	-	-	9
12.3-17.9	27	1	3	3	60	4	2

TL 96 SE 133 **9552 6460** **West of Arch Farm, Norton** **Block B**

Surface level +35.2 m (+115 ft)
Water struck at +34.2 m
Shell and auger 202 mm diameter
June 1979

Overburden 4.3 m
Mineral 2.2 m
Waste 8.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, peaty	0.1	0.1
Alluvium	Silt, clayey, mottled grey and brown with mollusc shells	0.9	1.0
Peat	Peat, soft brown organic matter	2.6	3.6
Alluvium	Silt, clayey, greenish grey with mollusc shells	0.7	4.3
River Terrace Deposits	**a** 'Clayey' pebbly sand Gravel: coarse with some fine subangular flint with some well rounded flint and vein quartz Sand: fine with some medium subangular quartz, greenish grey	2.2	6.5
Silt	Clayey and peaty, bluish grey	0.9	7.4
Boulder Clay	Clay, silty, bluish grey, sandy in parts, with pebbles of flint and chalk. Chalky gravel between 11.7 m and 12.6 m (**b**)	7.6+	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
a	19	69	12	4.3-5.3	22	50	17	2	4	5	0
				5.3-6.5	17	48	18	2	6	9	0
				Mean	**19**	**49**	**18**	**2**	**5**	**7**	**0**
b	5	44	51	11.7-12.6	5	8	16	20	25	26	0
a+b	**15**	**62**	**23**	**Mean**	**15**	**38**	**17**	**7**	**11**	**12**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
4.3-6.5	63	12	14	1	-	10	-
11.7-12.6	39	3	-	2	53	-	3

TL 96 SE 134 **9589 6406** **West of Old Hall, Tostock** **Block D**

Surface level +53.7 m (+176 ft)
Water struck at +41.2 m
Shell and auger 152 mm diameter
September 1979

Overburden 9.5 m
Mineral 5.0 m
Mineral 3.0 m
Bedrock 2.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy clay with scattered flints	0.2	0.2
Boulder Clay	Clay, silty, mottled orange and brown with pebbles of of flint and chalk. Below 4.0 m becoming firm dark grey silty clay with flint and chalk pebbles	9.3	9.5
Kesgrave Sands and Gravels	**a** Pebbly sand Gravel: fine and coarse subangular flint, well rounded vein quartz, flint and quartzite Sand: medium with some fine subangular to subrounded quartz, yellow-orange	5.0	14.5
Crag	**b** Pebbly sand Gravel: fine well rounded vein quartz and sandstone, with some subangular flint. Ironpan fragments abundant Sand: fine and medium with some coarse subrounded quartz, orange, greenish towards base	3.0	17.5
Upper Chalk	Chalk, hard rock	2.0+	19.5

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	5	75	20	9.5-10.5	14	12	18	11	20	23	2
				10.5-11.5	8	14	68	6	4	0	0
				11.5-12.5	3	10	81	2	4	0	0
				12.5-13.5	1	21	64	4	5	5	0
				13.5-14.5	1	16	37	6	18	22	0
				Mean	**5**	**15**	**54**	**6**	**10**	**10**	**trace**
b	3	91	6	14.5-15.5	3	30	37	26	3	1	0
				15.5-16.5	3	43	33	14	6	1	0
				16.5-17.5	3	30	46	14	7	0	0
				Mean	**3**	**34**	**39**	**18**	**5**	**1**	**0**
a+b	**4**	**82**	**14**	**Mean**	**4**	**22**	**50**	**10**	**8**	**6**	**trace**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
9.5-14.5	47	15	28	7	1	2	trace
14.5-17.5	21	4	40	1	-	12	22

TL 96 SE 135 **9554 6362** **Tostock** **Block D**

Surface level +63.7 m (+208 ft)
Water struck at +61.2 m
Shell and auger 152 mm diameter
September 1979

Overburden 1.5 m
Mineral 1.0 m
Waste 13.5 m
Mineral 1.0 m
Mineral 7.5 m
Bedrock 2.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy dark brown	0.6	0.6
Boulder Clay	Clay, silty, mottled orange and grey with scattered flint pebbles	0.9	1.5
Glacial Sand and Gravel	**a** 'Very clayey' pebbly sand Gravel: fine and coarse subangular flint, with flint, with some vein quartz Sand: medium and fine subangular quartz and flint, orange-brown	1.0	2.5
Boulder Clay	Clay, silty, pale grey (sandy and orange brown in top 1.0 m) with pebbles of flint and chalk. Becoming dark grey silty clay below 6.0 m	13.5	16.0
Glacial Sand and Gravel	**b** 'Clayey' pebbly sand Gravel: fine with some coarse subangular flint, with some well rounded vein quartz, quartzite, sandstone and chalk Sand: fine and medium subangular to subrounded quartz, orange	1.0	17.0
Crag	**c** Sand, pebbly at base Sand: fine with some medium subrounded quartz, orange above 23.0 m, then dark green and glauconitic	7.5	24.5
Upper Chalk	Chalk, hard rock, white	2.0+	26.5

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	20	72	8	1.5-2.5	20	27	39	6	5	3	0
b	12	80	8	16.0-17.0	12	43	30	7	6	2	0
c	6	91	3	17.0-18.0	13	79	7	1	0	0	0
				18.0-19.0	13	80	7	0	0	0	0
				19.0-20.0	6	85	9	0	0	0	0
				20.0-21.0	6	88	6	0	0	0	0
				21.0-22.0	3	61	24	6	4	2	0
				22.0-23.0	2	31	44	18	5	0	0
				23.0-24.5	2	55	30	7	3	3	0
				Mean	**6**	**67**	**19**	**5**	**2**	**1**	**0**
a+b	**16**	**76**	**8**	**Mean**	**16**	**34**	**35**	**7**	**6**	**2**	**0**
b+c	**7**	**90**	**3**	**Mean**	**7**	**65**	**20**	**5**	**2**	**1**	**0**
a+c	**8**	**89**	**3**	**Mean**	**8**	**63**	**21**	**5**	**2**	**1**	**0**
a+b+c	**8**	**88**	**4**	**Mean**	**8**	**61**	**22**	**5**	**3**	**1**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
16.0-17.0	47	-	19	10	12	12	-
21-0-24.5	19	24	40	4	-	13	-

TL 96 SE 136 **9523 6261** **North of The Meade, Drinkstone** **Block D**

Surface level +61.8 m (+202 ft)
Water struck at +44.3 m
Shell and auger 152 mm diameter
September 1979

Overburden 0.3 m
Mineral 1.5 m
Waste 3.7 m
Mineral 3.6 m
Waste 9.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy clay with scattered flints	0.3	0.3
Glacial Sand and Gravel	'Very clayey' pebbly sand Gravel: fine and coarse subangular flint Sand: fine with some medium subangular quartz and flint, orange	1.5	1.8
Boulder Clay	Clay, silty and sandy, orange-brown with scattered flint. Silty at base	3.7	5.5
Glacial Sand and Gravel	'Very clayey' pebbly sand Gravel: fine subrounded chalk with some subangular flint Sand: fine with some medium and coarse subangular quartz and flint, yellowish brown	3.6	9.1
Boulder Clay	Clay, silty, dark greyish brown with pebbles of chalk and flint, yellowish brown in top 0.4 m	9.6+	18.7

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
a	31	63	6	0.3-1.3	36	43	16	1	2	2	0
				1.3-1.8	21	50	17	2	5	5	0
				Mean	**31**	**46**	**16**	**1**	**3**	**3**	**0**
b	29	65	6	5.5-6.5	42	51	7	0	0	0	0
				6.5-7.5	21	53	15	8	3	0	0
				7.5-8.5	24	37	26	11	2	0	0
				8.5-9.1	29	28	15	9	7	9	3
				Mean	**29**	**42**	**16**	**7**	**3**	**2**	**1**
a+b	**30**	**65**	**5**	**Mean**	**30**	**44**	**16**	**5**	**3**	**2**	**trace**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.3-1.0	97	-	-	-	-	3	-
6.5-9.1	30	-	-	-	61	-	9

TL 96 SE 137 **9522 6176** **East of Drinkstone Park, Drinkstone** **Block D**

Surface level +63.4 m (+208 ft) Waste 22.0 m+
Water stuck at +58.2 m
Shell and auger 202 mm diameter
August 1979

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, silty and clayey with scattered flint pebbles	0.9	0.9
Boulder Clay	Clay, silty, mottled orange and brown, with pebbles of chalk and flint. Thin bed of sand from 5.2 m to 5.4 m	5.8	6.7
Glacial Sand and Gravel	**a** 'Very clayey' gravel Gravel: fine and coarse subangular flint and chalk, with some well rounded flint and vein quartz. Occasional flint cobbles Sand: medium and coarse with some fine sub-angular quartz and flint, pale brown	2.1	8.8
Boulder Clay	Clay, silty, firm, dark grey with pebbles of flint and chalk	9.4	18.2
Glacial Sand and Gravel	**b** Sandy gravel. Occasional flint cobbles near base Gravel: fine with some coarse subangular flint, with some well rounded vein quartz, quartzite, chalk and sandstone Sand: medium and coarse with some fine subangular quartz with flint	1.3	19.5
Boulder Clay	Clay, silty, dark grey with pebbles of flint and chalk and thin beds of chalky sand	2.5+	22.0

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	21	29	50	6.7-7.7	25	8	8	9	30	14	6
				7.7-8.8	18	6	11	15	23	21	6
				Mean	**21**	**7**	**10**	**12**	**26**	**18**	**6**
b	5	70	25	18.2-19.2	6	10	37	23	15	9	0
				19.2-19.5	1	9	35	26	19	5	5
				Mean	**5**	**10**	**37**	**23**	**16**	**8**	**1**
a+b	**15**	**44**	**41**	**Mean**	**15**	**8**	**20**	**16**	**23**	**14**	**4**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
6.7-8.8	34	7	7	2	46	4	-
18.2-19.5	56	9	6	9	12	8	-

TL 96 SE 138 9554 6058 Whitehouse House, Drinkstone Block D

Surface level +72.2 m (+236 ft)
Water not struck
Shell and auger 152 mm diameter
September 1979

Waste 21.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, silty and sandy with scattered flints	0.2	0.2
Boulder Clay	Clay, silty, brown with scattered flints. Becoming mottled orange brown and grey silty clay below 1.6 m, and pale grey silty clay below 1.9 m	9.3	9.5
	Clay, silty, dark grey with abundant pebbles of chalk and some flint	11.5+	21.0

TL 96 SE 139 9630 6330 Place Farm, Tostock Block B

Surface level +54.8 m (+179 ft)
Water struck at c +36.8 m
Shell and auger 152 mm diameter
September 1979

Overburden 0.2 m
Mineral 3.1 m
Waste 17.7 m
Bedrock 2.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy	0.2	0.2
Glacial Sand and Gravel	**a** 'Clayey' sandy gravel Gravel: fine and coarse subangular flint with some well rounded flint and vein quartz Sand: medium with fine and some coarse subangular quartz and flint, orange	3.1	3.3
Boulder Clay	Clay, silty, yellowish brown with scattered flints, becoming (below 4.5 m) firm, pale grey silty clay with abundant chalk pebbles and some flints	14.3	17.6
Glacial Sand and Gravel	**b** Sandy gravel (non-mineral) Gravel: fine with some coarse subangular flint and chalk Sand: medium with some fine coarse subangular quartz and flint, pale grey	3.4	21.0
Upper Chalk	Chalk, hard rock, white	2.0+	23.0

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	14	53	33	0.2-1.3	12	18	14	7	21	28	0
				1.3-2.3	16	21	23	8	11	21	0
				2.3-3.3	16	17	37	11	14	5	0
				Mean	**14**	**19**	**25**	**9**	**15**	**18**	**0**
b	6	70	24	17.6-18.6	10	18	60	7	1	4	0
				18.6-19.3	5	28	56	6	2	3	0
				19.7-20.7	1	3	15	24	38	19	0
				20.7-21.0	6	8	29	24	20	13	0
				Mean	**6**	**14**	**42**	**14**	**15**	**9**	**0**
a+b	**10**	**61**	**29**	**Mean**	**10**	**17**	**33**	**11**	**15**	**14**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.2-3.3	66	13	13	3	-	5	-
17.6-18.6	75	-	-	-	25	-	

TL 96 SE 140 **9661 6290** **near Bridge Farm, Tostock** **Block B**

Surface level +45.2 m (+148 ft)
Water struck at +44.0 m
Shell and auger 202 mm diameter
October 1979

Overburden	0.5 m
Mineral	1.5 m
Waste	4.6 m
Mineral	1.8 m
Waste	5.8 m
Mineral	10.3 m
Waste	0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy, orange-brown with scattered flints	0.5	0.5
River Terrace Deposits	**a** Sandy gravel Gravel: fine and coarse subangular flint with well rounded quartzite Sand: fine with some medium and coarse subangular quartz and flint, orange-brown	1.5	2.0
Boulder Clay	Clay, silty, firm, mottled grey and brown with pebbles of chalk and flint	4.6	6.6
Glacial Sand and Gravel	**b** 'Clayey' pebbly sand Gravel: fine and coarse subangular flint and and subrounded chalk Sand: medium with fine and some coarse subangular quartz and flint, pale grey	1.8	8.4
Glacial Silt	Silt, soft, brownish grey	5.8	14.2
Glacial Sand and Gravel	**c** 'Clayey' pebbly sand, pebbly at top and near base Gravel: fine and coarse subangular flint and subrounded chalk Sand: medium with some fine and a little coarse subangular quartz and flint, pale grey, chalky	10.3	24.5
Glacial Silt	Silt, pale brown	0.1+	24.6

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
a	9	47	44	0.5-0.8	12	18	12	7	16	35	0
				0.8-2.0	9	23	16	10	19	22	1
				Mean	**9**	**22**	**15**	**10**	**18**	**25**	**1**
b	19	64	17	6.6-7.6	17	21	26	8	16	12	0
				7.6-8.4	21	30	40	6	3	0	0
				Mean	**19**	**25**	**32**	**7**	**10**	**7**	**0**
c	11	80	9	14.2-15.2	14	10	29	12	17	18	0
				15.2-16.2	13	43	39	3	1	1	0
				16.2-17.2	15	44	40	1	0	0	0
				17.2-18.2	16	37	46	1	0	0	0
				18.2-19.2	13	37	49	1	0	0	0
				19.2-20.2	8	29	38	9	8	8	0
				20.2-21.2	20	12	51	15	2	0	0
				21.2-22.2	5	12	44	18	11	12	0
				22.2-23.2	4	18	57	12	7	2	0
				23.2-24.2	6	20	53	9	8	4	0
				24.2-24-5	5	16	59	11	5	2	2
				Mean	**11**	**26**	**46**	**8**	**5**	**4**	**trace**
a+b	**15**	**56**	**29**	**Mean**	**15**	**23**	**25**	**8**	**14**	**15**	**trace**
b+c	**12**	**77**	**11**	**Mean**	**12**	**26**	**43**	**8**	**6**	**5**	**trace**
a+c	**11**	**75**	**14**	**Mean**	**11**	**26**	**41**	**8**	**7**	**7**	**trace**
a+b+c	**12**	**74**	**14**	**Mean**	**12**	**25**	**41**	**8**	**7**	**7**	**trace**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.3-0.8	90	-	1	8	-	1	-
6.6-7.6	49	1	3	7	33	7	-
19.2-20.2	51	9	8	2	23	7	-

TL 96 SE 141 **9664 6170** **East of Drinkstone** **Block C**

Surface level +61.2 m (+200 ft)
Water struck at c + 42.2 m
Shell and auger 152 mm diameter
September 1979

Overburden 0.4 m
Mineral 4.1 m
Waste 20.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy with scattered flints	0.4	0.4
Glacial Sand and Gravel	'Very clayey' pebbly sand Gravel: mainly fine with some coarse subangular flint, subrounded chalk and well-rounded vein quartz Sand: fine and medium subangular quartz and flint, yellow-orange	4.1	4.5

Boulder Clay	Clay, silty, firm, dark grey with pebbles of chalk and flint. Thin beds of sand and chalky gravel at intervals	20.5+	25.0

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
26	57	17	0.4-1.4	50	30	13	2	1	4	0
			1.4-2.0	23	49	18	3	7	0	0
			2.0-3.0	14	11	21	16	30	8	0
			3.0-4.0	13	20	40	8	15	4	0
			4.0-4.5	29	38	24	2	4	3	0
			Mean	**26**	**26**	**24**	**7**	**13**	**4**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.4-4.5	36	-	7	2	53	1	2

TL 96 SE 142 **9625 6043** **near Drinkstone Green, Drinkstone** **Block D**

Surface level +74.4 m (+244 ft)
Water level not recorded
Shell and auger 152 mm diameter
September 1979

Waste 22.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, clayey	0.5	0.5
Boulder Clay	Clay, silty and sandy, brown above 0.9 m, becoming firm, mottled yellow and pale grey silty clay with abundant chalk pebbles. Below 4.5 m, firm, dark grey silty clay with pebbles of flint and chalk. Chalky silt from 21.0 m to 21.5 m	21.6+	22.1

TL 96 SE 143 **9676 6489** **Crawley Hall Farm, Norton** **Block C**

Surface level +53.4 m (+175 ft)
Water struck at +39.4 m
Shell and auger 202 mm diameter
June 1979

Overburden 4.3 m
Mineral 8.4 m
Mineral 3.4 m
Bedrock 1.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Made Ground	Soil and brick rubble	0.6	0.6
Boulder Clay	Clay, silty and sandy, orange brown, with pebbles of flint	3.7	4.3

Kesgrave Sands and Gravels	**a** Pebbly sand Gravel: fine with some coarse subangular flint, well rounded flint, vein quartz and quartzite Sand: medium with some fine and coarse subangular quartz, pale yellow. Chalky sand in parts	8.4	12.7
Crag	**b** Pebbly sand Gravel: fine with some coarse well rounded vein quartz, flint and quartzite, with some subangular flint Sand: medium and fine subrounded quartz, orange	3.4	16.1
Upper Chalk	Chalk, soft, white, becoming hard rock below 16.5 m	1.4+	17.5

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	4	78	18	4.3-5.3	6	27	55	3	5	4	0
				5.3-6.3	4	9	82	2	2	1	0
				6.3-7.3	8	9	77	4	2	0	0
				7.3-8.2	4	8	58	9	11	10	0
				8.2-9.3	5	4	29	19	27	14	2
				9.3-10.0	2	17	80	1	0	0	0
				10.0-11.0	5	8	37	15	23	12	0
				11.0-11.7	3	72	17	3	5	0	0
				11.7-12.7	1	12	40	8	19	20	0
				Mean	**4**	**17**	**53**	**8**	**11**	**7**	**trace**
b	4	84	12	12.7-14.0	5	50	39	2	2	2	0
				14.0-15.5	4	31	42	10	12	1	0
				15.5-16.1	3	18	46	6	16	11	0
				Mean	**4**	**36**	**42**	**6**	**9**	**3**	**0**
a+b	**4**	**79**	**17**	**Mean**	**4**	**22**	**50**	**7**	**11**	**6**	**trace**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
4.3-12.7	31	19	30	15	-	4	1
12.7-16.1	10	25	49	7	-	-	9

TL 96 SE 144 **9781 6383** **Bunker's Hill, Elmswell** **Block B**

Surface level +55.2 m (+181 ft)
Water level not recorded
Shell and auger 152 mm diameter
August 1979

Overburden 2.8 m
Mineral 2.0 m
Waste 19.7 m
Bedrock 2.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Made Ground	Soil and brick rubble	0.3	0.3
Glacial Sand and Gravel	**a** 'Very clayey' sandy gravel Gravel: coarse and fine subangular flint, with well rounded flint and vein quartz Sand: fine and medium with some coarse subangular quartz and flint, orange-brown	0.7	1.0

Boulder Clay	Clay, silty, mottled orange and grey, with pebbles of flint and chalk, becoming dark grey silty clay below 2.1 m	1.8	2.8
Glacial Sand and Gravel	**b** Pebbly sand Gravel: fine with some coarse subangular flint, with well rounded flint, vein quartz and quartzite Sand: medium with fine and coarse subangular quartz with some flint, orange-brown	2.0	4.8
Boulder Clay	Clay, silty, bluish grey, with pebbles of flint and chalk, becoming dark grey silty clay below 8.2 m	18.0	22.8
Glacial Sand and Gravel	**c** Pebbly sand Gravel: fine with some coarse subangular flint with some well rounded flint and vein quartz Sand: medium with some fine and coarse subangular quartz and flint, pale brown	1.7	24.5
Upper Chalk	Chalk, hard rock, white	2.6+	27.1

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
a	21	55	24	0.3-1.0	21	27	21	7	9	15	0
b	3	80	17	2.8-3.8	2	19	48	12	11	8	0
				3.8-4.8	4	9	56	17	10	4	0
				Mean	**3**	**14**	**52**	**14**	**11**	**6**	**0**
c	6	74	20	22.8-23.8	6	8	49	15	19	3	0
				23.8-24.5	5	9	61	10	10	5	0
				Mean	**6**	**9**	**52**	**13**	**16**	**4**	**0**
a+b	**8**	**74**	**18**	**Mean**	**8**	**17**	**45**	**12**	**10**	**8**	**0**
b+c	**4**	**78**	**18**	**Mean**	**4**	**11**	**53**	**14**	**13**	**5**	**0**
a+c	**10**	**69**	**21**	**Mean**	**10**	**14**	**44**	**11**	**14**	**7**	**0**
a+b+c	**7**	**74**	**19**	**Mean**	**7**	**14**	**47**	**13**	**12**	**7**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
2.8-4.8 22.8-23.8	59	19	12	1	-	8	1

TL 96 SE 145 **9744 6350** **South-west of Bunker's Hill, Elmswell** **Block B**

Surface level +45.8 m (+150 ft)
Water level not recorded
Shell and auger 152 mm diameter
August 1979

Overburden 1.1 m
Mineral 0.9 m
Waste 17.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy	0.4	0.4
Alluvium	Silt, clayey, orange brown	0.7	1.1
River Terrace Deposits	'Clayey' sandy gravel Gravel: fine and coarse subangular flint, with some well rounded quartzite Sand: fine and medium subangular quartz and flint, orange-brown	0.9	2.0
Boulder Clay	Clay, silty, mottled grey and orange with pebbles of flint and chalk. Below 3.0 m becoming firm, dark grey silty clay with flint and chalk pebbles	17.0+	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
16	43	41	1.1-1.4	15	19	13	9	21	23	0
			1.4-2.0	17	20	16	8	19	20	0
			Mean	**16**	**19**	**15**	**9**	**20**	**21**	**0**

TL 96 SE 146 **9726 6304** **near Broadgrass Green, Woolpit** **Block C**

Surface level +52.2 m (+171 ft)
Water struck at +45.2 m
Shell and auger 152 mm diameter
August 1979

Overburden 7.5 m
Mineral 5.0 m
Mineral 5.0 m
Chalk 1.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy clay with scattered flints	0.5	0.5
Boulder Clay	Clay, silty, mottled orange and grey with pebbles of flint and chalk. Becoming firm, brownish grey silty clay with abundant chalk pebbles below 3.0 m	7.0	7.5
Kesgrave Sands and Gravels	**a** Sandy gravel Gravel: fine and coarse subangular flint, with well rounded flint, vein quartz and quartzite Sand: medium with some fine and coarse subangular quartz, pale yellow	5.0	12.5
Crag	**b** Sand Sand: fine and medium subangular to subrounded quartz, glauconitic greenish grey	5.0	17.5
Upper Chalk	Chalk, hard rock, white	1.5+	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
a	3	66	31	7.5-8.5	7	9	30	7	20	21	6
				8.5-9.5	1	5	59	11	13	11	0
				9.5-10.5	1	3	59	12	14	11	0
				10.5-11.5	6	1	30	25	28	10	0
				11.5-12.5	1	43	26	8	11	9	2
				Mean	**3**	**12**	**42**	**12**	**17**	**12**	**2**
b	4	93	3	12.5-13.5	2	55	37	1	1	4	0
				13.5-14.5	4	55	36	3	2	0	0
				14.5-15.5	5	51	41	2	1	0	0
				15.5-16.5	6	22	58	10	3	1	0
				16.5-17.5	5	23	58	11	3	0	0
				Mean	**4**	**41**	**47**	**5**	**2**	**1**	**0**
a+b	**4**	**78**	**18**	**Mean**	**4**	**27**	**42**	**9**	**10**	**7**	**1**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
8.5-12.5	45	18	19	12	-	6	-
15.5-17.5	32	25	23	-	-	20	-

TL 96 SE 147 **9743 6170** **The Grange, Woolpit** **Block C**

Surface level +68.5 m (+224 ft)
Water struck at +45.0 m
Shell and auger 152 mm diameter
September 1979

Overburden 1.4 m
Mineral 1.6 m
Waste 22.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy clay with scattered flints	0.2	0.2
Boulder Clay	Clay, silty and sandy with scattered flints, orange-brown	1.2	1.4
Glacial Sand and Gravel	**a** 'Very clayey' gravel Gravel: fine and coarse subangular chalk and flint with some well rounded flint, vein quartz and quartzite Sand: medium with some coarse subangular quartz, and flint, chalky. Clay band from 2.3 m to 2.4 m	1.6	3.0
Boulder Clay	Clay, silty, mottled grey and brown, becoming firm, grey silty clay with pebbles of flint and chalk. Chalky gravel from 23.5 m to 24.5 m **(b)**	22.0+	25.0

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
a	36	29	35	1.4-2.3	41	10	11	9	16	13	0
				2.4-3.0	25	7	11	12	25	20	0
				Mean	**36**	**8**	**11**	**10**	**20**	**15**	**0**
b	22	41	37	23.5-24.5	22	5	23	13	21	16	0
a+b	**29**	**34**	**37**	**Mean**	**29**	**7**	**16**	**11**	**21**	**16**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
2.4-3.0	22	4	5	7	62	-	-

TL 96 SE 148 **9749 6034** **West of Clopton Green, Rattlesden** **Block C**

Surface level +71.8 m (+235 ft) Waste 20.0 m+
Water not struck
Shell and auger 152 mm diameter
September 1979

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, clayey with scattered flints	0.2	0.2
Boulder Clay	Clay, silty, mottled orange and grey with pebbles of flint and chalk	2.8	3.0
	Clay, silty, dark grey, with pebbles of chalk and flint. Grey silt from 19.0 m to 19.5 m	17.0+	20.0

TL 96 SE 149 **9824 6436** **Elmswell Hall, Elmswell** **Block C**

Surface level +60.4 m (+198 ft)
Water level not recorded
Shell and auger 202 mm diameter
September 1979

Overburden 14.0 m
Mineral 13.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, clayey sand	0.1	0.1
Boulder Clay	Clay, silty, bluish grey with pebbles of flint and chalk. Silty in parts and with thin sand bed from 12.6 m to 13.0 m	13.9	14.0
Crag	**a** 'Clayey' sand Sand: fine and medium subrounded quartz, thin interbedded clay laminae at intervals, orange, becoming greenish grey below 21.7 m. Pebble beds at top and base	13.4+	27.4

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
	15	76	9	12.6-13.0	15	34	36	6	7	2	0
a	11	85	4	14.0-14.6	12	11	45	7	12	13	0
				14.6-15.1	22	51	27	0	0	0	0
				15.1-16.0	9	59	32	0	0	0	0
				16.0-16.7	9	17	51	10	10	3	0
				16.7-17.7	50	46	4	0	0	0	0
				17.7-18.7	20	37	43	0	0	0	0
				18.7-19.7	11	45	43	1	0	0	0
				19.7-20.7	4	67	29	0	0	0	0
				20.7-21.7	6	42	52	0	0	0	0
				21.7-22.7	2	50	47	1	0	0	0
				22.7-23.7	2	47	50	1	0	0	0
				23.7-24.7	3	28	68	1	0	0	0
				24.7-25.7	3	40	56	1	0	0	0
				25.7-26.7	2	34	53	8	3	0	0
				26.7-27.4	11	25	28	9	11	16	0
				Mean	**11**	**41**	**42**	**2**	**2**	**2**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
12.6-13.0	48	-	29	3	11	9	-
14.0-14.6	25	20	25	2	-	26	2
26.7-27.4	24	33	20	23	-	-	-

TL 96 SE 150 **9881 6368** **Elmswell** **Block C**

Surface level +67.5 m (+221 ft)
Water struck at c + 64.5 m
Shell and auger 152 mm diameter
September 1979

Overburden 0.5 m
Mineral 5.9 m
Waste 16.4 m
Mineral 3.0 m
Mineral 7.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy with scattered flints	0.5	0.5
Glacial Sand and Gravel	**a** 'Clayey' pebbly sand Gravel: fine and coarse subangular flint with some well rounded flint vein quartz and quartzite Sand: medium with some fine subangular quartz and flint, orange	5.9	6.4
Boulder Clay	Clay, silty, dark grey with pebbles of flint and chalk	16.4	22.8
Kesgrave Sands and Gravels	**b** Sandy Gravel Gravel: fine and coarse subangular flint and well rounded flint and vein quartz Sand: medium with some coarse subangular quartz with some flint	3.0	25.8
Crag	**c** Sand Sand: medium with some fine and coarse subrounded quartz, orange, becoming greenish grey below 28.8 m, and containing shell debris below 30.8 m Pebbles of flint, vein quartz and rounded flint in thin beds at intervals		7.4+

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
a	12	72	16	0.5-1.5	20	43	21	3	5	8	0
				1.5-2.5	15	47	31	3	3	1	0
				2.5-3.5	10	8	45	13	17	7	0
				3.5-4.5	4	5	35	21	23	12	0
				4.5-5.5	12	22	52	8	4	2	0
				5.5-6.4	14	22	45	7	7	5	0
				Mean	**12**	**24**	**39**	**9**	**10**	**6**	**0**
b	2	65	33	22.8-23.8	3	2	37	18	25	15	0
				23.8-24.8	1	1	36	16	21	25	0
				24.8-25.8	2	14	59	12	8	5	0
				Mean	**2**	**6**	**44**	**15**	**18**	**15**	**0**
c	4	95	1	25.8-26.8	14	28	50	7	1	0	0
				26.8-27.8	4	38	55	3	0	0	0
				27.8-28.8	2	23	68	5	1	1	0
				28.8-29.8	3	26	64	6	1	0	0
				29.8-30.8	4	29	55	11	1	0	0
				30.8-31.8	1	22	53	23	1	0	0
				31.8-32.8	4	18	52	23	3	0	0
				32.8-33.2	4	20	50	23	3	0	0
				Mean	**4**	**26**	**57**	**12**	**1**	**	**0**
a+b	**9**	**69**	**22**	**Mean**	**9**	**18**	**40**	**13**	**9**	**0**	
b+c	**4**	**86**	**10**	**Mean**	**4**	**20**	**53**	**13**	**6**	**4**	**0**
a+c	**8**	**84**	**8**	**Mean**	**8**	**25**	**48**	**11**	**5**	**3**	**0**
a+b+c	**7**	**80**	**13**	**Mean**	**7**	**22**	**47**	**11**	**8**	**5**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.5-6.4	67	10	10	4	2	5	2
22.8-24.8	32	24	32	5	-	7	-
30.8-32.8	18	25	20	-	-	20	17 (shells)

TL 96 SE 151 **9873 6267** **South-east of Crossways, Elmswell** **Block C**

Surface level +52.5 m (+172 ft)
Water struck at c +46.5 m
Shell and auger 202 mm diameter
September 1979

Overburden 0.7 m
Mineral 7.0 m
Waste 1.3 m
Mineral 12.0 m
Mineral 2.0 m
Bedrock 2.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy and silty	0.3	0.3
Silt	Silt, dark brown	0.4	0.7
Glacial Sand and Gravel	**a** Sandy gravel Gravel: fine and coarse subangular flint with some well rounded flint, vein quartz, quartzite and sandstone Sand: medium with some fine and coarse subangular quartz and flint, orange	7.0	7.7
Glacial Silt	**b** Silt, clayey, with thin fine gravel beds, orange-brown	1.3	9.0
Glacial Sand and Gravel	**c** Sandy gravel Gravel: fine and coarse subangular flint with some chalk, well rounded flint, vein quartz and quartzite Sand: medium with some fine and coarse subangular quartz and flint, orange, chalky near base	12.0	21.0
Crag	**d** 'Clayey' sand, shelly Sand: medium with some fine and coarse subangular quartz, orange with abundant shell debris. Thin beds of fine gravel contain flint and vein quartz	2.0	23.0
Upper Chalk	Chalk, hard rock, white	2.0+	25.0

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	8	57	35	0.7-1.7	5	7	12	15	29	27	5
				1.7-2.7	2	9	13	13	32	31	0
				2.7-3.7	2	9	16	14	32	22	5
				3.7-5.0	28	16	31	5	10	10	0
				5.0-6.0	4	8	54	18	13	3	0
				6.0-7.0	4	12	65	10	8	1	0
				7.0-7.7	5	11	55	13	9	7	0
				Mean	**8**	**10**	**35**	**12**	**19**	**15**	**1**
b	61	20	19	8.0-9.0	61	7	9	4	12	7	0
c	9	62	29	9.0-10.0	16	5	21	14	18	24	2
				10.0-11.0	18	3	22	22	21	14	0
				11.0-12.0	4	10	32	15	23	16	0
				12.0-13.0	3	3	20	19	31	24	0
				13.0-14.0	5	3	26	15	28	23	0
				14.0-15.0	5	7	59	14	11	4	0
				15.0-16.0	8	12	54	11	8	7	0
				16.0-17.0	11	15	60	11	3	0	0
				17.0-17.4	8	15	62	13	2	0	0
				20.0-21.0	16	20	37	10	8	9	0
				Mean	**9**	**9**	**39**	**14**	**16**	**13**	**trace**
d	13	84	3	21.0-22.0	10	15	54	19	2	0	0
				22.0-23.0	17	17	49	13	2	2	0
				Mean	**13**	**16**	**52**	**16**	**2**	**1**	**0**
a+b	**15**	**51**	**34**	**Mean**	**15**	**10**	**30**	**11**	**19**	**14**	**1**
b+c	**14**	**58**	**28**	**Mean**	**14**	**9**	**36**	**13**	**16**	**12**	**trace**
a+c	**9**	**58**	**33**	**Mean**	**9**	**10**	**35**	**13**	**18**	**14**	**1**
a-d	**12**	**59**	**29**	**Mean**	**12**	**10**	**36**	**13**	**16**	**12**	**1**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.7-6.0	77	5	8	7	-	3	-
7.0-14.0	52	10	9	8	14	3	4
21.0-22.0	17	-	17	8	-	3	55 (shells)

TL 96 SE 152 **9847 6194** **South-east of Brickworks, Woolpit** **Block C**

Surface level +58.9 m (+193 ft)
Water struck at +44.0 m
Shell and auger 202 mm diameter
August 1979

Overburden 0.1 m
Mineral 1.8 m
Waste 13.0 m
Mineral 3.7 m
Waste 5.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy dark brown	0.1	0.1
Glacial Sand and Gravel	**a** 'Very clayey' pebbly sand Gravel: fine and coarse subangular flint and well rounded vein quartz Sand: fine with some medium subangular quartz, orange-brown	1.8	1.9
Boulder Clay	Clay, silty and sandy with pebbles of flint and chalk, mottled orange and grey becoming dark bluish grey below 3.5 m	13.0	14.9
Glacial Sand and Gravel	**b** Sandy gravel Gravel: fine with some coarse subangular flint and subrounded chalk Sand: medium with fine and some coarse subangular quartz and flint, pale brown	3.7	18.6
Boulder Clay	Clay, silty, firm, dark grey with pebbles of flint and chalk. Thin beds of chalky sand at intervals	5.5+	24.1

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
a	22	65	13	0.1-1.1	18	43	20	3	4	12	0
				1.1-1.9	28	38	21	4	4	5	0
				Mean	**22**	**42**	**20**	**3**	**4**	**9**	**0**
b	5	70	25	14.9-15.9	4	10	38	16	23	9	0
				15.9-16.9	1	7	36	19	21	16	0
				16.9-17.9	5	8	58	18	10	1	0
				17.9-18.6	10	10	54	10	12	4	0
				Mean	**5**	**8**	**46**	**16**	**17**	**8**	**0**
a+b	**10**	**70**	**20**	**Mean**	**10**	**19**	**39**	**12**	**12**	**8**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.1-1.1	81	1	18	-	-	-	-
15.9-16.9	42	-	-	-	58	-	-

TL 96 SE 153 **9852 6068** **South-east of Barley Green, Woolpit** **Block C**

Surface level +69.0 m (+226 ft)
Water struck at +60.5 m
Shell and auger 152 mm diameter
September 1979

Waste 33.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy clay	0.2	0.2
Boulder Clay	Clay, silty, yellow-brown with pebbles of flint and chalk	2.0	2.2
	Clay, silty, firm, pale grey with abundant chalk pebbles, chalky gravel at base	6.3	8.5
	Clay, silty, dark grey with pebbles of flint and chalk. Brownish grey with pebbles of black mudstone between 25.6 m and 29.5 m	24.5+	33.0

TL 96 SE 154 **9945 6408** **South of Whitehouse Farm, Elmswell** **Block C**

Surface level +69.6 m (+228 ft)
Water level not recorded
Shell and auger 152 mm diameter
July 1979

Waste 18.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Made Ground	Soil and brick rubble	0.4	0.4
Boulder Clay	Clay, sandy, orange, becoming brown and grey mottled below 1.0 m	2.1	2.5
Glacial Sand and Gravel	Chalky sand, pebbles of subrounded chalk and subrounded quartz sand	1.3	3.8
Boulder Clay	Clay, silt,y mottled buff and bluish grey with pebbles of flint and chalk	3.8	7.6
Glacial Sand and Gravel	Chalky gravel, mainly chalk with some flint gravel and medium quartz sand	0.7	8.3
Boulder Clay	Clay, silty, firm, bluish grey with flint and chalk pebbles	2.6	10.9
Glacial Sand and Gravel	Chalky gravel, mainly pebbles of chalk with some flint and medium quartz sand	1.0	11.9
Boulder Clay	Clay, silty firm, bluish grey with pebbles of chalk and flint	2.7	14.6
Glacial Sand and Gravel	Chalky gravel, mainly chalk and flint gravel and medium quartz sand	0.7	15.3
Boulder Clay	Clay, silty, firm, bluish grey with pebbles of chalk and flint	3.0+	18.3

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
29	38	33	2.5-3.8	42	17	12	9	12	8	0
			7.6-8.3	6	3	10	17	41	23	0
			10.9-11.9	9	8	18	26	24	15	0
			14.6-15.3	51	4	13	14	6	12	0
			Mean	**29**	**9**	**13**	**16**	**19**	**14**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
2.5-3.8	21	6	-	-	66	7	0
7.6-8.3	19	5	2	-	46	4	24 (shells)
10.9-11.9	29	-	1	-	54	3	13
14.6-15.3	20	5	2	-	26	23	24 (shells)

TL 96 SE 155 **9972 6323** **near Cross Street Houses, Elmswell** **Block C**

Surface level +61.7 m (+202 ft)
Water struck at +60.7 m and +56.1 m
Shell and auger 202 mm diameter
September 1979

Overburden 1.1 m
Mineral 5.1 m
Waste 8.4 m
Mineral 3.4 m
Mineral 7.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy, pale brown	0.3	0.3
Head	Clay, sandy, mottled grey and brown with scattered flints	0.8	1.1
Glacial Sand and Gravel	**a** Sandy gravel, boulder clay between 5.0 m and 5.6 m Gravel: fine with some coarse subangular flint with some chalk, and with some well rounded flint, vein quartz and quartzite Sand: medium with some fine and coarse subangular quartz and flint	5.1	6.2
Boulder Clay	Clay, silty, brown with pebbles of flint and chalk, becoming firm, bluish grey silty clay. 'Clayey' sand between 12.8 m and 14.1 m **(b)**	8.4	14.6
Kesgrave Sands and Gravels	**c** Sandy gravel Gravel: mainly fine with some coarse subangular flint, vein quartz and quartzite Sand: medium with some coarse subangular quartz with some flint, pale brown	3.4	18.0
Crag	**d** Sand Sand: mainly fine subrounded quartz, pale grey Fine well rounded vein quartz pebbles in thin beds at intervals	7.0+	25.0

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	7	56	37	1.1-2.2	14	28	27	9	19	3	0
				2.2-? 2	5	9	38	11	19	18	0
				3.2-4.2	5	3	22	27	32	11	0
				4.2-5.0	3	2	28	25	29	13	0
				5.6-6.2	3	3	25	25	27	17	0
				Mean	**7**	**10**	**28**	**18**	**25**	**12**	**0**
b	14	72	14	12.8-14.1	14	13	46	13	9	5	0
c	4	67	29	14.6-15.0	2	6	49	14	18	11	0
				15.0-16.0	5	5	46	16	21	7	0
				16.0-17.0	3	3	34	26	28	6	0
				17.0-18.0	4	7	46	15	15	7	4
				Mean	**4**	**5**	**44**	**18**	**21**	**7**	**1**
d	3	97	0	18.0-19.0	2	77	18	3	0	0	0
				19-0-20.0	4	88	8	0	0	0	0
				20.0-21.0	1	94	4	1	0	0	0
				21.0-22.0	1	90	9	0	0	0	0
				22.0-23.0	7	80	15	0	0	0	0
				23.0-24.0	2	87	11	0	0	0	0
				24.0-25.0	3	92	5	0	0	0	0
				Mean	**3**	**86**	**10**	**1**	**0**	**0**	**0**
a+b	**8**	**61**	**31**	**Mean**	**8**	**11**	**33**	**17**	**21**	**10**	**0**
b+c	**7**	**67**	**26**	**Mean**	**7**	**7**	**43**	**17**	**18**	**7**	**1**
a+c	**5**	**61**	**34**	**Mean**	**5**	**8**	**35**	**18**	**23**	**10**	**1**
a-d	**5**	**78**	**17**	**Mean**	**5**	**43**	**25**	**10**	**12**	**5**	**trace**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
1.1-6.2	61	6	7	6	16	3	1
12.8-14.1	46	27	21	1	-	5	-
14.6-18.0	47	15	18	8	-	12	-

TL 96 SE 156 **9974 6180** **Woolpit Wood, Woolpit** **Block C**

Surface level +76.7 m (+251 ft)
Water not struck
Shell and auger 152 mm diameter
September 1979

Overburden 0.1 m
Mineral 7.5 m
Waste 17.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy with scattered flints	0.1	0.1
Glacial Sand and Gravel	'Clayey' sandy gravel Gravel: fine and coarse subangular flint with some well rounded flint, vein quartz, and quartzite Sand: medium with some fine subangular quartz and flint, orange. Thin bed of silt from 6.8 m to 7.0 m	7.5	7.6
Boulder Clay	Clay, silty, mottled grey and brown with pebbles of flint and chalk. Below 10.1 m becoming grey silty clay with abundant chalk pebbles. Thin beds of chalky gravel at intervals	17.4+	25.0

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
11	63	26	0.1-1.0	11	25	28	9	11	16	0
			1.0-2.0	6	9	30	16	18	21	0
			2.0-3.0	11	8	25	13	20	23	0
			3.0-4.0	11	8	38	6	26	11	0
			4.0-5.0	7	17	45	11	12	8	0
			5.0-6.0	12	29	55	4	0	0	0
			6.0-6.8	15	31	46	5	3	0	0
			7.0-7.6	15	9	25	8	16	27	0
			Mean	**11**	**17**	**37**	**9**	**13**	**13**	**0**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
0.1-7.6	66	10	10	11	-	1	2

TL 96 SE 157 **9952 6046** **Slough Farm, Shelland** **Block C**

Surface level +56.8 m (+186 ft)
Water struck at c +46.4 m
Shell and auger 152 mm diameter
October 1979

Overburden 0.5 m
Mineral 1.1 m
Waste 7.6 m
Mineral 6.8 m
Waste 9.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil, sandy, silty, dark brown	0.5	0.5
Head	**a** 'Very clayey' pebbly sand Gravel: fine and coarse subangular flint with some vein quartz and quartzite Sand: mainly fine with some medium subangular quartz, yellowish brown	1.1	1.6
Glacial Silt	Silt, clayey, mottled greenish grey and orange with scattered flints	0.4	2.0
	Silt, peaty, dark brown, clayey and laminated in parts, with shell debris at some levels	7.2	9.2
Glacial Sand and Gravel	**b** Sandy gravel, silt between 10.0 and 10.4 m Gravel: mainly fine with some coarse subangular flint and chalk, with traces of well rounded vein quartz and flint, orange, chalky	6.8	16.0
Boulder Clay	Clay, silty, dark grey, very firm with pebbles of chalk and flint. Becoming brownish grey silty clay below 16.4 m, with thin beds of silt and chalky gravel at intervals	9.0+	25.0

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	20	66	14	0.5-1.5	22	45	21	2	3	7	0
				1.5-1.6	6	11	7	9	32	35	0
				Mean	**20**	**44**	**20**	**2**	**5**	**9**	**0**
b	9	52	39	9.2-10.0	10	5	14	19	31	21	0
				10.4-11.4	10	9	14	18	40	9	0
				11.4-12.4	13	11	17	15	33	11	0
				12.4-13.4	7	8	21	19	31	11	3
				13.4-14.4	10	16	34	17	20	3	0
				14.4-15.4	4	8	43	14	13	18	0
				15.4-16.0	5	6	34	24	16	15	0
				Mean	**9**	**9**	**25**	**18**	**27**	**12**	**trace**
a+b	**10**	**54**	**36**	**Mean**	**10**	**14**	**25**	**15**	**24**	**12**	**trace**

COMPOSITION

Depth below surface (m)	Percentages by weight in +8-16 mm fraction						
	Angular/sub-angular flint	Well-rounded flint	Vein quartz	Quartzite	Chalk	Sandstone	Others
10.4-14.4	38	2	2	tr	49	2	6 (shells)

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

2 The sand and gravel resources of the country around Witham, Essex: Resource sheet TL 81. H. J. E. Haggard.
Report 72/6 ISBN 0 11 880588 6 £1.20

3 The sand and gravel resources of the country south and west of Woodbridge, Suffolk: Resource sheet TM 24.
R. Allender and S. E.Hollyer.
Report 72/9 ISBN 0 11 880596 7 £1.70

4 The sand and gravel resources of the country around Maldon, Essex: Resource sheet TL 80. J. D. Ambrose
Report 73/1 ISBN 0 11 880600 9 £1.20

5 The sand and gravel resources of the country around Hethersett, Norfolk: Resource sheet TG 10.
E. F. P. Nickless.
Report 73/4 ISBN 0 11 880606 8 £1.60

6 The sand and gravel resources of the country around Terling, Essex: Resource sheet TL 71. C. H. Eaton.
Report 73/5 ISBN 0 11 880608 4 £1.20

7 The sand and gravel resources of the country around Layer Breton and Tolleshunt D'Arcy, Essex: Resource sheet TL 91 and part 90. J. D. Ambrose.
Report 73/8 ISBN 0 11 880614 9 £1.30

8 The sand and gravel resources of the country around Shotley and Felixstowe, Suffolk: Resource sheet TM 23.
R. Allender and S. E. Hollyer.
Report 73/13 ISBN 0 11 880625 4 £1.60

9 The sand and gravel resources of the country around Attlebridge, Norfolk: Resource sheet TG 11.
E. F. P. Nickless.
Report 73/15 ISBN 0 11 880658 0 £1.85

10 The sand and gravel resources of the country west of Colchester, Essex: Resource sheet TL 92. J. D. Ambrose.
Report 74/6 ISBN 0 11 880671 8 £1.45

11 The sand and gravel resources of the country around Tattingstone, Suffolk: Resource sheet TM 13. S. E. Hollyer.
Report 74/9 ISBN 0 11 880675 0 £1.95

12 The sand and gravel resources of the country around Gerrards Cross, Buckinghamshire: Resource sheet SU 99, TQ 08, 09. H. C. Squirrell.
Report 74/14 ISBN 0 11 880710 2 £2.20

Mineral Assessment Reports

13 The sand and gravel resources of the country east of Chelmsford, Essex: Resource sheet TL 70. M. R. Clarke.
ISBN 0 11 880744 7 £3.50

14 The sand and gravel resources of the country east of Colchester, Essex: Resource sheet TM 02. J. D. Ambrose.
ISBN 0 11 880745 5 £3.25

15 The sand and gravel resources of the country around Newton on Trent, Lincolnshire: Resource sheet SK 87.
D. Price.
ISBN 0 11 880746 3 £3.00

16 The sand and gravel resources of the country around Braintree, Essex: Resource sheet TL 72. M. R. Clarke.
ISBN 0 11 880747 1 £3.50

17 The sand and gravel resources of the country around Besthorpe, Nottinghamshire: Resource sheet SK 86 and part 76. J. R. Gozzard.
ISBN 0 11 880748 X £3.00

18 The sand and gravel resources of the Thames Valley, the country around Cricklade, Wiltshire: Resource sheet SU 09, 19 and parts SP 00, 10. P R. Robson.
ISBN 0 11 880749 8 £3.00

19 The sand and gravel resources of the country south of Gainsborough, Lincolnshire: Resource sheet SK 88 and part 78. J .H. Lovell.
ISBN 0 11 880750 1 £2.50

20 The sand and gravel resources of the country east of Newark upon Trent, Nottinghamshire: Resource sheet SK 85.
J. R. Gozzard.
ISBN 0 11 880751 X £2.75

21 The sand and gravel resources of the Thames and Kennet Valleys, the country around Pangbourne, Berkshire: Resource sheet SU 67. H. C. Squirrell.
ISBN 0 11 880752 8 £3.25

22 The sand and gravel resources of the country north-west of Scunthorpe, Humberside: Resource sheet SE 81.
J. W. C. James.
ISBN 0 11 880753 6 £3.00

23 The sand and gravel resources of the Thames Valley, the country between Lechlade and Standlake: Resource sheet SP 30 and parts SP 20, SU 29, 39. P. Robson.
ISBN 0 11 881252 1 £7.25

24 The sand and gravel resources of the country around Aldermaston, Berkshire: Resource sheet SU 56, 66.
H. C. Squirrell.
ISBN 0 11 881253 X £5.00

25 The celestite resources of the area north-east of Bristol: Resource sheet ST 68 and parts 59, 69, 79, 58, 68, 78, 77.
E. F. P. Nickless, S. J. Booth and P. N. Mosley.
ISBN 0 11 881262 9 £5.00

26 The sand and gravel resources of the country around Monyash, Derbyshire: Resource sheet SK 16. F. C. Cox and D. McC. Bridge.
ISBN 0 11 881263 7 £7.00

27 The sand and gravel resources of the country west and south of Lincoln, Lincolnshire: Resource sheets SK 95 and part 96, and SK 97 and part 96. I. Jackson.
ISBN 0 11 884003 7 £6.00

28 The sand and gravel resources of the country around Eynsham, Oxfordshire: Resource sheet SP 40 and part 41.
W. J. R. Harries.
ISBN 0 11 884012 6 £3.00

29 The sand and gravel resources of the country south-west of Scunthorpe, Humberside: Resource sheet SE 80.
J. H. Lovell.
ISBN 0 11 884013 4 £3.50

30 Procedure for the assessment of limestone resources.
F. C. Cox, D. McC. Bridge and J. H. Hull.
ISBN 0 11 884030 4 £1.25

31 The sand and gravel resources of the country west of Newark upon Trent, Nottinghamshire: Resource sheet SK 75.
D. Price and P. J. Rogers.
ISBN 0 11 884031 2 £3.50

32 The sand and gravel resources of the country around Sonning and Henley, Berkshire, Oxfordshire and Buckinghamshire: Resource sheet SU 77, 78.
H. C. Squirrell.
ISBN 0 11 884032 0 £5.25

33 The sand and gravel resources of the country north of Gainsborough, Lincolnshire: Resource sheet SK 89.
J. R. Gozzard and D. Price.
ISBN 0 11 884033 9 £4.50

34 The sand and gravel resources of the Dengie Peninsula, Essex: Resource sheet TL 90 and parts 80, TM 00, TQ 89, 99, TR 09. M. B. Simmons.
ISBN 0 11 884081 9 £5.00

35 The sand and gravel resources of the country around Darvel, Strathclyde: Resource sheet comprising parts of NS 53, 54, 63, 64. E. F. P. Nickless, A. M. Aitken and A. A. McMillan.
ISBN 0 11 884082 7 £7.00

36 The sand and gravel resources of the country around Southend-on-Sea, Essex: Resource sheets comprising parts of TQ 88, 89, 98, 99, TR 08, 09; and TQ 78, 79 and parts of 88, 89. S. E. Hollyer and M. B. Simmons.
ISBN 0 11 884083 5 £7.50

37 The sand and gravel resources of the country around Bawtry, South Yorkshire: Resource sheet SK 69.
A. R. Clayton.
ISBN 0 11 884053 3 £5.75

38 The sand and gravel resources of the country around Abingdon, Oxfordshire: Resource sheet SU 49, 59, SP 40, 50.
C. E. Corser.
ISBN 0 11 884084 5 £5.50

39 The sand and gravel resources of the Blackwater Valley (Aldershot) area: Resource sheet SU 85, 86 and parts 84, 94, 95, 96. M. R. Clarke, A. J. Dixon and M. Kubala.
ISBN 0 11 884085 1 £7.00

40 The sand and gravel resources of the country west of Darlington, County Durham: Resource sheet NZ 11, 21.
A. Smith.
ISBN 0 11 884086 X £5.00

41 The sand and gravel resources of the country around Garmouth, Grampian Region: Resource sheet NJ 36.
A. M. Aitken, J. W. Merritt and A. J. Shaw.
ISBN 0 11 884090 8 £8.75

42 The sand and gravel resources of the country around Maidenhead and Marlow: Resource sheet SU 88 and parts 87, 97, 98. P. N. Dunkley.
ISBN 0 11 884091 6 £5.00

43 The sand and gravel resources of the country around Misterton, Nottinghamshire: Resource sheet SK 79.
D. Thomas and D. Price.
ISBN 0 11 884092 4 £5.25

44 The sand and gravel resources of the country around Sedgefield, Durham: Resource sheet NZ 32. M. D. A. Samuel.
ISBN 0 11 884093 2 £5.75

45 The sand and gravel resources of the country around Brampton, Cumbria: Resource sheet NY 55, part 56. I. Jackson.
ISBN 0 11 884094 0 £6.75

46 The sand and gravel resources of the country north of Harlow, Essex: Resource sheet TL 41. P. M. Hopson.
ISBN 0 11 884107 6 £9.50

47 The limestone and dolomite resources of the country around Wirksworth, Derbyshire: Resource sheet SK 25 and part 35. F. C. Cox and D. J. Harrison.
ISBN 0 11 884108 4 £15.00

48 The sand and gravel resources of the Loddon Valley area: Resource sheet SU 75, 76, and parts 64, 65, 66, 74.
M. R. Clarke, E. J. Raynor and R. A. Sobey.
ISBN 0 11 884109 2 £8.75

49 The sand and gravel resources of the country around Lanark, Strathclyde Region: Resource sheet NS 94 and part 84. J. L. Laxton and E. F. P. Nickless.
ISBN 0 11 884110 6 £11.00

50 The sand and gravel resources of the country around Fordingbridge, Hampshire: Resource sheet SU 11 and parts 00, 01, 10, 20, 21. M. Kubala.
ISBN 0 11 884111 4 £7.75

51 The sand and gravel resources of the country north of Bournemouth, Dorset: Resource sheet SU 00, 10, 20, SZ 09, 19, 29. M. R. Clarke.
ISBN 0 11 884112 2 £9.75

52 The sand and gravel resources of the country between Hatfield Heath and Great Waltham, Essex: Resource sheet TL 51, 61. R. J. Marks.
ISBN 0 11 884113 0 £8.00

53 The sand and gravel resources of the country around Cottenham, Cambridgeshire: Resource sheet TL 46, 47.
A. J. Dixon.
ISBN 0 11 884114 9 £9.25

54 The sand and gravel resources of the country around Huntingdon and St Ives, Cambridgeshire: Resource sheets comprising parts of TL 16, 17, 26, 27; and TL 26, 27, 36, 37.
R. W. Gatliff.
ISBN 0 11 884115 7 £8.75

55 The sand and gravel resources of the country around Ipswich, Suffolk: Resource sheet TM 14. R. Allender and S. E. Hollyer.
ISBN 0 11 884116 5 £10.00

56 Procedure for the assessment of the conglomerate resources of the Sherwood Sandstone Group. D. P. Piper and P. J. Rogers.
ISBN 0 11 884143 2 £1.25

57 The conglomerate resources of the Sherwood Sandstone Group of the country around Cheadle, Staffordshire: Resource sheet SK 04. P. J. Rogers, D. P. Piper and T. J. Charsley.
ISBN 0 11 884144 0 £7.75

58 The sand and gravel resources of the country west of Peterhead, Grampian Region: Resource sheet NK 04 and parts NK 05, 14, 15, NJ 94, 95. A. A. McMillan and A. M. Aitken.
ISBN 0 11 884145 9 £12.00

59 The sand and gravel resources of the country around Newbury, Berkshire: Resource sheet SU 46, 47 and parts 36, 37, 47. J. R. Gozzard.
ISBN 0 11 884146 7 £11.50

60 The sand and gravel resources of the country south-west of Peterborough, in Cambridgeshire and east Northamptonshire: Resource sheets TL 09, 19 and SP 98, TL 08.
A. M. Harrisson.
ISBN 0 11 884147 5 £15.50

61 The sand and gravel resources of the country north of Wrexham, Clwyd: Resource sheet SJ 35 and part 25.
P. N. Dunkley.
ISBN 0 11 884148 3 £11.75

62 The sand and gravel resources of the country around Dolphinton, Strathclyde Region, and West Linton, Borders Region: Resource sheet NT 04, 14 and parts 05 15.
A. A. McMillan, J. L. Laxton and A. J. Shaw.
ISBN 0 11 884149 1 £8.00

63 The sand and gravel resources of the valley of the Douglas Water, Strathclyde Region: Resource sheet NS 83 and parts 82, 92, 93. A. J. Shaw and E. F. P. Nickless.
ISBN 0 11 884150 5 £11.50

64 The sand and gravel resources of the country between Wallingford and Goring, Oxfordshire: Resource sheet SU 68 and part 58. C. E. Corser.
ISBN 0 11 884151 3 £11.50

65 The sand and gravel resources of the country around Hexham, Northumberland: Resource sheet NY 86, 96.
J. H. Lovell.
ISBN 0 11 884152 1 £7.50

66 The sand and gravel resources of the country west of Chelmsford, Essex: Resource sheet TL 60. P. M. Hopson.
ISBN 0 11 884153 X £8.50

67 The sand and gravel resources of the country around Hatfield and Cheshunt, Hertfordshire: Resource sheet TL 20, 30 and parts TQ 29, 39. J. R. Gozzard.
ISBN 0 11 884167 X £10.00

68 The sand and gravel resources of the country north-east of Halstead, Essex: Resource sheet TL 83. R. J. Marks and J. W. Merritt.
ISBN 0 11 884168 8 £13.25

69 The sand and gravel resources of the country around Welwyn Garden City, Hertfordshire: Resource sheet TL 11, 21.
J. R. Gozzard.
ISBN 0 11 884169 6 £10.50

70 The sand and gravel resources of the country east of Harrogate, North Yorkshire: Resource sheet SE 35.
D. L. Dundas.
ISBN 0 11 884170 7 £15.50

71 The sand and gravel resources of the country around Hemel Hempstead, St Albans and Watford: Resource sheet TL 00, 10, and parts TQ 09, 19.
W. J. R. Harries, S. E. Hollyer and P. M. Hopson.
ISBN 0 11 884171 8 £12.00

72 The sand and gravel resources of the country around Bury St Edmunds, Suffolk: Resource sheet TL 86.
M. P. Hawkins.
ISBN 0 11 884172 6 £10.50

73 The sand and gravel resources of the country between Ely and Cambridge, Cambridgeshire: Resource sheet TL 56, 57. A. R. Clayton.
ISBN 0 11 884173 4 £9.50

74 The sand and gravel resources of the country around Blaydon, Tyne and Wear: Resource sheet NZ 06, 16.
J. R. A. Giles.
ISBN 0 11 884174 2 £10.50

75 The sand and gravel resources of the country around Stokesley, North Yorkshire: Resource sheet NZ 40, 50, and parts 41, 51. R. G. Crofts.
ISBN 0 11 884175 0 £11.50

76 The sand and gravel resources of the country around Ellon, Grampian Region: Resource sheets NJ 93 with parts 82, 83, 92, and NK 03 with parts 02, 13. J. W. Merritt.
ISBN 0 11 884176 9 £15.00

77 The limestone and dolomite resources of the country around Buxton, Derbyshire: Resource sheet SK 07 and parts 06, 08. D. J. Harrison.
ISBN 0 11 884177 7 £13.50

78 The sand and gravel resources of the country west of Boroughbridge, North Yorkshire: Resource sheet SE 36.
D. A. Abraham.
ISBN 0 11 884178 5 £12.75

79 The limestone and dolomite resources of the country around Bakewell, Derbyshire: Resource sheet SK 26 and part 27. D. McC. Bridge and J. R. Gozzard.
ISBN 0 11 884179 3 £10.50

80 The sand and gravel resources of the country between Stamford, Lincolnshire, and Peterborough, Cambridgeshire: Resource sheet TF 00, 10. S. J. Booth.
ISBN 0 11 884180 7 £14.50

81 The sand and gravel resources of the country around Dorchester and Watlington, Oxfordshire: Resource sheet SU 69 and part 59. C. E. Corser.
ISBN 0 11 884204 8 £14.25

82 The sand and gravel resources of the country around Sible Hedingham, Essex: Resource sheet TL 73.
R. J. Marks and D. W. Murray.
ISBN 0 11 884205 6 £10.75

83 The sand and gravel resources of the country around Hollesley, Suffolk: Resource sheet TM 34.
S. E. Hollyer and R. Allender.
ISBN 0 11 884206 4 £13.25

84 The sand and gravel resources of the country around Kirk Hammerton, North Yorkshire: Resource sheet SE 45.
J. R. A. Giles.
ISBN 0 11 884207 2 £10.00

85 The sand and gravel resources of the country around Nayland, Suffolk: Resource sheet TL 93. P. M. Hopson.
ISBN 0 11 884208 0 £11.25

86 The sand and gravel resources of the country around Wem, Shropshire: Resource sheet SJ 42, 52.
B. Cannell and W. J. R. Harries.
ISBN 0 11 884209 9 £15.50

87 The sand and gravel resources of the country around Ranskill and East Retford, Nottinghamshire: Resource sheet SK 68 and part 78. D. Thomas.
ISBN 0 11 884210 2 £8.50

88 The sand and gravel resources of the country around Tholthorpe, North Yorkshire: Resource sheet SE 46.
R. Stanczyszyn.
ISBN 0 11 884211 0 £13.00

89 The sand and gravel resources of the country around Newport-on-Tay, Fife Region: Resource sheet NO 42 and parts 32, 52. J. L. Laxton and D. L. Ross.
ISBN 0 11 887413 6 £12.75

90 The sand and gravel resources of the country around Shrewsbury, Shropshire: Resource sheet SJ 41, 51.
B. Cannell.
ISBN 0 11 884213 7 £17.00

91 The conglomerate resources of the Sherwood Sandstone Group of the country east of Stoke-on-Trent, Staffordshire: Resource sheet SJ 94. D. Piper.
ISBN 0 11 884214 5 £7.00

92 The sand and gravel resources of the country around Armthorpe, South Yorkshire: Resource sheet SE 60. D. Price and D. P. Best.
ISBN 0 11 884215 3 £10.00

93 The sand and gravel resources of the country around Whittlesey, Cambridgeshire: Resource sheet TF 20, TL 29.
S. J. Booth.
ISBN 0 11 884216 1 £12.50

94 The sand and gravel resources of the country north and west of Woodhall Spa, Lincolnshire: Resource sheet TF 16 and part 17. I. Jackson.
ISBN 0 11 884217 X £14.75

95 The sand and gravel resources of the country around Biggar, Strathclyde Region: Resource sheet NS 93, NT 03, and parts NS 92, NT 02. A. J. Shaw and J. W. Merritt.
ISBN 0 11 887414 4 £15.00

96 The sand and gravel resources of the country around Potter Hanworth and Reepham, Lincolnshire: Resource sheet TF 06, 07. R. G. Crofts.
ISBN 0 11 884219 6 £9.75

97 The sand and gravel resources of the country around Clare, Suffolk: Resource sheet TL 74. R. Marks.
ISBN 0 11 884297 8 £10.00

98 The limestone and dolomite resources of the country around Tideswell, Derbyshire: Resource sheet SK 17 and parts 18, 27. R. W. Gatliff.
ISBN 0 11 884298 6 £14.50

99 The sand and gravel resources of the country north and west of Billingham, Cleveland: Resource sheet NZ 42 and part 52. J. W. C. James.
ISBN 0 11 884299 4 £10.50

100 The sand and gravel resources of the country around Billinghay, Lincolnshire: Resource sheet TF 15 and part 05.
J. B. L. Wild.
ISBN 0 11 884300 1 £13.75

101 The sand and gravel resources of the country around Glenrothes, Fife Region: Resource sheet NO 20 and parts 21, 30, 31. A. M. Aitken and D. L. Ross.
ISBN 0 11 887415 2 £15.00

102 The sand and gravel resources of the country around Coggeshall, Essex: Resource sheet TL 82. S. J. Booth and J. W. Merritt.
ISBN 0 11 887416 0 £16.00

103 The sand and gravel resources of the country between Dorchester and Wareham, Dorset: Resource sheets comprising parts of SY 68, 69, 78, 79, 88, 89, 98, 99.
S. J. Mathers.
ISBN 0 11 884303 6 £17.00

104 The sand and gravel resources of the country around Stansted Mountfitchet, Essex: Resource sheet TL 52.
P. M. Hopson.
ISBN 0 11 884304 4 £11.75

105 The sand and gravel resources of the Welshampton area, Shropshire and Clwyd: Resource sheet SJ 43. Institute of Geological Sciences.
ISBN 0 11 884305 2 £12.00

106 The sand and gravel resources of the country south of Wrexham, Clwyd: Resource sheet SJ 34 and part 24. D. F. Ball.
ISBN 0 11 884306 0 £11.00

107 The sand and gravel resources of the country between Rugby and Northampton, Warwickshire and Northamptonshire: Resource sheet SP 66 and parts 56, 57, 65, 67, 75 and 76. M. R. Clarke and E. R. Moczarski.
ISBN 0 11 884307 9 £20.00

108 The sand and gravel resources of the country south of Horncastle, Lincolnshire: Resource sheet TF 26. G. Power and J. B. L. Wild.
ISBN 0 11 884308 7 £9.75

109 The sand and gravel resources of the country around Great Dunmow, Essex: Resource sheet TL 62. C. W. Thomas.
ISBN 0 11 884309 5 £12.75

110 The sand and gravel resources of the country north of Newmarket, Cambridgeshire and Suffolk: Resource sheet TL 67 and part 66. C. E. Corser.
ISBN 0 11 884310 9 £14.50

111 The sand and gravel resources of the country east and south-east of Darlington, Durham: Resource sheet NZ 30, 31. J. R. Gozzard and D. Price.
ISBN 0 11 884311 7 £14.25

112 The sand and gravel resources of the country around Hertford, Hertfordshire: Resource sheet TL 31. P. M. Hopson and M. D. A. Samuel.
ISBN 0 11 884312 5 £11.75

113 The sand and gravel resources of the country around Mold, Clwyd: Resource sheet SJ 26 and part 16. D. F. Ball and K. A. McL. Adlam.
ISBN 0 11 884313 3 £12.00

114 The sand and gravel resources of the country around Kettering and Wellingborough, in parts of Northamptonshire, Cambridgeshire and Bedfordshire: Resource sheets SP 97 and parts SP 87, TL 07; and SP 86, 96. A. M. Harrisson.
ISBN 0 11 884314 1 £18.00

115 The sand and gravel resources of the country east of Solihull, Warwickshire: Resource sheet comprising parts of SP 17, 18, 27, 28. B. Cannell.
ISBN 0 11 884315 X £10.75

116 The limestone resources of the Craven Lowlands: Resource sheet comprising parts of 1:50000 geological sheets 59, 69, 61, 67, 68 and 69. D. J. Harrison.
ISBN 0 11 884316 8 £15.00

117 The sand and gravel resources of the country around Redgrave, Suffolk: Resource sheet TM 07 and part 08. C. A. Auton.
ISBN 0 11 884317 6 £15.00

118 The sand and gravel resources of the country around Sudbury, Suffolk: Resource sheet TL 84. P. M. Hopson.
ISBN 0 11 884318 4 £12.50

119 The sand and gravel resources of the country around Bedale, North Yorkshire: Resource sheet SE 28. J. R. A. Giles.
ISBN 0 11 884319 2 £11.75

120 The sand and gravel resources of the country around Catterick, North Yorkshire: Resource sheet SE 29. J. H. Lovell.
ISBN 0 11 884320 6 £10.75

121 The sand and gravel resources of the country around Callander and Dunblane, Central Region: Resource sheet NN 60, 70. J. W. Merritt and J. L. Laxton.
ISBN 0 11 887417 9 £15.00

122 The sand and gravel resources of the country around Lymington and Beaulieu, Hampshire: Resource sheet comprising parts of SU 20, 30, 40, and SZ 29, 39, 49. S. J. Mathers.
ISBN 0 11 884322 2 £17.00

123 The sand and gravel resources of the country between Mildenhall and Barrow, Suffolk: Resource sheet TL 76, 77 and part 87. A. R. Clayton.
ISBN 0 11 884323 0 £15.50

124 The sand and gravel resources of the country around Chatteris, Cambridgeshire: Resource sheet TL 38 and part 37. J. R. Gozzard.
ISBN 0 11 884324 9 £12.50

125 The sand and gravel resources of the country between Coventry and Rugby, Warwickshire: Resource sheet SP 47 and part 37.
ISBN 0 11 884325 7 £12.75

126 The limestone and dolomite resources of the country around Settle and Malham, North Yorkshire: Resource sheet comprising parts of 1:50000 geological sheets 50 and 60. D. W. Murray.
ISBN 0 11 884326 5 £9.75

127 The sand and gravel resources of the country around Woolpit, Suffolk: Resource sheet TL 96. M. R. Clarke.
ISBN 0 11 884327 3 £13.00

Reports of the Institute of Geological Sciences

Other Reports

69/9 Sand and gravel resources of the Inner Moray Firth. A. L. Harris and J. D. Peacock.
ISBN 0 11 880106 0 35p

70/4 Sands and gravels of the southern counties of Scotland. G. A. Goodlet.
ISBN 0 11 880105 8 90p

72/8 The use and resources of moulding sand in Northern Ireland. R. A. Old.
ISBN 0 11 881594 0 30p

73/9 The superficial deposits of the Firth of Clyde and its sea lochs. C. E. Deegan, R. Kirby, I. Rae and R. Floyd.
ISBN 0 11 880617 3 95p

77/1 Sources of aggregate in Northern Ireland (2nd edition). I. B. Cameron.
ISBN 0 11 881279 3 70p

77/2 Sand and gravel resources of the Grampian Region. J. D. Peacock and others
ISBN 0 11 881282 3 80p

77/5 Sand and gravel resources of the Fife Region. M. A. E. Browne.
ISBN 0 11 884004 5 60p

77/6 Sand and gravel resources of the Tayside Region. I. B. Paterson.
ISBN 0 11 884008 8 £1.40

77/8 Sand and gravel resources of the Strathclyde Regio I. B. Cameron and others.
ISBN 0 11 884028 2 £2.50

77/9 Sand and gravel resources of the Central Region, Scotland. M. A. E. Browne.
ISBN 0 11 884016 9 £1.35

77/19 Sand and gravel resources of the Borders Region, Scotland. A. D. McAdam.
ISBN 0 11 884025 8 £1.00

77/22 Sand and gravel resources of the Dumfries and Galloway Region. I. B. Cameron.
ISBN 0 11 884021 5 £1.20

78/1 Sand and gravels of the Lothian Region of Scotland.
A. D. McAdam.
ISBN 0 11 884042 8 £1.00

78/8 Sand and gravel resources of the Highland Region.
W. Mykura, D. L. Ross and F. May.
ISBN 0 11 884050 9 £3.00

Dd 717427 C10

Printed in England for Her Majesty's Stationery Office by
Commercial Colour Press, London E7

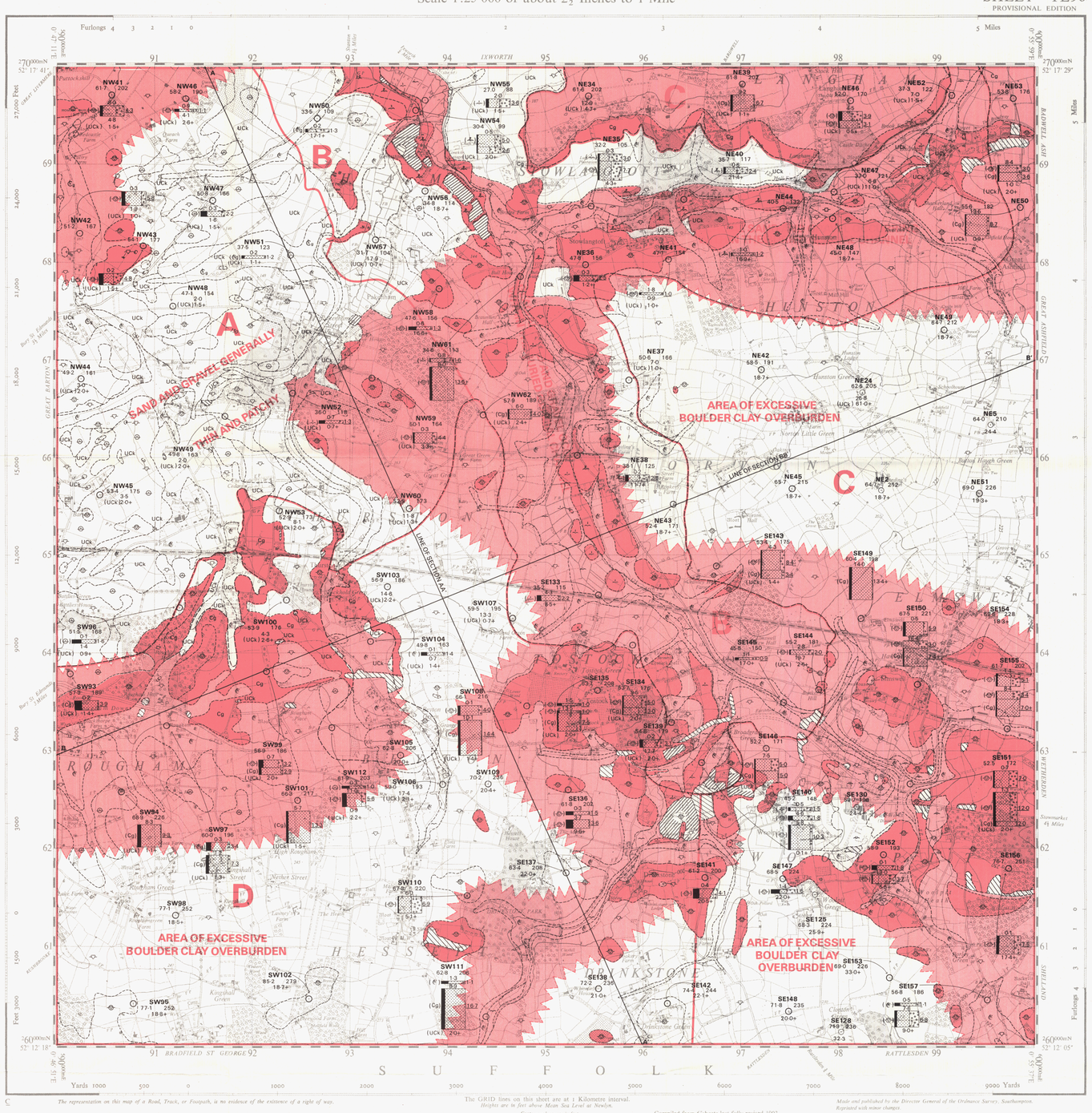
INSTITUTE OF GEOLOGICAL SCIENCES

INDUSTRIAL MINERALS ASSESSMENT UNIT

THE SAND AND GRAVEL RESOURCES OF THE COUNTRY AROUND WOOLPIT, SUFFOLK

Scale 1:25 000 or about 2½ Inches to 1 Mile

ORDNANCE SURVEY
SHEET TL96
PROVISIONAL EDITION



The representation on this map of a Road, Track, or Footpath, is no evidence of the existence of a right of way.

The GRID lines on this sheet are at 1 Kilometre interval.
Heights are in feet above Mean Sea Level at Newlyn.
Contour values are in feet
1 square inch on this map represents 99.636 acres on the ground.

Compiled from 6"sheets last fully revised 1903.
Other partial systematic revision 1950 has been incorporated.
Major roads revised 1969.

Made and published by the Director General of the Ordnance Survey, Southampton.
Reprinted with minor changes.

Geological lines from a survey at a scale of 1:10,560 by C. R. Bristow in 1977/78. The limit of sub-drift Crag is based upon the intersection of two computer-generated surfaces and does not necessarily correspond with the conjectural limit of Crag shown on the 1:10,000 scale geological map.
Sand and Gravel survey by C.A. Auton, M.R. Clarke and M.P. Hawkins in 1979.
1:25,000 Sand and Gravel Resource Sheet published in 1983.
R.G. Thurrell, Head, Industrial Minerals Assessment Unit.
G.M. Brown, D.Sc., F.R.S., Director, Institute of Geological Sciences.

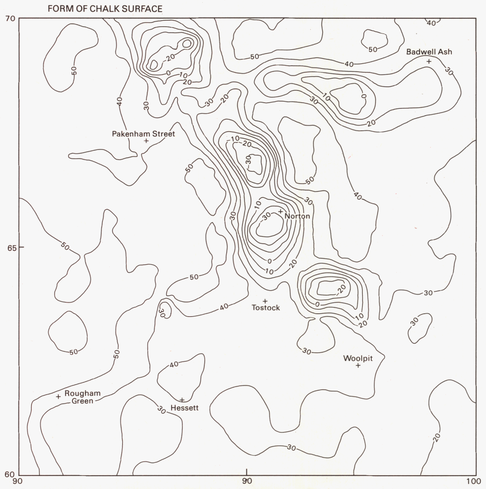
Data quoted for an individual borehole refer strictly to that site; reliable conclusions cannot be drawn about the thickness and grading elsewhere in the deposit, particularly in material as variable as sand and gravel. However, estimates of the volume and mean grading of the mineral as a whole in each Resource Block are given in the Report.

TL87	TL97	TM07
TL86 189	TL96	TM06 190
TL85	TL95	TM05

Diagram showing the relationship of this Sheet to the National Grid 1:25,000 Sheets and the New Series Geological Sheets 189 and 190 (shown in red).

DIAGRAM A

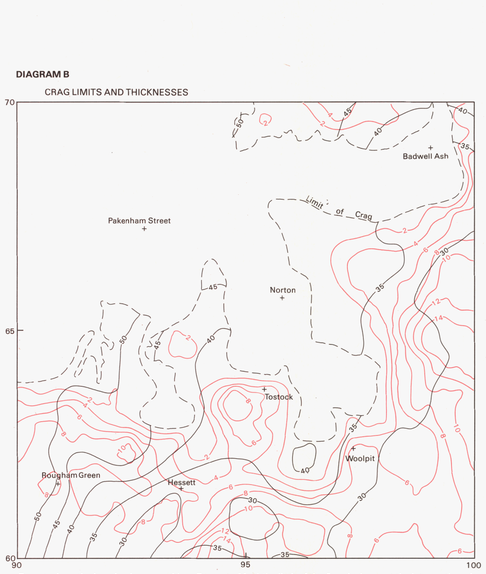
FORM OF CHALK SURFACE



Generalised contours in metres on the surface of the Chalk relative to Ordnance Datum. A deep glacial channel (trending SE-NW) and a tributary channel (trending E-W) have been excavated up to 80 metres into the Chalk surface, which slopes towards the south-east.

DIAGRAM B

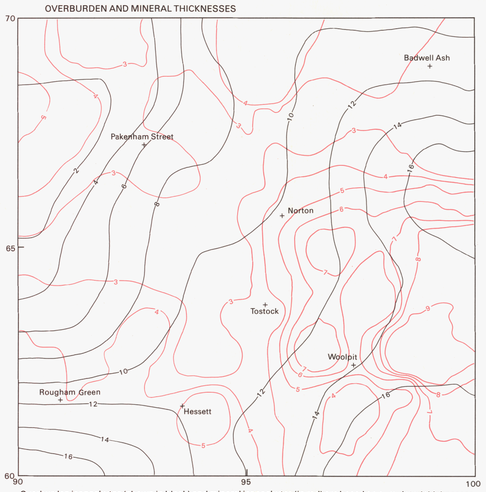
CRAG LIMITS AND THICKNESSES



Except where the junction is exposed (see Resource Map) the limit of the Crag is drawn at the intersection of the computer-generated surfaces representing the base of the Crag (shown by contours in black) and the top of the Chalk (Diagram A). The generalised Crag isopachytes (shown in red), which are derived from thicknesses (in metres) proved in assessment boreholes, demonstrate thickening towards the south and south-east into the basin of deposition.

DIAGRAM C

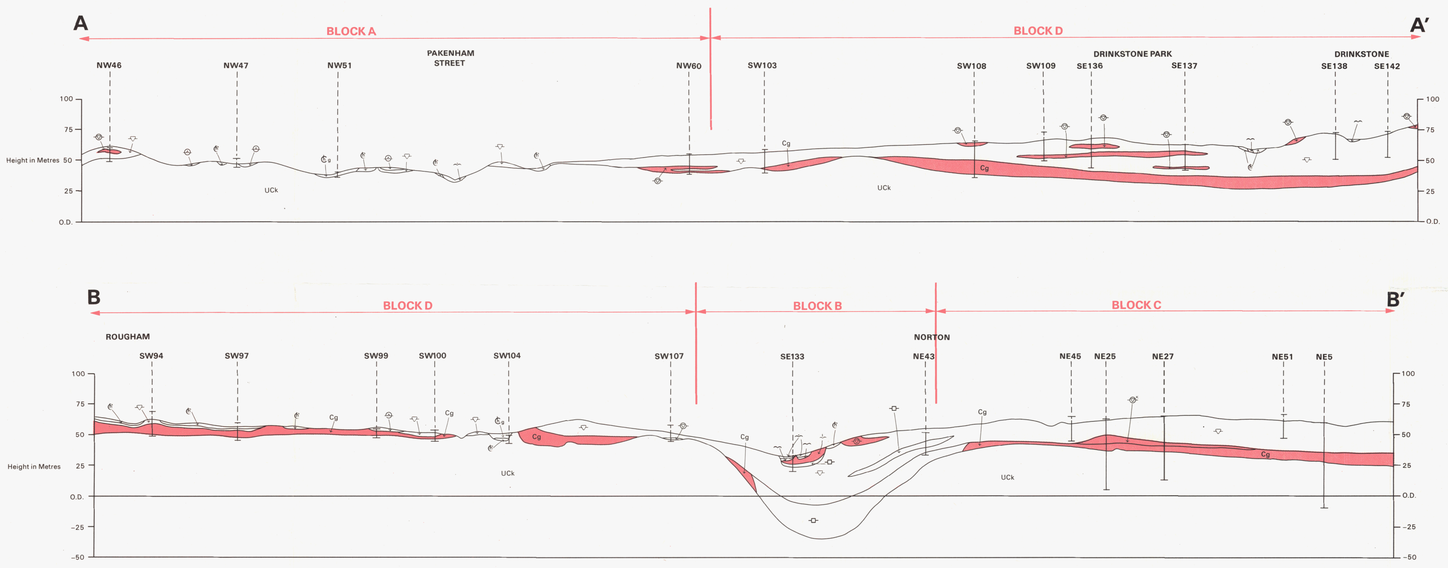
OVERBURDEN AND MINERAL THICKNESSES



Overburden isopachytes (shown in black) and mineral isopachytes (in red) are based on cumulated thicknesses (in metres) of silts and clays and of potentially workable sand and gravel proved in assessment boreholes. They demonstrate the regional trend in thickening of the deposits towards the south and south-east.

GENERALISED HORIZONTAL SECTIONS SHOWING THE RELATIONSHIPS OF THE DRIFT DEPOSITS

HORIZONTAL SCALE 1:25 000 VERTICAL EXAGGERATION x10



KEY TO SECTIONS

Sand and Gravel

Geological boundary lines and other symbols and abbreviations as map legend

THE SAND AND GRAVEL RESOURCES OF THE COUNTRY AROUND WOOLPIT, SUFFOLK

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

127

EXPLANATION OF SYMBOLS AND ABBREVIATIONS

DRIFT

RECENT AND PLEISTOCENE

- **Peat** – dark brown, partially decomposed organic matter P-4
- **Alluvium** – soft, orange and grey mottled, silts and clays A-74
- **River Terrace Deposits** – subangular flint gravels and quartz-rich sands RT-33
- **Cover Sand** – silty, fine and medium quartz sands CS-3
- **Head** – silts and clays derived by local solifluxion H-52
- **Head Gravel** – clayey and sandy gravels derived by local solifluxion H-53
- **Glacial Silt** – } pale grey silts and clays, laminated in parts GSI-13
- **Lacustrine Deposits** – } LA-11

PLEISTOCENE

- **Boulder Clay** – firm silty clay containing pebbles of chalk and flint BC-49
- **Glacial Sand and Gravel** – sands and gravels comprising quartz-rich sands and pebbles of flint, vein quartz, quartzite and chalk GS-82
- **Kesgrave Sands and Gravels** – sands and gravels rich in pebbles of vein quartz and quartzite, proved in assessment boreholes only K-11

CRETACEOUS

SOLID

- **Crag** – fine and medium quartz sands, micaceous and glauconitic in parts, with beds of gravel rich in vein quartz and quartzite pebbles CG-1
- **Upper Chalk** – firm, white chalk, buff and silty in weathered zone

- **Made ground** MG-2
- **Worked out areas of sand and gravel** WO-9

BOUNDARY LINES

- Geological boundary, Drift.
- Geological boundary, Solid. (Limit of Crag)
- Inferred boundary between recognised categories of deposits.
- Resource Block boundary.

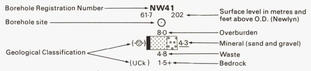
Broken lines denote uncertainty.

BOREHOLE DATA

SITE LOCATIONS

- Industrial Minerals Assessment Unit (I.M.A.U.) boreholes
- Other boreholes

I.M.A.U. BOREHOLES



Grading diagram
Thicknesses in metres

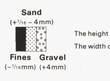
Note:
(i) Figures underlined denote thicknesses used in the assessment of resources.
(ii) The + sign indicates that the base of the deposit was not reached.
(iii) The surface level in feet is a conversion of a measurement recorded in metres.
(iv) The Geological Classification is given only for sand and gravel and bedrock.

Borehole Registration Number

Each I.M.A.U. borehole is identified by a Registration Number, e.g. **NW41.** The letters refer to the quarter sheet and the figures to the I.G.S. serial number for that quarter. All fall within the 1:25,000 sheet **TL96,** a unique designation for this borehole is therefore **TL96 NW41.**

Grading Diagrams

Each grading diagram shows the mean particle size distribution of a deposit of mineral.



The height of the diagram is proportional to the mineral thickness.
The width 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.

CATEGORIES OF DEPOSITS

- **Exposed mineral, assessed.** CAT-E2
- **Continuous or almost continuous spreads of mineral beneath overburden, assessed.** CAT-C1
- **Sand and gravel either not potentially workable (see Report) or absent.** CAT-A2
- **Sand and gravel not assessed.** CAT-N1

RESOURCE BLOCKS

For assessment purposes the mineral-bearing land 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, Keyworth, Nottingham, NG12 5GG.

Produced for the Institute of Geological Sciences by E.S.R. Ltd., West Byfleet, Surrey, England.
Printed by Impact Litho (Tolworth) Ltd. 1981.