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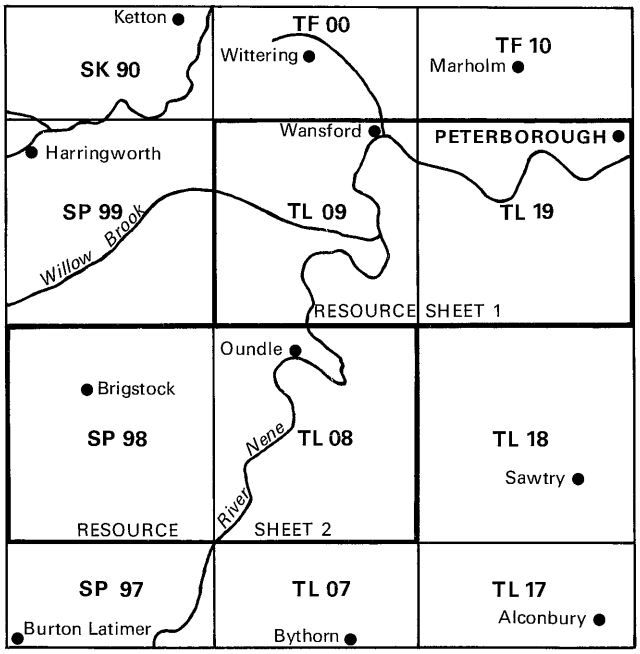

The sand and gravel resources of the country south-west of Peterborough, in Cambridgeshire and east Northamptonshire

Description of 1:25 000 resource sheets TL 09, 19 and SP 98, TL 08

A. M. Harrisson

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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 13 and subsequent reports appear as Mineral Assessment Reports of the Institute.

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

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PREFACE

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

Sand and gravel, considered together as naturally occurring aggregate, was selected as the bulk mineral demanding the most urgent attention, initially in the south-east of England, where about half the national output is won and very few resources 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 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 resources of sand and gravel of 371.2 km^2 of country south-west of Peterborough, shown on the accompanying 1:25 000 resource sheets: TL 09 with TL 19 (Sheet I) and SP 98 with TL 08 (Sheet II); 28.8 km^2 of Greater Peterborough has not been assessed. The survey was conducted during 1974–1976 by A. M. Harrisson and A. H. Fawcett, who supervised the drilling and sampling programme, assisted by S. J. Booth and J. W. Merritt. A. M. Harrisson compiled the report.

The work is based on six-inch primary geological surveys by members of the Institute's Field Staff. The area west of grid-line Easting 12 was surveyed between 1939 and 1947 by G. Bisson, R. F. Goossens, J. E. Prentice, P. A. Sabine, J. H. Taylor and V. Wilson and published as parts of the Stamford (157) and Kettering (171) New Series One-Inch geological sheets. The area of Greater Peterborough was surveyed in 1968 by B. C. Coppack and A. Horton and published in 1972 at the 1:25 000 scale; an accompanying geological description was published in 1974. A six-inch survey of the remaining areas was commissioned for the purpose of this report, and completed in 1976 by J. M. Ridgway and R. J. Wyatt.

Officers of the Property Services Agency based at Newmarket and J. W. Gardner, C.B.E., (IGS Land Agent) were responsible for negotiating access to land for drilling. The ready co-operation of land owners and tenants in this work and the release of borehole data by the British Steel Corporation are gratefully acknowledged.

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SUMMARY

The geological maps of the Institute of Geological Sciences, pre-existing borehole information and 117 boreholes drilled for the Industrial Minerals Assessment Unit form the basis of the assessment of sand and gravel resources of the country south-west of Peterborough, in parts of Cambridgeshire and east Northamptonshire.

All deposits in the area which 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 maps are divided into five resource blocks, containing between 7.7 and 11.7 km^2 of sand and gravel. For each block the geology of the deposits is described and the mineral-bearing area, the mean thicknesses 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 maps.

Bibliographical reference
HARRISSON, A. M. 1981. The sand and gravel resources of the country south-west of Peterborough, in Cambridgeshire and east Northamptonshire. Description of 1:25 000 resource sheets TL 09, TL 19 and SP 98, TL 08. *Miner. Assess. Rep. Inst. Geol. Sci.*, No. 60.

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INTRODUCTION

The survey is concerned with the estimation of resources, which include deposits that are not currently exploitable but have a foreseeable use, rather than reserves, which can only be assessed in the light of current, locally prevailing, economic considerations. Clearly, both the economic and the social factors used to decide whether a deposit may be workable in the future cannot 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; 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.

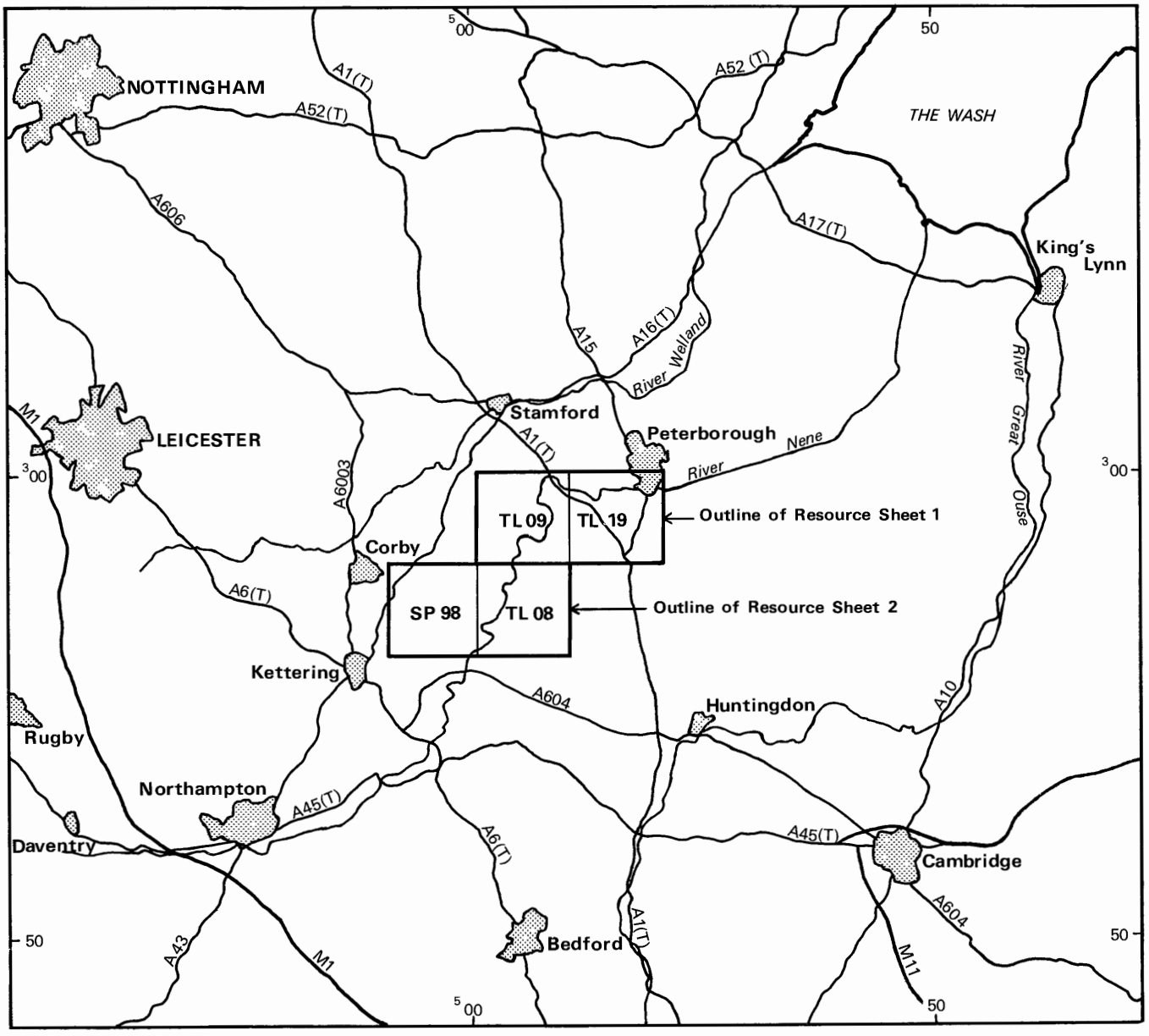
A deposit of sand and gravel which broadly meets these criteria is regarded as 'potentially workable' and is described and assessed as 'mineral' in this report. As the assessment is at the indicated level, parts of such a deposit may not satisfy all the criteria.

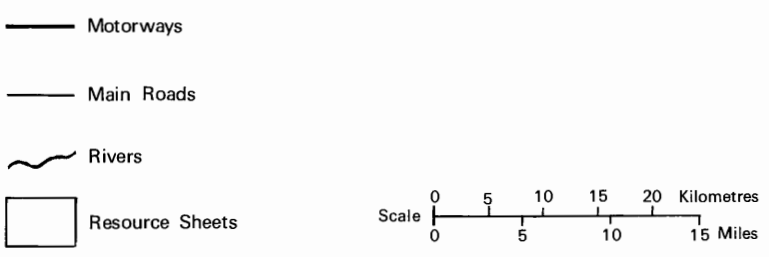
For the particular needs of assessing sand and gravel resources, a grain-size classification based on the

geometric scale $\frac{1}{16}$ mm, $\frac{1}{4}$ mm, 1 mm, 4 mm, 16 mm 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).

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 and 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 the mineral in parts of a block, except in the immediate vicinity of the actual sample points.





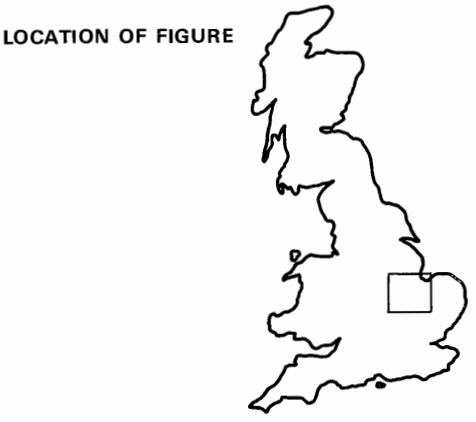


Figure 1 Map showing the location of the resource sheets.

DESCRIPTION OF THE RESOURCE SHEETS

GENERAL

The resource sheets cover an area of 400 km² of which a little over 12 per cent (49.7 km²) is mineral-bearing. They are situated at the northern end of the valley of the River Nene in the counties of Northamptonshire and Cambridgeshire. The chief settlements are Peterborough, in the north-east, and Oundle, which is more or less centrally situated in the area. The mineral-bearing deposits are mainly concentrated along the valley of the Nene and its tributary the Willow Brook, but there is also some Glacial Sand and Gravel beneath Boulder Clay in the south-western part of the area. Resource Block E of the assessment falls entirely within the limits of Greater Peterborough, in an area designated as parkland and agricultural land. Much of the potentially workable aggregate of the valley of the Nene underlies open countryside.

TOPOGRAPHY

The valley of the River Nene is cut into a gently sloping plateau which becomes increasingly dissected as the river approaches Peterborough. The river meanders across a floodplain 200 m to 1 km wide which turns through angles of up to 150° in the vicinity of Oundle. The floodplain descends from 26.8 m (88 ft) above OD at Aldwincle [TL 010 816], to 7.3 m (24 ft) above OD at Peterborough. Downstream from Peterborough the valley broadens out into the Fenland.

GEOLOGY

The area under consideration was first mapped on the six-inch scale between 1939 and 1947 by G. Bisson, R. F. Goossens, J. E. Prentice, P. A. Sabine, J. H. Taylor and V. Wilson. Following the designation of the limits of the extended city of Peterborough in July 1967, additional mapping by B. C. Coppack and A. Horton was carried out in 1968. In 1976, parts of sheet TL 19 were mapped by J. M. Ridgway and R. J. Wyatt for the purpose of this survey. The deposits of the area are classified in Table 1. Further details of the geology of the area may be found in the Kettering, Corby and Oundle memoir (Taylor, 1963) and in The Geology of Peterborough (Horton and others, 1974).

STRUCTURE

The area is structurally simple with a regional dip of less than 0.5 degrees to the east. The main features are a downfaulted belt (the Stanion–Aldwincle trough) bounded by faults with a throw of 30–40 m, and the Elton fault, with a maximum throw of about 5 m; both features trend east-south-east. Another fault of unknown dimensions is shown by various site investigation borehole records to extend north–south through Peterborough (Horton and others, 1974).

Superficial bulges, cambers and gulls are common and associated with the main valleys. These structures (Hollingworth, Taylor and Kellaway, 1944), are generally considered to be of Pleistocene age but to predate the deposition of river gravels in the area.

STRATIGRAPHY

SOLID

Rocks of the Upper Lias, Inferior Oolite, Great Oolite 'Series', Cornbrash, Kellaways Beds and Oxford Clay crop out in the area.

Table 1 Classification of deposits proved at the surface and in IMAU boreholes

DRIFT	*Thickness*
Quaternary (Holocene and Pleistocene)	m
Alluvium	0.4 to 4.5
Shell Marl	0.0 to 0.5
Nordelph Peat	1.4 to 5.3
Barroway Drove Beds	0.0 to 2.7
River Gravel	
First Terrace	1.5 to 11.0
Second Terrace	1.3 to 8.5
Third Terrace	1.0 to 6.3
Head	0.7 to 2.9
Woodston Beds	up to 7.0
Boulder Clay	1.8 to 20.0+
Glacial Sand and Gravel	1.0 to 4.5
Glacial Lake Deposits	at least 7.5
SOLID	
Jurassic	
Oxford Clay	at least 15.9
Kellaways Sand	1.5 to 4.5
Kellaways Clay	0.5 to 3.1
Cornbrash	1.8 to 2.4
Great Oolite 'Series'	
Blisworth Clay	3.5 to 6.0
Blisworth Limestone	4.5 to 7.5
Upper Estuarine 'Series'	12 to 14
Inferior Oolite	
Upper Lincolnshire Limestone	0 to 12
Lower Lincolnshire Limestone	0 to 12
Lower Estuarine 'Series'	0 to 7
Northampton Sand	0 to 7
Upper Lias	50 to 60

The Glinton borehole [TF 1500 0528] near Peterborough showed that beneath the Jurassic and the underlying Rhaetic and Keuper (Mercia Mudstone), there is a considerable unconformity, with Triassic rocks resting directly on a Precambrian rhyolitic crystal tuff.

Upper Lias The Upper Lias, usually 50 to 55 m, but locally 60 m thick, comprises fissile grey mudstones which weather to stiff bluish grey clay. Phosphatic and ferruginous nodules occur throughout, and calcareous beds are present. Several assessment boreholes penetrated the uppermost silty clays and their associated shelly layers. The Upper Lias is exposed in the valley floor of the Nene between Alwalton [TL 136 960] and Stoke Doyle [TL 024 864] and in a valley bulge south of the latter village. Elsewhere, these rocks are drift-covered.

Inferior Oolite The Inferior Oolite comprises the Northampton Sand, the Lower Estuarine 'Series' and the Lincolnshire Limestone.

The *Northampton Sand* (maximum thickness about 7 m) which comprises ironstones and sandstones, extends westwards from Wansford [TL 073 993] and Nassington [TL 063 962], although boreholes in Peterborough suggest that the formation persists for some distance eastwards in a sandy sideritic limestone facies (Horton and others, 1974).

The *Lower Estuarine 'Series'*, which locally oversteps the Northampton Sand to rest directly on Upper Lias, consists of white fine sands and brown and black silts and mudstones. The thickness, which is variable, probably does not exceed 7.0 m overall. Contorted beds with carbonaceous plant remains occur frequently in borehole samples. The fine-grained sandy facies, known locally as ganister, has been worked as a refractory in some localities. A sample of sand in the Lower Estuarine 'Series' recovered from borehole 09 NE 85 grades as mineral, but it is not included in the assessment of resources which relates only to drift deposits.

The *Lower* and *Upper Lincolnshire Limestones* are together up to 30 m thick in the area of maximum development, between Grantham and Lincoln to the north, but they thin out southwards, and a line drawn from north of Peterborough through Elton [TL 089 935], Oundle [TL 042 883] and south-west to Kettering roughly defines the south-eastern extent of their occurrence. The Lower Lincolnshire Limestone is more widespread in the survey area than the Upper Lincolnshire Limestone and, whereas the former is predominantly a sandy oolite, the latter consists of coarse shelly oolites.

Great Oolite 'Series' Included in this 'Series' are the Upper Estuarine 'Series', the Blisworth Limestone and the Blisworth Clay.

The *Upper Estuarine 'Series'*, generally 12 to 14 m thick, overlaps the Lincolnshire Limestone locally to rest directly on the Lower Estuarine 'Series'. The three main divisions in ascending order are: freshwater silts and clays with a nodular ironstone bed, a thin limestone and finally a sequence of green and grey clays, silts and mudstones.

The *Blisworth Limestone*, a hard massive limestone with beds of softer shell-debris marl and dark grey mudstone, is 4.5 to 7.5 m thick. It passes up into the *Blisworth Clay*, a sequence of clays of varying shades of grey, purple, green and brown, 3.5 to 6.0 m thick, often with a thin band of nodular ironstone near the base.

Cornbrash The Cornbrash, which is a reddish brown-weathering, shelly, and often flaggy limestone 1.8 to 2.4 m thick, forms a prominent bench along the valley sides of the Nene.

Oxford Clay (including the Kellaways Beds) The Oxford Clay is described here together with the Kellaways Clay and the Kellaways Sand.

The *Kellaways Clay* is a medium to dark grey mudstone 0.5 to 3.1 m thick. The overlying *Kellaways Sand*, 1.5 to 4.5 m thick, consists of greenish grey clayey silt and fine sand. It is intensely bioturbated and has an abundant molluscan fauna.

The *Oxford Clay* outcrop forms a plateau sloping eastwards towards the Fenland south and east of Peterborough. Of the three main divisions only the Lower Oxford Clay is present in this area and consists mainly of fossiliferous mudstones which weather to bluish grey or greenish grey plastic clay with selenite crystals.

DRIFT

Glacial Lake Deposits Glacial Lake Deposits fill an elongate depression which trends north-north-east and extends from Norman Cross [TL 160 908] to Farcet [TL 202 946] adjacent to the western margin of the Fenland near Yaxley [TL 177 918], south of Peterborough. The deposits consist of finely laminated clay, sand and silt, containing pebbles of chalk, flint and quartzite near the top, in places merging upwards into Boulder Clay. At the Fenland edge, these deposits are at least 7.5 m thick (Horton and others, 1974), but their maximum thickness is not known.

Glacial Sand and Gravel The oldest sand and gravel deposits in the area were exposed (1978) in a disused sand pit [SP 955 849] near Brigstock, where brown sands with water-worn ironstone and limestone pebbles of local derivation lie beneath Boulder Clay (the Lower Boulder Clay of Hollingworth and Taylor, 1946). Their extent is uncertain, but boreholes 98 SE 303, 331, 337 and 340 to the south and south-east of the pit proved, beneath Chalky Boulder Clay, sand and gravel of similar composition overlying bedrock (for Boulder Clay relationships, see below). The gravels overlying the Lower Boulder Clay contain far-travelled quartzite erratics, but little or no chalk or flint.

Sands and gravels containing chalk and flint pebbles, as well as quartzite and Jurassic material, occur at the base of, within and overlying the Chalky Boulder Clay (for example in boreholes 98 NE 225, 08 NW 179 and 98 NW 722, respectively). These gravels were deposited during and subsequent to the glacial advance as outwash or by temporary drainage systems.

Boulder Clay The Lower Boulder Clay of Hollingworth and Taylor (1946), which overlies the locally derived sand and gravel deposits at Brigstock, contains erratics predominantly of quartzite, probably derived from the 'Bunter' Pebble Beds, and various Jurassic rocks; it is distinguished from the Chalky Boulder Clay by an absence of chalk and flint pebbles. The deposit has been recorded only at Barnwell [TL 049 843], near Stanion Lodge [SP 906 870] and at Brigstock; at the last locality it is unconformably overlain by the Chalky Boulder Clay (Taylor, 1963, p. 17). These appear to be localised remnants occurring in hollows in the sub-drift surface.

The most extensive spreads of Chalky Boulder Clay occur in the southern part of the area, where they constitute the most common Pleistocene deposits. The till occurs as a dissected sheet above about 200 ft (61 m) OD, but it is absent from the sides and floors of the main valleys except beneath deposits of First Terrace gravel in assessment borehole 08 SW 28. The deposit consists of stiff bluish grey to dark grey clay weathering to brown near the surface, with a varied erratic content including chalk (ranging from 'flour' through coarse gravel to blocks several metres across), flint, quartzite, ironstone and limestone of local origin, shells of *Gryphaea*, ammonites, belemnites, and, more rarely, far-travelled igneous and metamorphic rocks (Sabine, 1949). The erratic suite suggests movement of ice from a centre located to the north of the Wash.

Woodston Beds The Woodston Beds, which occur south of Peterborough [TL 186 957], are a sequence of raised estuarine and lacustrine deposits, comprising clays and mudstones with seams of sand which contain marine shells and interbedded gravel with mammalian bones, particularly near the base. Pollen analysis suggests that the beds are of interglacial origin, and probably accumulated in an environment which varied from salt marsh to lacustrine (Horton and others, 1974).

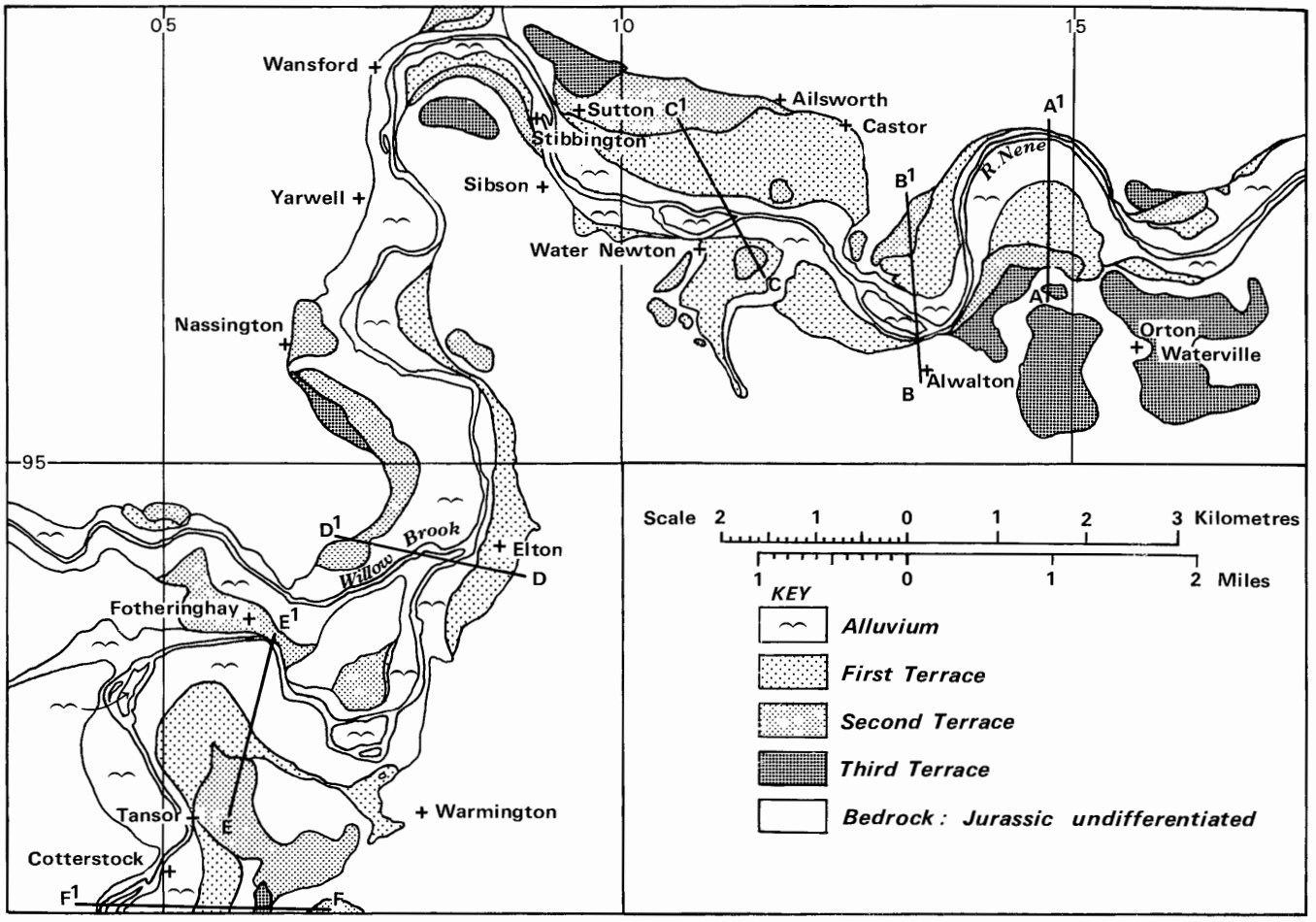


Figure 2 Terraces of the River Nene between Cotterstock and Orton, showing the lines of sections in Figure 3.

Head Head comprises a variety of deposits resulting from the solifluxion of weathering products including rock debris under gravity. Pockets of Head up to 2.9 m thick occur throughout the area, but only the thicker spreads, for example, east of Alwalton and at Ailsworth [TL 118 990] are shown on the map.

River Gravel Three river terraces have been developed along the valley of the Nene and its major tributaries (Figure 2).

Third Terrace deposits are widespread south-west of Peterborough around Orton Waterville, and assessment borehole 09 NE 82, north of Sutton, encountered 6.3 m* of Third Terrace deposits, the maximum proved, on Upper Lincolnshire Limestone. Exposures along the railway cutting south-west of this borehole reveal that here the terrace deposits lie in a channel 500 m north-east of the present river course. The surface of the terrace is generally 10–15 m above the level of the present floodplain.

South-west and west of Peterborough, the deposits generally consist of clean, well-sorted gravels of ironstone, limestone, quartzite and flint, with seams of clay, silt and fine to coarse sand. However, upstream from Wansford, remnant patches of Third Terrace are clayey.

The deposits have been subjected to frost-heaving under periglacial conditions, resulting in gravel being downfolded into the underlying clays. Solifluxion has also occurred locally (Horton and others, 1974).

Second Terrace deposits occur along the flanks of the River Nene from Aldwincle [TL 010 816] to Alwalton (Figure 4) and also underlie much of Peterborough. The terrace surface is 5.5 to 7.0 m above the level of the flood plain of the Nene. The deposits have a similar composition to those of the Third Terrace, but are generally less silty. Downstream from Oundle the deposit consists mainly of 3 to 4 m of clean sand and gravel, but boreholes 09 SE 48, 09 SE 51 and 19 NW 138 proved 7 m, 8.5 m and 7 m, respectively, which might suggest the existence of a buried channel. At Aldwincle only 2.1 m of Second Terrace was proved in borehole 08 SW 25, and this was too 'clayey' to be considered mineral for assessment purposes (see Appendix C).

Second Terrace deposits also extend along the valley of Willow Brook about 3 km upstream from its confluence with the Nene near Fotheringhay [TL 058 932]. Part of the Second Terrace immediately south of Fotheringhay has been incised by a recent meander of the Nene. The possible position of the river in Second Terrace times and the extent of the gravel spread, particularly in the Tansor area, are shown in Figure 4.

In the past, the valley of Thorpe Brook, east of Aldwincle, may have been occupied by a meander of the Nene (Taylor, 1963) and Second Terrace deposits mapped at Thorpe Fox Covert [TL 037 814] support this hypothesis.

* Terrace thicknesses quoted throughout this report include soil.

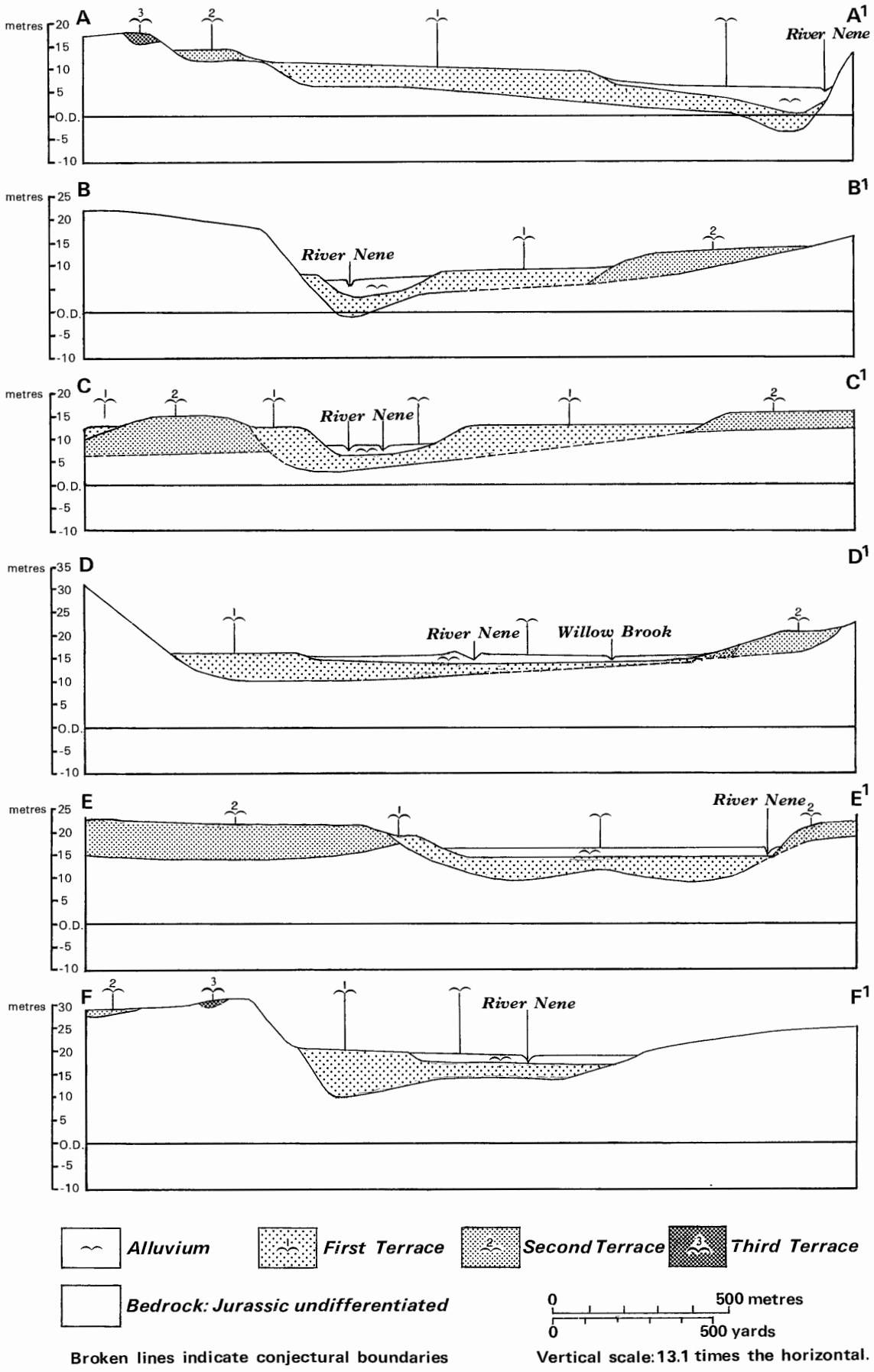


Figure 3
Sections across the valley of the River Nene, progressing upstream from Orton Waterville (A–A[1]) to Cotterstock (F–F[1]), based on borehole and other data. (See Figure 2 for lines of sections.)

First Terrace deposits, whose surface is 1.0 to 1.5 m above the level of the floodplain, crop out on both sides of the Nene valley in the assessed area. In borehole 19 SE 81, 2.7 m of sand and gravel of the First Terrace was proved beneath Nordelph Peat.

The First Terrace deposits are better preserved than those of the older terraces because the river was graded to a lower base level than exists now, and the deposits have been subjected to relatively little erosion. Data from boreholes sunk in connection with the urban de-

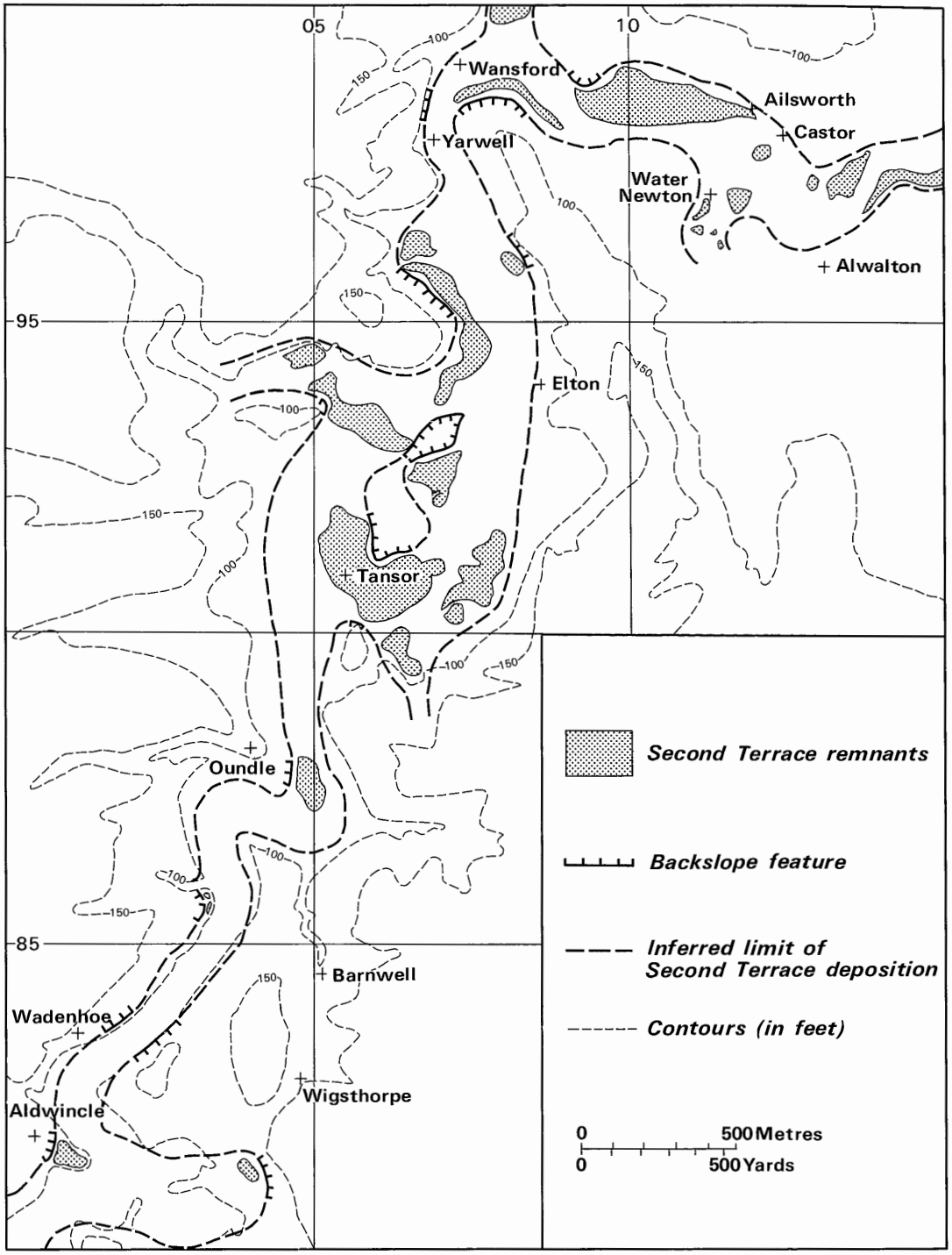


Figure 4
Hypothetical reconstruction of the depositional extent of the Second Terrace.

velopment at Peterborough suggest that a deep buried channel extends from here under the Fenland. The channel may also extend some distance upstream from Peterborough (Figures 2 and 3). Within the channel, assessment borehole 19 NW 141 proved drift to 4.7 m below OD, that is, 9.4 m below the present floodplain.

The First Terrace channel was cut by lateral migration of a meandering river, producing a steep bank on one side and a gentle valley slope on the other (but see Castleden, 1976, p. 34). Aggradation was accomplished by fast-flowing braided streams which, in the area of Castor [TL 124 985] and Water Newton [TL 108 973], have left Second Terrace 'islands' surrounded by First Terrace sand and gravel containing seams of silty clay.

South-west of the survey area, at Great Billing near Northampton, gravels of the First Terrace beneath Alluvium show cryoturbation structures, and include blocks of organic material containing an insect fauna indicative of periglacial conditions (Morgan, 1969).

Holocene deposits

Holocene deposits crop out in the extreme south-eastern corner of Resource Sheet I. They comprise the Barroway Drove Beds, consisting of glutinous silty clays containing plant remains, overlain by the Nordelph Peat, which in turn is succeeded locally by the Shell Marl, formed largely from the calcareous remains of aquatic plants.

The maximum thickness of the Barroway Drove Beds recorded in this survey was 2.7 m in borehole 19 SE 79. In borehole 19 SE 82, 5.3 m of Nordelph Peat rested directly on Oxford Clay, but it is more commonly 3.0–

3.5 m thick. The Shell Marl is generally less than 0.5 m thick.

Alluvium In most places Alluvium overlies deposits of the First Terrace. However, where the modern floodplain of the Nene does not coincide with that of the First Terrace river, the Alluvium is deposited in a shallow channel cut directly into bedrock, as proved, for example, in IMAU boreholes 08 SW 27 and 09 NE 72.

The floodplain deposits are clay and silt with scattered pebbles, generally with a basal bed of sand and gravel consisting mainly of reworked terrace deposits, usually with a high proportion of sand which is more easily transported by the relatively slow-moving river.

COMPOSITION OF THE SAND AND GRAVEL

Glacial Sand and Gravel and River Gravel constitute the mineral resource in the area.

Glacial Sand and Gravel Included under this heading are the deposits below, within and above the Boulder Clay. Those classified as mineral occur in the vicinities of Brigstock and Benefield in Resource Block A (for definition of a resource block, see Appendix A).

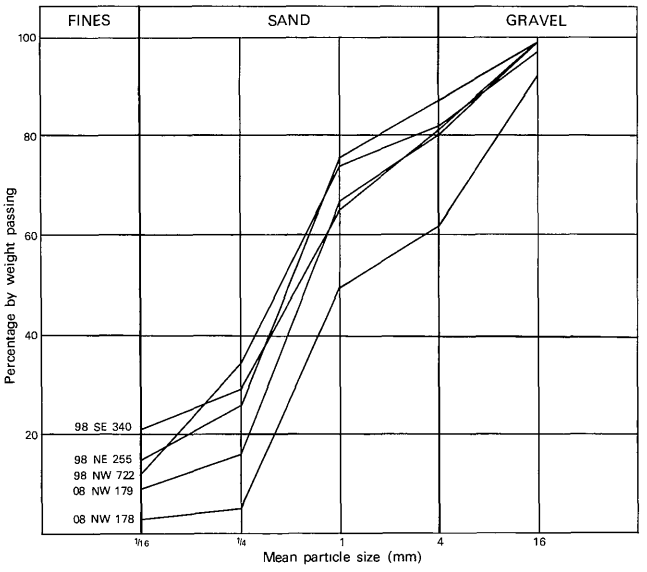
The mean particle size distribution of samples from the five mineral-bearing IMAU boreholes that proved Glacial Sand and Gravel are shown in Figure 5. The fines content varies from 3 to 21% but the samples are alike in having a high proportion of medium sand (up to 51%), and 8% or less of gravel over 16 mm. The gravel fraction as a whole accounts for less than 21% of the deposit in all but one borehole (08 NW 178), where it is 38%. The mineral classifications range from pebbly sand to 'very clayey' sandy gravel.

Lithologically, the gravel varies from consisting entirely of ironstone and limestone to a combination of ironstone, limestone and flint, with quartzite and chalk. The sand is medium-grained, comprising mainly quartz and ironstone.

The mean grading of the deposit as a whole is fines 12%, sand 66% and gravel 22%.

River Gravel This forms three terraces in the valleys of the Nene and its tributaries. The distribution of grain size in these deposits, arranged by resource blocks, is illustrated in Figure 6.

Although the relative abundance of rock types forming the gravels shows little variation between the three terraces (Table 2 and Figure 7), the grading characteristics show marked differences. The limited lithological variations appear to relate to differences in adjacent



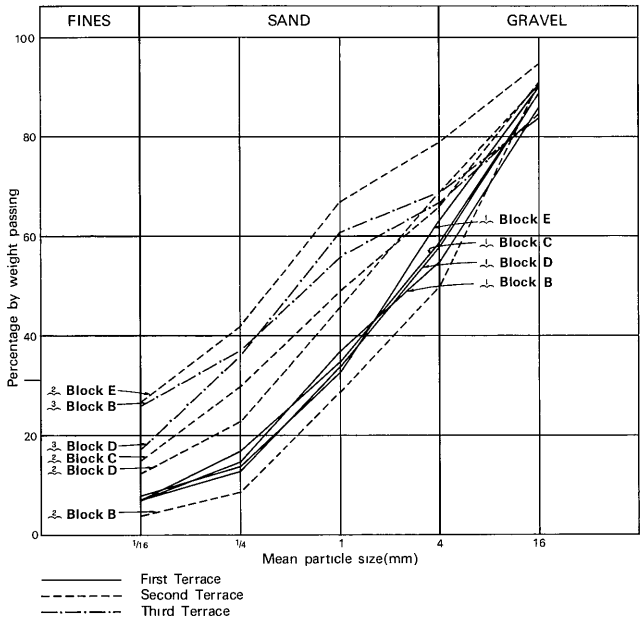
Borehole	Percentage by weight passing				
	Sieve size (mm)				
	$\frac{1}{16}$	$\frac{1}{4}$	1	4	16
98 NE 255	15	26	76	87	99
98 NW 722	12	34	74	82	97
98 SE 340	21	29	65	81	99
08 NW 178	3	5	49	62	92
08 NW 179	9	16	67	80	99

Figure 5 Mean particle size distribution of Glacial Sand and Gravel, by individual borehole.

Table 2 Pebble type analyses of samples from selected boreholes on Resource Sheet I

Borehole number	Terrace	Mineral thickness (m)	Percentage by weight						
			Limestone	Flint	Ironstone	Quartzite	Chalk	Quartz	Other
TL 09 NE 73	First	3.2	28	27	30	15	–	–	–
TL 09 NE 74	First	6.0	30	26	31	9	1	1	2
TL 09 NE 82	Third	5.6	36	33	22	4	–	4	1
TL 09 SW 201	First	5.8	36	25	19	18	1	–	1
TL 09 SE 44	First	4.8	50	20	20	8	Trace	2	–
TL 09 SE 48	Second	5.6	25	44	21	7	Trace	2	1
TL 09 SE 49	First	8.4	43	28	19	10	Trace	Trace	–
TL 09 SE 53	Second	3.7	51	16	21	10	Trace	1	1
TL 09 SE 56	First	6.1	42	21	18	13	1	2	3
TL 09 SE 60	First	1.8	28	45	16	9	1	1	–
TL 19 NW 136	Second	2.2	60	22	8	7	–	2	1
TL 19 NW 141	First	9.7	41	32	19	3	Trace	3	2
TL 19 NW 144	First	5.0	32	25	21	20	Trace	1	1
TL 19 SE 81	First	2.7	35	33	16	12	Trace	3	1

(No data are available for Resource Sheet II).
Samples were bulked for each borehole, and the +4 −50 mm size range was examined. No weighting factor has been applied.



	Percentage by weight passing				
	Sieve size (mm)				
	$\frac{1}{16}$	$\frac{1}{4}$	1	4	16
FIRST TERRACE					
Block B	7	15	37	55	86
Block C	7	17	35	59	89
Block D	7	13	34	58	89
Block E	8	14	33	63	90
SECOND TERRACE					
Block B	4	8	29	50	91
Block C	15	30	49	66	91
Block D	13	23	46	69	90
Block E	27	42	67	79	95
THIRD TERRACE					
Block D	18	36	61	69	84
Block E	26	37	56	67	85

Figure 6 Mean particle size distribution of River Gravel, by resource block for each terrace.

solid rocks rather than in the flow regime of the river at various times of deposition.

Third Terrace deposits are judged potentially workable only in Blocks D and E, where the main features of the grain-size distribution are a high proportion of fines (18 and 26%, respectively), a predominance of medium sand and a high proportion of coarse gravel (16 and 15%).

The Second Terrace deposits are relatively inconsistent, the mean fines content for the blocks ranging from 4 to 27%, and the sand fraction from 46 to 56%. The percentage of gravel in the +16 mm size range does not exceed 10% in any block.

The First Terrace deposits show a consistency in grading in all the four blocks containing them. The sand fraction is mainly medium and coarse, the gravel predominantly fine and the mean fines content is below 10% in each block.

The gravel fraction (+4 mm) of all the River Gravels comprises flint, ironstone, limestone and sandstone, with minor amounts of varied igneous and metamorphic rocks and chalk (Table 2 and Figure 7). Overall, Jurassic limestone predominates, locally exceeding 60% of the deposit. Samples from boreholes 09 NE 73 and 09 NE 74, sited on deposits in close proximity to the ironstone of the Northampton Sand, show this rock to be the chief component of the gravel fraction with 30 and 31%, respectively. Flint, derived from the Boulder Clay, is most abundant in boreholes 09 SE 48 (44%) and 09 SE 60 (45%). Sandstone and quartzite, immediately derived from the Chalky Boulder Clay, are ubiquitous as minor constituents. Quartz and chalk are present in small quantities, and various igneous and metamorphic rock types occur in trace amounts.

RESULTS

The statistical results are summarised in Table 3, and grading information is shown graphically in Figures 5 and 6.

Accuracy of results For the five resource blocks the confidence limits at the symmetrical 95 per cent probability level vary between 21% and 43% (that is, it is probable that nineteen times out of twenty the true

Table 3 Statistical assessment of sand and gravel resources

Block	Area		Mean thickness		Volume of mineral			Mean grading percentage		
	Block km²	Mineral km²	Over-burden m	Mineral m	$m^3 \times 10^6$	Limits at the 95% confidence level ±%	± $m^3 \times 10^6$	Fines $-\frac{1}{16}$ mm	Sand $+\frac{1}{16}$ -4 mm	Gravel +4 mm
A	98.2	7.7	4.8	3.2	24.6	26	6.4	14	67	19
B	34.3	11.0	1.9	2.6	28.6	22	6.3	8	46	46
C	12.5	11.7	1.4	3.3	38.6	30	11.6	8	52	40
D	27.7	9.9	1.5	3.1	30.7	43	13.2	8	53	39
E	11.4	9.4	1.4	3.5	32.9	21	6.9	17	50	33
A to E	184.1	49.7	2.1	3.1*	155.4	10	15.5	11	53	36

* This figure was arrived at by weighting individual mean thicknesses by the area of mineral for each block, and dividing the total volume of mineral by the total of the weighted mean thicknesses. The total mean thickness therefore bears no direct relationship to the total area and volume of mineral.

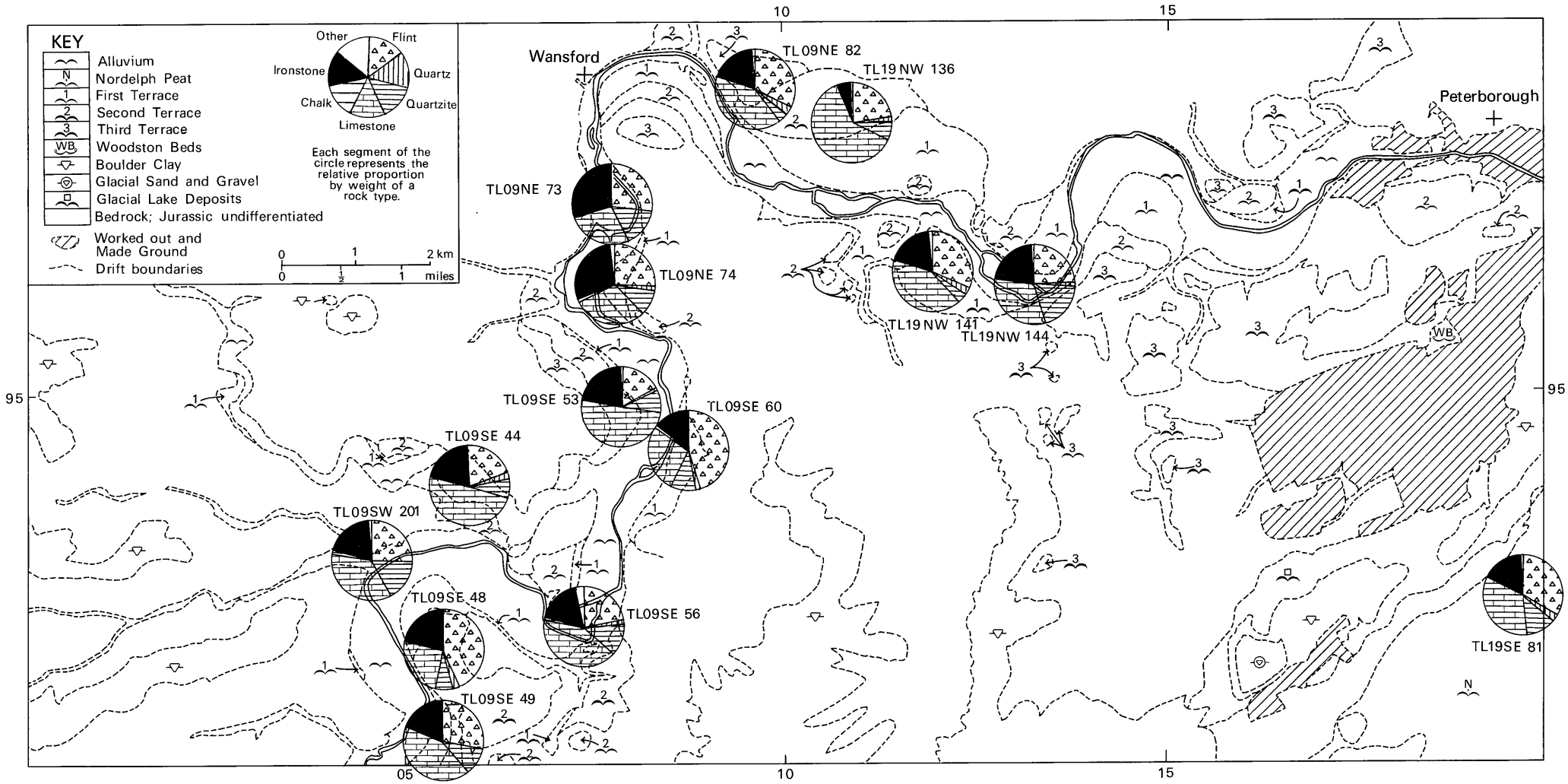


Figure 7 Distribution of data given in Table 2.

volumes present lie within these limits). However, the true values are more likely to be nearer the figures estimated than the limits. Moreover, it is probable that in each block roughly the same percentage limits would apply for the estimate of volume of 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 the quotation of reserves of part of a block, it can be expected that data from more than ten sample points will be required, even if the area is quite small. This point can be illustrated by considering the whole of the potentially workable sand and gravel on this sheet. The volume (155.4 million m^3) can be estimated to limits of ±10 per cent of the 95 per cent probability level, by a calculation based on the data from 104 sample points spread across the five resource blocks.

THE MAPS

The sand and gravel resource sheets (Sheets I and II) are folded into the pocket at the end of this report. The base maps are the Ordnance Survey 1:25 000 Outline Editions in grey, on which the topography is shown by contours in green, the geological data in black and the mineral resource information in shades of red.

Geological data The geological boundary lines are taken from the Kettering (171) and Stamford (157) sheets, surveyed in 1939–45, and from the 1:25 000 special Peterborough Sheet, surveyed in 1968. All were mapped at the scale of 1:10 560. Additional mapping was recently carried out by members of the Institute's field staff.

The geological boundaries are regarded as the best interpretation of the information available at the time of survey. However, it is inevitable that local irregularities or discrepancies will be revealed by some boreholes. These are taken into account in the assessment of resources (see below and Appendix B). Borehole data, which include the stratigraphical relations and mean particle size distribution of sand and gravel samples collected during the assessment survey, are also shown.

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', and areas where it is present beneath overburden. The mineral is identified as 'exposed' where the overburden, commonly consisting only of soil and subsoil, averages less than 1.0 m in thickness. Beneath overburden the mineral may be continuous (or almost continuous) or discontinuous. 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, and where sand and gravel is interpreted as being not potentially workable or absent, are uncoloured on the maps; where appropriate the reason is given. In such areas, it has been assumed that mineral is absent except in infrequent and relatively minor patches which 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 exposed sand and gravel is measured from the mapped geological boundary lines. The whole of this area is considered as mineral, although it may include small areas where sand and gravel is not present, or is not potentially workable. Inferred boundaries have been inserted where sand and gravel beneath cover is interpreted to be not potentially workable or absent. Such boundaries (for which a distinctive symbol is used) are drawn primarily for the purpose of volume estimation. The symbol is intended to convey an approximate location within a likely zone of occurrence rather than to represent the breadth of the zone, its width being limited only by cartographic considerations. For the purpose of measuring areas, the centre-line of the symbol is used.

However, it must be emphasised that the quoted volume of sand and gravel 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 mineral-bearing area is divided into five resource blocks, each designated by a letter. The block boundaries are drawn, where possible, using geological criteria, so that, for example, on Sheet II the glacial deposits are separated (in Block A) from the river terrace deposits of Block B. In some cases, however, other criteria are used: for example, the boundary between Blocks C and D is arbitrarily drawn in order to achieve, as nearly as possible, the optimum block size (see Appendix A), and the boundary between Blocks D and E is determined by the limits of Greater Peterborough as depicted on the structure plan (Anon., 1970), Block E falling entirely within the area designated as agricultural land, open space or woodland.

Block A (Table 4)

Block A, the largest of the five resource blocks, is situated in the south-western part of the area assessed and west of the River Nene. Although the block is 98.2 km^2 in area, only 7.7 km^2 is mineral-bearing, the deposit occurring as five isolated patches on a dissected plateau of Boulder Clay. The mineral consists of Glacial Sand and Gravel beneath overburden.

Glacial Sand and Gravel has been mapped on the flanks of several tributary valleys (for example, Harper's Brook [950 845]), beyond which it is overlain by Boulder Clay. Because the thickness of the overburden increases towards the interfluves, only narrow strips of potentially workable mineral are available. In addition to IMAU boreholes, the data from several hundred commercial boreholes have been used to draw the inferred boundaries where the ratio of the thickness of overburden to mineral exceeds 3:1 (see p. 1).

Two boreholes (98 SE 341 and 98 SE 344) out of the four drilled into the Alluvium in Harper's Brook proved thin deposits of sand and gravel beneath overburden; because the mean thickness of the deposit was less than 1 m, the valley deposits overall were considered to be non-mineral.

The assessment of resources is based on information from 18 IMAU boreholes and 26 other records. The mineral (as defined on p. 1), which is present in five of the assessment boreholes (see Table 4) is up to 6.4 m thick, with a mean thickness of 3.2 m. The estimated

Table 4 Block A: data from IMAU boreholes

Borehole	Recorded thickness		Mean grading percentage						Overall classification
	Mineral	Overburden	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 $+16$ mm	
	m	m							
SP 98									
NW 722	3.2	1.8	12	22	40	8	15	3	'Clayey' pebbly sand
NW 723	absent								
NE 255	4.8	4.0	15	11	50	11	12	1	'Clayey' pebbly sand
NE 256	absent								
NE 257	absent								
NE 258	absent								
SW 394	absent								
SE 340	4.7	9.6	21	8	36	16	18	1	'Very clayey' pebbly sand
SE 341	1.1*	1.9	25	9	9	6	12	39	'Very clayey' gravel
SE 342	absent								
SE 343	absent								
SE 344	1.3*	1.9	3	4	11	19	49	14	Gravel
SE 345	absent								
SE 346	absent								
SE 347	absent								
TL 08									
NW 177	absent								
NW 178	1.8	1.8	3	2	44	13	30	8	Sandy gravel
NW 179	2.6	4.6	9	7	51	13	19	1	Pebbly sand
Mean	3.2	4.8	14	11	44	12	17	2	

* The deposit in which this borehole was drilled has been classified as non-mineral (see text).

volume of mineral is 24.6 million m³ ± 26%. The thickness of overburden generally increases with distance from the exposed sand and gravel: proved thicknesses range from 1.1 m (borehole 98 NW 648) to 14.5 m (borehole 98 SE 337). The mean is 4.8 m.

In the five IMAU boreholes that proved mineral, the fines content ranged from 3% in borehole 08 NW 178 to 21% in borehole 98 SE 340. The proportion of sand ranged from 59% in borehole 08 NW 178 to 72% in borehole 98 NE 255, and the gravel proportion ranged from 13% (borehole 98 NE 255) to 38% (borehole 08 NW 178).

The mean grading for the block is fines 14%, sand 67% and gravel 19%.

Block B (Table 5)

Block B occupies a position east of centre on the southern resource sheet (Sheet II), and includes deposits in the Alluvium and in the First, Second and Third terraces of the River Nene.

The Third Terrace is represented by four small patches in the valley of Barnwell Brook, one at Aldwincle and one near Elmington Lodge [TL 053 897]. A further patch, north-west of Long Thong Farm [TL 947 810], which is shown on the map as Third Terrace, was proved by augering to consist of a pebbly clay more akin to Head, and the form of the outcrop and its elevation also suggest such an origin. Of four boreholes in Third Terrace deposits, only two (08 SW 35 and 08 SW 20) proved sand and gravel (overlain by soil), 1.1 m and 1.0 m thick, respectively, and therefore the Third Terrace as a whole in this block has been assessed as non-mineral. The Second Terrace forms a flat feature at Aldwincle, and occurs south-east of Stoke Doyle, but it is of mineral grade only south-east of Oundle, where assessment borehole 08 NW 188 was prematurely terminated by 'rising' gravel, having proved 4.3 m of mineral. A narrow, discontinuous strip of First Terrace crops out along both sides of the valley of the Nene, broadening on the insides of tight meanders near Oundle. Alluvium is generally underlain by First or Second Terrace deposits, so that differentiation between gravel at the base of Alluvium and terrace gravel is not possible. However, the thin gravel beneath alluvial silt and clay in the valley of Thorpe Brook (08 SW 29 and 32) is probably part of the modern Alluvium.

The assessment of resources is based on information from 32 IMAU boreholes. Mineral (as defined on p. 1) was proved in 21 boreholes and reaches a maximum thickness of 4.7 m in borehole 08 NW 183. The mean thickness of mineral is 2.6 m and the estimated volume 28.6 million m³ ± 22%. The overburden is 0.7 m (borehole 08 SW 32) to 3.7 m thick (borehole 08 SW 22), with a mean of 1.9 m.

The mean fines content of the mineral exceeds 10% in seven boreholes, and 20% in two of these—08 SW 29 (30%) and 08 NE 2 (27%). The proportion of sand is not less than 33%, and reaches 64% in borehole 08 NW 184. The gravel content ranges from 20% in borehole 08 NE 2, to 65% in borehole 08 SW 24.

Table 5 Block B: data from IMAU boreholes

Borehole number	Terrace	Recorded thickness		Mean grading percentage						Overall classification
				Fines	Fine sand	Medium sand	Coarse sand	Fine gravel	Coarse gravel	
		Mineral m	Over-burden m	$-\frac{1}{16}$ mm	$+\frac{1}{16}$ $-\frac{1}{4}$ mm	$+\frac{1}{4}$ -1 mm	$+1$ -4 mm	$+4$ -16 mm	$+16$ mm	
		m	m							
TL 08										
NW 180	I	2.8	2.7	10	7	22	18	30	13	'Clayey' sandy gravel
NW 181	I	3.2	3.5	12	8	35	13	19	13	'Clayey' sandy gravel
NW 182	I	2.2	2.3	5	6	33	20	31	5	Sandy gravel
NW 183	I	4.7	1.4	2	7	22	18	36	15	Gravel
NW 184	I	2.1	2.3	9	36	19	9	22	5	Sandy gravel
NW 185	I	3.7	1.8	1	3	23	23	38	12	Gravel
NW 186	I	1.5	2.0	7	6	33	11	30	13	Sandy gravel
NW 187	I	2.1	1.6	3	6	23	17	33	18	Gravel
NW 188	II	4.3+	0.9	4	4	21	21	41	9	Gravel
NW 189	I	2.9	2.3	2	3	20	27	40	8	Sandy gravel
NW 190	I	3.5	1.3	2	4	22	18	37	17	Gravel
NE 2	I	1.6	2.0	27	16	29	8	15	5	'Very clayey' sandy gravel
NE 3	III	absent								
NE 4	Alluvium	absent								
NE 5	I	3.0	1.0	3	3	17	18	39	20	Gravel
NE 6	I	4.5	2.4	2	1	9	25	47	16	Gravel
NE 8	II	absent								
SW 20	III	1.0*	0.6	16	10	23	14	29	8	'Clayey' sandy gravel
SW 21	I	absent								
SW 22	I	3.3	3.7	5	3	13	18	36	25	Gravel
SW 23	I	4.0	1.1	17	10	25	16	21	11	'Clayey' sandy gravel
SW 24	I	3.1	2.1	2	2	15	16	38	27	Gravel
SW 25	II	absent								
SW 26	I	2.8	1.0	13	9	19	15	33	11	'Clayey' gravel
SW 27		absent								
SW 28	I	2.6	3.0	18	24	25	10	15	8	'Clayey' sandy gravel
SW 29	Alluvium	1.2	1.6	30	9	21	12	22	6	'Very clayey' sandy gravel
SW 30	Alluvium	absent								
SW 31	II	absent								
SW 32	Alluvium	2.3	0.7	15	9	19	15	29	13	'Clayey' sandy gravel
SW 33	III	absent								
SW 35	III	1.1*	1.2	37	60	2	0	0	1	'Very clayey' sand
Mean		2.6	1.9	8	8	21	17	32	14	

* The deposit in which this borehole was drilled has been classified as non-mineral (see text).

The mean grading for the block is fines 8%, sand 46% and gravel 46%.

Block C (Table 6)

Block C contains all the River Gravel and Alluvium on Sheet I upstream of an arbitrary east–west line drawn through Elton. This includes deposits of the River Nene, Willow Brook and an unnamed tributary which flows through Glapthorn.

The Third Terrace is represented by a small patch south of Tansor, which is assumed to be non-mineral on the basis of a barren borehole (08 NE 3) in the same deposit in the adjoining Block B. A large expanse of Second Terrace gravel occurs between Fotheringhay and Tansor, where the combination of meanders and the confluence of the Willow Brook with the Nene makes this the largest occurrence of potentially workable sand and gravel in one of the most productive parts of the area of study. First Terrace deposits crop out on either side of the Nene valley and the tributary valleys, and underlie most of the Alluvium. Two small tributaries join the Nene through a common valley west-south-west of Fotheringhay, where borehole 08 SW 201 proved 5.8 m of mineral. However, borehole 09 SW 199 proved none, and the small size of the tributaries upstream from the convergence of the two valleys suggests that none is present. An inferred boundary to the mineral has been placed arbitrarily halfway along the common valley.

The assessment of resources is based on information from 24 IMAU boreholes. The mineral, which is present in all but 3 boreholes (see Table 6), is up to 8.4 m thick, with a mean of 3.3 m. The estimated volume of mineral is 38.6 million $m^3 \pm 30\%$. The overburden is 0.3 m (borehole 09 SW 198) to 5.8 m thick (borehole 09 SW 197), with a mean thickness of 1.4 m.

The mean fines content of the mineral is below 10% in

Table 6 Block C: data from IMAU boreholes

Borehole	Terrace	Recorded thickness		Mean grading percentage						Overall classification
		Mineral m	Overburden m	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 $+16$ mm	
TL 09										
NW 287	I	3.2	1.6	10	6	10	23	34	17	'Clayey' gravel
SW 195		absent								
Sw 197	Alluvium	1.5	5.8	8	6	15	30	22	19	Sandy gravel
SW 198	Alluvium	1.2	0.3	20	15	19	12	16	18	'Very clayey' sandy gravel
SW 200	I	1.7	0.9	17	43	12	8	15	5	'Clayey' pebbly sand
SW 201	I	5.8	0.8	10	5	14	26	35	10	'Clayey' sandy gravel
SW 202	I	3.4	1.3	5	4	21	30	28	12	Sandy gravel
SW 203	I	3.8	1.8	3	4	12	29	38	14	Gravel
SE 44	I	4.8	0.9	6	10	16	23	34	11	Sandy gravel
SE 45	II	1.3	1.5	21	12	15	13	29	10	'Very clayey' sandy gravel
SE 46	I	4.4	1.6	4	7	25	24	30	10	Sandy gravel
SE 47	I	2.4	1.4	8	8	28	29	19	8	Sandy gravel
SE 48	II	5.6	1.4	10	13	25	20	27	5	'Clayey' sandy gravel
SE 49	I	8.4	0.4	11	13	23	17	23	13	'Clayey'sandy gravel
SE 50	I	4.7	0.9	3	5	16	39	32	5	Sandy gravel
SE 51	II	7.7	0.8	6	20	17	22	25	10	Sandy gravel
SE 52	II	2.7	1.0	16	10	19	16	28	11	'Clayey' sandy gravel
SE 54	II	1.7	0.7	17	17	17	17	25	7	'Clayey' sandy gravel
SE 55	I	5.8	1.8	3	4	22	26	35	10	Sandy gravel
SE 56	I	6.1	1.9	4	8	23	24	31	10	Sandy gravel
SE 57	I	absent								
SE 58		absent								
SE 61	I	1.8	2.2	10	4	21	21	34	10	'Clayey'sandy gravel
SE 62	I	2.0	4.6	7	26	10	10	26	21	Sandy gravel
Mean		3.3	1.4	8	10	19	23	29	11	

11 boreholes, between 10 and 20% in 8 boreholes, and is 20% or more in 2 boreholes—09 SW 198 (20%) and 09 SE 45 (21%). The proportion of sand is between 45 and 65% in all but one borehole (09 NW 287) where it is 39%. The gravel proportion is generally between 32 and 52%, except in borehole 09 SW 200, where it is 20%.

The mean grading for the block is fines 8%, sand 52% and gravel 40%.

Block D (Table 7)

This block extends downstream from Block C, and includes all the remaining deposits of River Gravel and Alluvium except those within Greater Peterborough, which are treated separately as Block E. The mineral deposits comprise sand and gravel of the First, Second and Third terraces and Alluvium. The floodplain varies considerably in width; it narrows to pass through a gap in the Lower Lincolnshire Limestone at Yarwell, then broadens, after a 90° turn at Wansford, to spread into the Fenland to the east.

Samples from two patches of Third Terrace south of Nassington and south-east of Wansford grade as mineral. Neither occurrence is substantial, the thicknesses proved in boreholes 09 NE 85 and 09 NE 81 being 2.6 m and 1.5 m, respectively. Further outcrops extend from Alwalton southwards to Haddon [TL 139 962], but these are too small and isolated to be included in the survey. Second Terrace gravels occur irregularly along both sides of the Nene valley, and form a hill (surrounded by First Terrace deposits) east of Water Newton, where a thickness of 7.0 m was proved (borehole 19 NW 138). First Terrace deposits underlie Alluvium, and crop out at intervals along the valley sides: 9.7 m of sand and gravel was recorded in borehole 19 NW 141.

The assessment of resources is based on information from 19 IMAU boreholes. The mineral, which is present in all but 4 boreholes (see Table 7), is up to 9.7 m thick, with a mean thickness of 3.1 m. The estimated volume of mineral is 30.7 million $m^3 \pm 43\%$. Overburden is up to 4.5 m thick, with a mean thickness of 1.5 m.

The mean fines content is 15% or less in all but 2 boreholes—09 NE 77 (19%) and 09 NE 81 (24%). Sand forms between 40 and 63% in all boreholes, and the gravel content is 28–44% except in borehole 09 NE 73, where it forms 57% of the mineral.

The mean grading for the block is fines 8%, sand 53% and gravel 39%.

Block E (Table 8)

Block E lies entirely within the area of Greater Peter-

Table 7 Block D: data from IMAU boreholes

Borehole number	Terrace	Recorded thickness		Mean grading percentage						Overall classification
		Mineral m	Overburden m	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 $+16$ mm	
TL 09										
NE 72		absent								
NE 73	I	3.2	1.4	3	2	15	23	40	17	Gravel
NE 74	I	6.0	0.6	7	5	16	28	39	9	Sandy gravel
NE 75	I	1.5	0.7	8	8	18	23	36	7	Sandy gravel
NE 76		absent								
NE 77	II	3.0	0.5	19	10	22	19	23	7	'Clayey' sandy gravel
NE 78	I	3.5	4.5	5	6	21	26	32	10	Sandy gravel
NE 79	Alluvium	absent								
NE 80	I	0.6	2.2	13	10	20	18	22	17	'Clayey' sandy gravel
NE 81	III	1.2	0.3	24	20	16	6	12	22	'Very clayey' Sandy gravel
NE 84	I	3.0	3.4	7	6	22	22	31	12	Sandy gravel
NE 85	III	2.1	0.5	13	15	35	9	19	9	'Clayey' sandy gravel
SE 53	II	3.7	1.1	5	9	22	27	22	15	Sandy gravel
SE 59	I	3.9	1.6	2	3	18	29	35	13	Sandy gravel
SE 60	I	1.8	2.9	7	8	30	25	24	6	Sandy gravel
TL 19										
NW 138	II	6.4	0.6	15	11	24	22	18	10	'Clayey' sandy gravel
NW 141	I	9.7	1.3	7	8	26	21	24	14	Sandy gravel
NW 142	I	5.7	1.4	7	8	25	21	28	11	Sandy gravel
Mean		3.1	1.5	8	8	22	23	27	12	

Table 8 Block E: data from IMAU boreholes

Borehole number	Terrace	Recorded thickness		Mean grading percentage						Overall classification
		Mineral m	Overburden m	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 $+16$ mm	
		m	m							
TL 09										
NE 82	III	5.6	0.7	31	10	18	10	17	14	'Very clayey' sandy gravel
NE 83	I	3.0	1.1	11	6	21	23	29	10	'Clayey' sandy gravel
TL 19										
NW 136	II	2.2	1.3	25	13	25	12	19	6	'Very clayey' sandy gravel
NW 137	I	3.3	1.1	6	5	17	40	22	10	Sandy gravel
NW 139	I	3.2	1.1	9	10	25	24	26	6	Sandy gravel
NW 140	II	3.5	0.4	31	14	24	13	15	3	'Very clayey' sandy gravel
NW 143	I	2.3	1.2	9	5	15	36	28	7	Sandy gravel
NW 144	I	5.0	2.5	8	4	18	24	30	16	Gravel
Mean		3.5	1.2	17	8	20	22	23	10	

borough, but includes only those parts designated as agricultural land, open space or woodland. The mineral consists of deposits of the First, Second and Third terraces. The First Terrace passes beneath Alluvium on the floodplain of the Nene.

Third Terrace deposits occur north of Sutton and south-west of Longthorpe [TL 163 983]. Only one borehole, 09 NE 82, was sited on the Third Terrace, proving 5.3 m of mineral. The Second Terrace crops out east of Sutton, south-east of Castor [TL 124 985] and south of Longthorpe. Borehole data indicate that these deposits are of relatively constant thickness compared with those

in the other blocks, and fall within the range 1.1 m to 3.3 m. An extensive outcrop of the First Terrace spreads westwards from Castor, and there are smaller outcrops north of Alwalton, and in the area known as the Milton Bowl, north of Orton Waterville. The maximum recorded thickness of First Terrace mineral in the block is 6.0 m, in borehole 19 NE 967, a site investigation borehole which was terminated in gravel. First terrace deposits pass beneath Alluvium on the floodplain.

The assessment of resources is based on information from 8 IMAU boreholes and 16 other records. The mineral is 0.9 m to 6.0 m thick, with a mean thickness of 3.5 m. The estimated volume of mineral is 32.9 million $m^3 \pm 21\%$. The overburden is up to 4.3 m thick, with a mean thickness of 1.4 m.

The mean fines content varies widely, from 6% in borehole 19 NW 137 (First Terrace) to 31% in borehole 19 NW 140 (Second Terrace). Sand forms from 41 to 62% of the mineral. In 5 of the 8 IMAU boreholes, the mean proportion of gravel is between 25 and 35%; however, borehole 19 NW 140 proved only 19%, and boreholes 09 NE 83 and 19 NW 144 contained 39 and 46% gravel, respectively.

The mean grading for the block is fines 17%, sand 50% and gravel 33%.

Other areas

The resource sheets include 215.9 km^2 of ground not assigned to any resource block. Of this, 29.2 km^2 lies within the limits of Greater Peterborough. The extensions to the city, and especially the Orton township, cover wide areas of River Gravel, mainly of the Third Terrace. Construction of the townships had already begun at the time of the survey, and excavations revealed large areas of gravel 2 to 3 m thick. This area has not been included in the assessment, since effective sterilisation of the resource will soon have occurred as building progresses.

Apart from the deposits already described in Block A a number of patches of Glacial Sand and Gravel are present, most of which have not been assessed because of their small size (no assessment is attempted for an isolated area of sand and gravel of less than 0.25 km^2). Where sand and gravel may have been present beneath Boulder Clay, assessment boreholes were drilled to explore this possibility. Boreholes 08 SW 34, 08 NE 7, 09 SW 193, 09 SW 194, 09 SW 196, 19 SW 60, and 19 SW 61 were all drilled for this purpose, but none proved mineral.

Assessment boreholes 19 SE 78, 19 SE 79, 19 SE 80, 19 SE 81, 19 SE 82 and 19 SE 83 were put down through Nordelph Peat to investigate the mineral potential of the Fenland in this area. Only one of these, 19 SE 81, proved sand and gravel; it was 2.7 m thick, beneath 3.1 m of overburden. As a whole, the peat-covered area is regarded as barren.

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, 10 km², is a compromise to meet the aims of the survey by providing sufficient sample points in each block. As far as possible the block boundaries are determined by geological boundaries so that, for example, glacial and river terrace gravels are separated. Otherwise division is by arbitrary lines, which may bear no relationship to the geology. The blocks are drawn provisionally before drilling begins.

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

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

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

A continuous series of bulk samples is taken throughout the sand and gravel. Ideally samples are composed exclusively of the whole of the material encountered in the borehole between stated depths. However, care is taken to discard, as far as possible, material which has caved or has been pumped from the bottom of the hole. A new sample is commenced whenever there is an appreciable lithological change within the sand and gravel, or at every 1 m (3.3 ft) depth. The samples, each weighing between 25 and 45 kg (55 and 100 lb), are despatched in heavy duty polythene bags to a laboratory for grading. The grading procedure is based on British Standard 1377 (1967). Random checks on 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 F.

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

APPENDIX B

STATISTICAL PROCEDURE

Statistical assessment

1 A statistical assessment is made of an area of mineral greater than 2 km², if there is a minimum of 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. Conventional symmetrical confidence limits are calculated for the 95 per cent probability level, that is, there is a 5 per cent or one in twenty chance of a result falling outside the stated limits.

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

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

4 The above relationship may be transposed such that

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

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 mean 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}, . . . 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 $S_{\bar{l}}$, expressed as a proportion of the mean thickness, is given by

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

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 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 $S_A/S_{\bar{l}_m} \leqslant \frac{1}{3}$ is assumed in all cases. It follows from equation [2] that

$$s_{\bar{l}_m} \leqslant S_V \leqslant 1.05\, S_{\bar{l}_m} \quad . \qquad [3]$$

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

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

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

per cent, and when n is greater than 20, as

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

per cent.

11 The application of this procedure to a fictitious area is illustrated in Figures 8 and 9.

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, based on 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 need 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 within the zone as the weighting factor.

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 (less than $\frac{1}{16}$ mm) and coarser than pebbles (more than 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 not considered to be 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 Figure 10). The procedure is as follows:

1 Classify according to ratio of sand to gravel.
2 Describe 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 Note 11, Appendix D).

Many differing proposals exist 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 (Table 9), which is used in this Report.

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

Block calculation Block 1:25 000 } **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

$1.05(t/\overline{wl_m})\sqrt{[\Sigma(\overline{wl_m} - \overline{wl_m})^2/n(n-1]} \times 100$
$= 1.05 \times (2.365/6.5)\sqrt{[15.82/(8 \times 7)]} \times 100$
$= 20.3$
$\triangleq 20$ per cent

Figure 8 Example of resource block assessment: calculation and results.

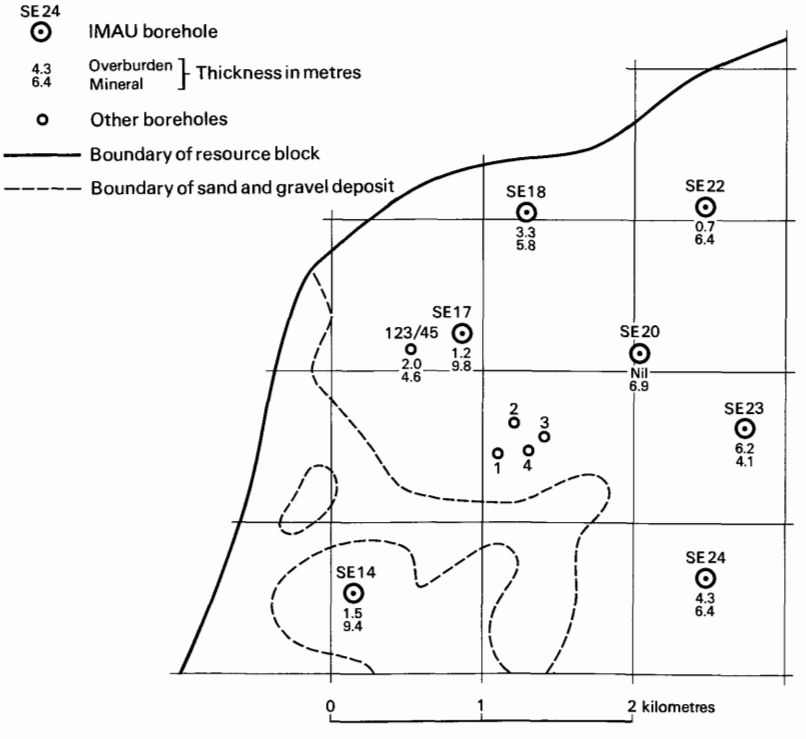


Figure 9 Example of resource block assessment: map of a fictitious block.

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 Standard 1377: 1967). In this report the grading is tabulated on the borehole record sheets (Appendix F), 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 very approximate equal proportions with neither constituent accounting for less than about 25 per cent of the whole; 'flint with quartz' indicates that flint is dominant and quartz, the principal accessory rock type, comprises 5 to 25 per cent of the whole. Where the accessory material accounts for less than 5 per cent of the whole, but is still readily apparent, the phrase 'with some' has been used. Rare constituents are referred to as 'trace'.

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

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

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

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

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

Well-rounded: 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.

Table 9 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

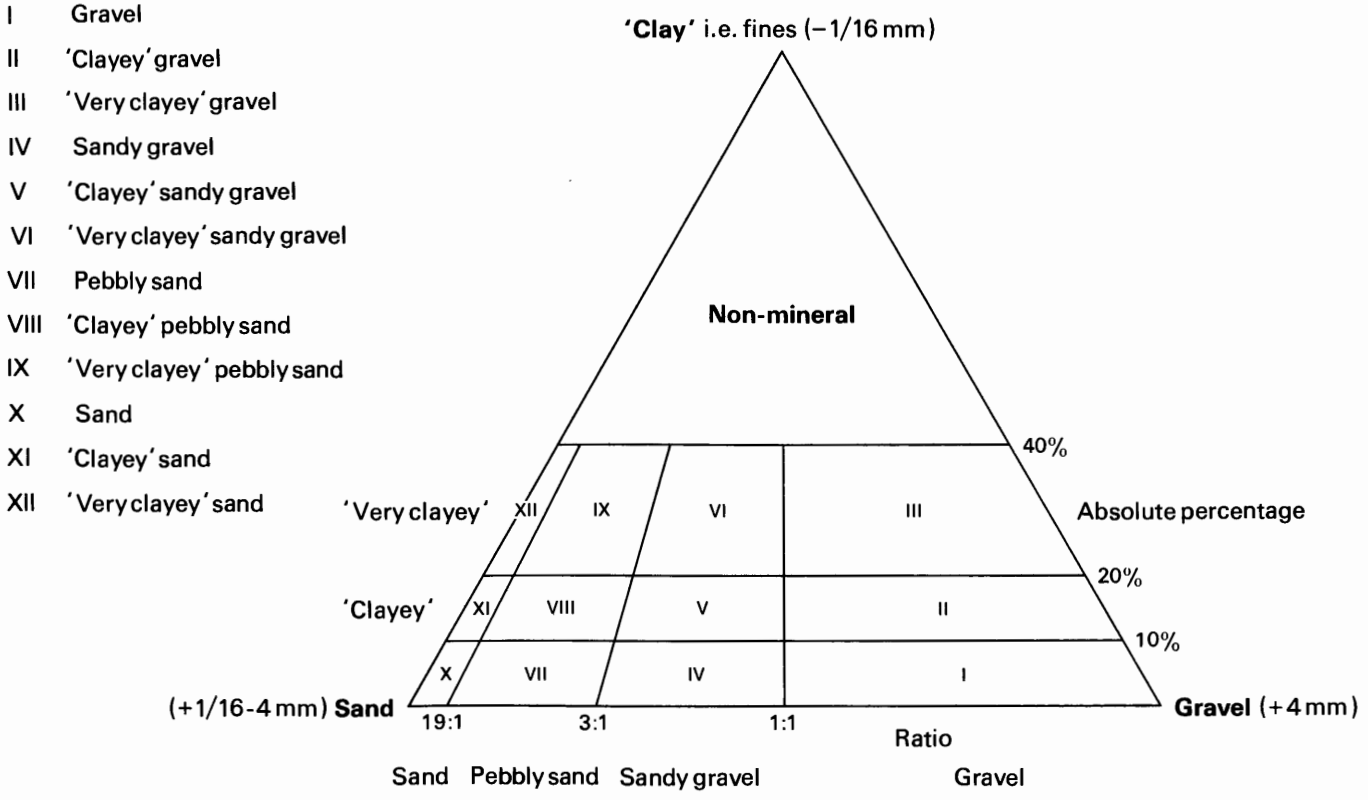


Figure 10 Diagram showing the descriptive categories used in the classification of sand and gravel.

APPENDIX D

EXPLANATION OF THE BOREHOLE RECORDS

Annotated example

TL 09 NE 83[1] **0988 9835**[2] **Sutton**[3] **Block E**

Surface level (+10.8 m) +36 ft[4]

Groundwater conditions not recorded[5]
152 mm percussion[6]
September 1975

Overburden[7] 1.1 m
Mineral 3.0 m
Bedrock 0.1 m+[9]

LOG

Geological classification[10]	Lithology[11]	Thickness[8] m	Depth m
	Soil	0.3	0.3
Head	Clay, medium brown, sandy, with pebbles	0.8	1.1
River Gravel (First Terrace)	'Clayey' sandy gravel Gravel: fine, angular and subangular, flint, ironstone and limestone, with sandstone, quartzite and shells Sand: medium and coarse, quartz, flint, ironstone and limestone	3.0	4.1
Lincolnshire Limestone	Limestone, oolitic	0.1+	4.2

GRADING[12]

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
11	50	39	1.1–2.1	10	4	19	20	38	9
			2.1–3.1	7	6	21	30	33	4
			3.1–4.1	16	9	23	18	17	18
			Mean	11	6	21	23	29	10

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

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

1 The number of the 1:25 000 sheet on which the borehole lies, for example TL 09.

2 The quarter of the 1:25 000 sheet on which the borehole lies and its number in a series for that quarter, for example SE 44.

Thus the full Registration Number is TL 09 SE 44. Usually this is abbreviated to 09 SE 44 in the text.

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

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 it 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 feet; approximate conversions to metres 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
Modified shell and auger rigs were used in this survey. The type of machine and the external diameter of the casing used are given. 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 Thickness and Depth
All measurements were made in metres.

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

10 Geological classification
The geological classification (Table 1) is given wherever possible.

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

12 Grading data
A continuous series of bulk samples is taken throughout the thickness of the 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 percentage 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.

The mean gradings of groups of samples making up an identified mineral horizon are also given in detail and in summary. 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.

APPENDIX E

LIST OF BOREHOLES USED IN THE ASSESSMENT OF RESOURCES

Borehole number	Grid reference
1 IMAU BOREHOLES	
SP 98	**SP**
NW 722	9257 8548
NW 723	9310 8504
NE 255	9823 8981
NE 256	9896 8990
NE 257	9939 8953
NE 258	9961 8864
SW 394	9485 8494
SE 340	9548 8465
SE 341	9538 8359
SE 342	9623 8361
SE 343	9708 8292
SE 344	9646 8206
SE 345	9758 8076
SE 346	9825 8177
SE 347	9912 8155
TL 08	**TL**
NW 177	0100 8939
NW 178	0092 8881
NW 179	0210 8907
NW 180	0309 8767
NW 181	0326 8648
NW 182	0371 8567
NW 183	0404 8918
NW 184	0489 8916
NW 185	0447 8881
NW 186	0476 8811
NW 187	0420 8764
NW 188	0470 8748
NW 189	0483 8693
NW 190	0431 8674
NE 2	0535 8989
NE 3	0573 8977
NE 4	0539 8787
NE 5	0537 8716
NE 6	0564 8686
NE 7	0599 8586
NE 8	0620 8960
SW 20	0041 8191
SW 21	0114 8290
SW 22	0102 8229
SW 23	0110 8199
SW 24	0189 8177
SW 25	0122 8155
SW 26	0254 8390
SW 27	0249 8361
SW 28	0201 8079
SW 29	0243 8090
SW 30	0312 8487
SW 31	0370 8128
SW 32	0312 8027
SW 33	0473 8397
SW 34	0409 8360
SW 35	0460 8286
TL 09	**TL**
NW 286	0146 9934
NW 287	0168 9644
NE 72	0739 9915
NE 73	0773 9756
NE 74	0776 9651
NE 75	0886 9594
NE 76	0712 9564
NE 77	0857 9986
NE 78	0831 9953
NE 79	0814 9916
NE 80	0891 9886
NE 81	0847 9848
NE 82	0963 9912
NE 83	0988 9835
NE 84	0962 9771
NE 85	0723 9525
SW 193	0087 9255
SW 194	0053 9072
SW 195	0258 9490
SW 196	0235 9140
SW 197	0263 9043
SW 198	0369 9399
SW 199	0388 9265
SW 200	0487 9408
SW 201	0450 9277
SW 202	0471 9141
SW 203	0492 9018
SE 44	0582 9379
SE 45	0554 9336
SE 46	0591 9260
SE 47	0546 9229
SE 48	0547 9155
SE 49	0545 9033
SE 50	0675 9355
SE 51	0676 9256
SE 52	0657 9074
SE 53	0782 9480
SE 54	0711 9389
SE 55	0749 9283
SE 56	0733 9186
SE 57	0723 9133
SE 58	0754 9081
SE 59	0833 9461
SE 60	0871 9422
SE 61	0797 9376
SE 62	0676 9152
TL 19	**TL**
NW 136	1095 9863
NW 137	1107 9762
NW 138	1127 9717
NW 139	1237 9796
NW 140	1290 9716
NW 141	1197 9665
NW 142	1267 9618
TL 19	**TL**
NW 143	1350 9711
NW 144	1333 9644
NW 145	1386 9596
SW 60	1049 9304
SW 61	1026 9093
SE 78	1765 9052
SE 79	1869 9160
SE 80	1841 9047
SE 81	1981 9218
SE 82	1975 9166
SE 83	1948 9080
1 OTHER IGS REGISTERED BOREHOLES	
SP 98	
NW 45	
NW 638	
NW 648	
NW 659	
NE 13	
NE 14	
NE 21	
SE 237	
SE 242	
SE 247	
SE 265	
SE 303	
SE 314	
SE 331	
SE 337	
SE 339	
TL 19	
NE 91	
NE 141	
NE 142	
NE 143	
NE 155	
NE 156	
NE 157	
NE 158	
NE 232	
NE 959	
NE 961	
NE 963	
NE 965	
NE 967	
NE 969	
NW 11	

APPENDIX F

INDUSTRIAL MINERALS ASSESSMENT UNIT BOREHOLE RECORDS

TL 09 NW 286 0146 9934 Kings Cliffe

Surface level (+68.2 m) +224 ft
Water not struck
152 mm percussion
August 1975

Waste 1.8 m
Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Boulder Clay	Clay, variegated, pebbly, sandy	1.6	1.8
Upper Estuarine 'Series'	Clay, firm, silty, with sand patches and ironstone concretions	1.0+	2.8

TL 09 NW 287 0168 9644 Apethorpe **Block C**

Surface level (+34.3 m) +113 ft
Water struck at (+32.5 m)
152 mm percussion
August 1975

Overburden 1.6 m
Mineral 3.2 m
Bedrock 1.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Alluvium	Clay, soft to firm, medium grey with black carbonaceous patches, twigs and scattered pebbles. Silty and pebbly at the base	1.4	1.6
River Gravel (First Terrace)	'Clayey' gravel Gravel: fine with coarse, angular to rounded, ironstone, limestone, flint and sandstone Sand: mainly coarse, quartz	3.2	4.8
Lower Estuarine 'Series'	Silt, grey with black carbonaceous patches	1.2+	6.0

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}$–$\frac{1}{4}$	$+\frac{1}{4}$–1	+1–4	+4–16	+16–64
10	39	51	1.6–3.2	12	7	11	21	32	17
			3.2–4.2	7	5	9	26	36	17
			4.2–4.8	No grading data available					
			Mean	10	6	10	23	34	17

TL 09 NE 72 0739 9915 Wansford **Block D**

Surface level (+10.3 m) +34 ft
Water not struck
152 mm percussion
July 1975

Waste 1.9 m
Bedrock 3.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Head	Clay, glutinous, dull yellow-brown and grey, mottled, sandy, pebbly	1.7	1.9
Upper Lias Clay	Clay stiff, blue-grey	3.1+	5.0

TL 09 NE 73 0773 9756 Nassington **Block D**

Surface level (+10.9 m) +36 ft
Water struck at (+9.5 m)
152 mm percussion
July 1975

Overburden 1.4 m
Mineral 3.2 m
Bedrock 1.4 m +

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Alluvium	Clay, dull yellow-brown, sandy with some shell material	1.2	1.4
River Gravel (First Terrace)	Gravel Gravel: mainly fine, angular to rounded, flint, limestone and ironstone with quartzite Sand: coarse with medium, subangular to rounded, quartz, flint, ironstone and limestone	3.2	4.6
Upper Lias Clay	Clay, stiff, blue-grey	1.4	6.0

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}$–$\frac{1}{4}$	$+\frac{1}{4}$–1	+1–4	+4–16	+16–64
3	40	57	1.4–2.4	4	2	14	21	35	24
			2.4–4.6	3	3	16	23	41	14
			Mean	3	2	15	23	40	17

TL 09 NE 74 0776 9651 Elton **Block D**

Surface level (+12.8 m) +42 ft
Water struck at (+10.8 m)
152 mm percussion
July 1975

Overburden 0.6 m
Mineral 6.0 m
Waste 0.2 m
Bedrock 0.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
River Gravel (First Terrace)	Sandy gravel Gravel: fine, angular to subrounded, ironstone, limestone and flint with quartzite and rare chalk Sand: coarse, subangular to subrounded, quartz, flint, ironstone and limestone	6.0	6.6
	Silt, blue-grey, laminated	0.2	6.8
Upper Lias Clay	Clay, stiff, blue-grey	0.7+	7.5

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
7	49	44	0.6–1.6	8	9	21	23	32	8
			1.6–2.6	2	3	18	25	40	11
			2.6–3.6	4	3	13	31	37	13
			3.6–5.0	6	4	15	32	38	6
			5.0–6.0	16	6	17	24	30	8
			6.0–6.6	No grading data available					
			Mean	7	5	16	28	39	9

TL 09 NE 75 0886 9594 Elton **Block D**

Surface level (+12.8 m) +42 ft
Water not struck
152 mm percussion
July 1975

Overburden 0.7 m
Mineral 1.5 m
Bedrock 1.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Alluvium	Clay, brown, sandy	0.4	0.7
River Gravel (First Terrace)	Sandy gravel Gravel: fine, flint, limestone and ironstone with sandstone Sand: coarse, quartz, flint, ironstone and limestone	1.5	2.2
Upper Lias Clay	Clay, stiff, blue-grey, with shell fragments	1.6+	3.8

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
8	49	43	0.7–2.2	8	8	18	23	36	7

TL 09 NE 76 0712 9564 Nassington **Block D**

Surface level (+18.5 m) +61 ft
Groundwater conditions not recorded
152 mm percussion
July 1975

Waste 4.0 m
Bedrock 2.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	4.0	4.0
Upper Lias Clay	Clay, bluish grey, with partings of shell fragments	2.1+	6.1

TL 09 NE 77 0857 9986 Wansford **Block D**

Surface level (+17.3 m) +57 ft
Groundwater conditions not recorded
152 mm percussion
July 1975

Overburden 0.5 m
Mineral 3.0 m
Bedrock 2.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
River Gravel (Second Terrace)	'Clayey' sandy gravel, 'very clayey' in first metre Gravel: fine rounded sandstone, subangular to subrounded limestone, angular flint with ironstone Sand: medium and coarse, quartz, flint, ironstone and limestone	3.0	3.5
Upper Lias Clay	Clay, stiff, blue-grey	2.1+	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
19	51	30	0.5–1.5	22	13	27	18	15	4
			1.5–2.5	19	12	25	20	21	5
			2.5–3.5	15	5	13	19	34	14
			Mean	19	10	22	19	23	7

TL 09 NE 78 0831 9953 Sibson-cum-Stibbington **Block D**

Surface level (+13.0 m) +43 ft
Water struck at (+8.5 m)
152 mm percussion
July 1975

Overburden 4.5 m
Mineral 3.5 m
Bedrock 2.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	4.4	4.4
Alluvium	Sand, medium brown, 'very clayey'	0.1	4.5
River Gravel (First Terrace)	Sandy gravel Gravel: fine angular and subangular, flint, ironstone and limestone, rounded sandstone and quartz Sand: medium ironstone and quartz, coarse ironstone and flint	3.5	8.0
Upper Lias Clay	Clay, stiff, blue-grey	2.1+	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
5	53	42	4.5–5.4	3	4	18	26	36	13
			5.4–6.4	5	7	23	23	34	9
			6.4–7.4	5	6	24	29	27	9
			7.4–8.0	No grading data available					
			Mean	5	6	21	26	32	10

TL 09 NE 79 0814 9916 Sibson-cum-Stibbington **Block D**

Surface level (+12.0 m) +40 ft
Water not struck
152 mm percussion
July 1975

Waste 1.8 m
Bedrock 1.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Alluvium	Clay, medium brown, sandy, with fine angular pebbles of flint and rounded of limestone	1.6	1.8
Upper Lias Clay	Clay, blue-grey, silty	1.4+	3.2

TL 09 NE 80 0891 9886 Sibson-cum-Stibbington **Block D**

Surface level (+10.6 m) +35 ft
Water struck at (+8.1 m)
152 mm percussion
July 1975

Overburden 2.2 m
Mineral 0.6 m
Waste 0.2 m
Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.9	0.9
Head	Clay, medium brown with red-brown patches, sandy, pebbly. Pebbles angular flint, rounded sandstone and subrounded ironstone	1.3	2.2
River Gravel (First Terrace)	'Clayey' sandy gravel Gravel: fine, flint, ironstone and limestone with sandstone. Iron concretions present Sand: medium and coarse, quartz, flint, ironstone and limestone	0.6	2.8
	Clay, soft, blue-grey, and black silt	0.2	3.0
Lincolnshire Limestone	Calcareous sandstone, light grey and brown	0.6+	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
13	48	39	2.2–2.8	13	10	20	18	22	17

TL 09 NE 81 0847 9848 Sibson-cum-Stibbington **Block D**

Surface level (+21.1 m) +69 ft
Ground water conditions not recorded
152 mm percussion
July 1975

Overburden 0.3 m
Mineral 1.2 m
Bedrock 1.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
River Gravel (Third Terrace)	'Very clayey' sandy gravel Gravel: mainly coarse, angular to subangular, sandy limestone and ironstone Sand: fine and medium, quartz, ironstone and limestone	1.2	1.5
Lincolnshire Limestone	Limestone, sandy, weathered	1.4+	2.9

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
24	42	34	0.3–1.3	24	20	16	6	12	22
			1.3–1.5	No grading data available					

TL 09 NE 82 0963 9912 Sutton **Block E**

Surface level (+17.4 m) +57 ft
Groundwater conditions not recorded
152 mm percussion
September 1975

Overburden 0.7 m
Mineral 5.6 m
Bedrock Trace

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
	Clay, pebbly, sandy	0.3	0.7
River Gravel (Third Terrace)	'Very clayey' sandy gravel Gravel: fine and coarse, limestone and flint with ironstone Sand: medium with fine and coarse, quartz, flint and ironstone with limestone Fines: clay seam between 2.8 m and 3.1 m	5.6	6.3
Lincolnshire Limestone	Limestone, oolitic	Trace	6.3

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
31	38	31	0.7–1.8	25	9	14	11	21	21
			1.8–2.8	36	16	11	8	18	11
			2.8–3.1	100*					
			3.1–4.1	25	11	26	11	8	19
			4.1–5.6	22	8	25	12	22	11
			Mean	31	10	18	10	17	14

* Clay seam not sampled

TL 09 NE 83 0988 9835 Sutton **Block E**

Surface level (+10.8 m) +36 ft
Groundwater conditions not recorded
152 mm percussion
September 1975

Overburden 1.1 m
Mineral 3.0 m
Bedrock 0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Head	Clay, medium brown, sandy with pebbles	0.8	1.1
River Gravel (First Terrace)	'Clayey' sandy gravel Gravel: fine, angular and subangular, flint, ironstone and limestone, with sandstone, quartzite and shells Sand: medium and coarse, quartz, flint, ironstone and limestone	3.0	4.1
Lincolnshire Limestone	Limestone, oolitic	0.1+	4.2

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}$–$\frac{1}{4}$	$+\frac{1}{4}$–1	+1–4	+4–16	+16–64
11	50	39	1.1–2.1	10	4	19	20	38	9
			2.1–3.1	7	6	21	30	33	4
			3.1–4.1	16	9	23	18	17	18
			Mean	11	6	21	23	29	10

TL 09 NE 84 0962 9771 Sibson-cum-Stibbington **Block D**

Surface level (+9.0 m) +30 ft
Water struck at (+5.6 m)
152 mm percussion
August 1975

Overburden 3.4 m
Mineral 3.0 m
Bedrock 1.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Alluvium	Clay, brown and blue-grey, sandy, silty	2.8	3.0
	Peat, clayey, with wood fragments	0.4	3.4
River Gravel (First Terrace)	Sandy gravel Gravel: fine, angular and subangular, flint and ironstone, rounded limestone, quartz and sandstone Sand: medium and coarse, flint, quartz, ironstone and shell material	3.0	6.4
Lower Estuarine 'Series'	Silt, dark grey, laminated, clayey, with carbonaceous remains	1.5+	7.9

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
7	50	43	3.4–4.4	5	6	22	22	34	11
			4.4–5.4	8	5	22	20	31	15
			5.4–6.4	7	7	23	24	29	10
			Mean	7	6	22	22	31	12

TL 09 NE 85 0723 9525 Nassington **Block D**

Surface level (+27.7 m) +91 ft
Groundwater conditions not recorded
152 mm percussion
January 1976

Overburden 0.5 m
Mineral 2.1 m
Bedrock 4.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
River Gravel (Third Terrace)	Clay, with pebbles	0.1	0.5
	'Clayey' sandy gravel Gravel: mainly fine angular to subrounded, flint, limestone, ironstone and sandstone Sand: fine to medium, quartz with ironstone	2.1	2.6
Upper Estuarine 'Series'	Sand, fine, silty, mostly quartz	4.4+	7.0

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
13	59	28	0.5–1.5	15	10	39	5	19	12
			1.5–2.6	11	21	32	12	18	6
			Mean	13	15	35	9	19	9

TL 09 SW 193 0087 9255 Southwick

Surface level (+66.5 m) +219 ft
Groundwater conditions not recorded
152 mm percussion
June 1975

Waste 4.2 m
Bedrock 1.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.9	0.9
Boulder Clay	Clay, brown and light grey, with pebbles of chalk, flint and limestone	3.3	4.2
?Kellaways Sand	Clay and sand, brown and grey streaked, containing fine calcium carbonate clasts	0.8	5.0
Oxford Clay	Clay, stiff, dark grey, containing calcium carbonate nodules	0.8+	5.8

TL 09 SW 194 0053 9072 Glapthorn

Surface level (+72.5 m) +238 ft
Groundwater conditions not recorded
152 mm percussion
June 1975

Waste 10.4 m
Bedrock 0.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, friable to firm, brown, pebbly with sandy patches	10.1	10.4
Oxford Clay	Clay, stiff, dark grey, fossiliferous	0.4+	10.8

TL 09 SW 195 0258 9490 Apethorpe **Block C**

Surface level (+30.2 m) +99 ft
Groundwater conditions not recorded
152 mm percussion
September 1975

Waste 2.1 m
Bedrock 0.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.8	0.8
Head	Clay, patchy orange-brown and grey, silty, sandy with pebbles of ironstone and sandstone, and carbonaceous material	1.3	2.1
?Northampton Sand	Limestone, greenish, chamositic, oolitic, passing into very sandy limestone	0.9+	3.0

TL 09 SW 196 0235 9140 Southwick

Surface level (+67.5 m) +222 ft
Groundwater conditions not recorded
152 mm percussion
June 1975

Waste 7.6 m
Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Boulder Clay	Clay, firm, brown and grey, with pebbles of chalk, flint, limestone and sandstone	6.4	6.6
Glacial Sand and Gravel	Sand, medium brown, clayey with pebbles	1.0	7.6
Oxford Clay	Clay, stiff, dark grey, with abundant shell fragments	0.8+	8.4

TL 09 SE 197 **0263 9043** **Glapthorn** **Block C**

Surface level (+29.2 m) +96 ft
Water struck at (+23.4 m)
152 mm percussion
June 1975

Overburden 5.8 m
Mineral 1.5 m
Bedrock 1.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Head	Clay, medium brown, sandy with pebbles	2.6	2.8
Alluvium	Clay, mottled light grey and brown, sandy	3.0	5.8
	Sandy gravel Gravel: fine with coarse, angular and subangular ironstone and subrounded limestone Sand: coarse, quartz, flint, ironstone and limestone	1.5	7.3
Upper Estuarine 'Series'	Clay, variegated, sandy	1.1+	8.4

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
8	51	41	5.8–6.8	8	6	17	28	27	14
			6.8–7.3	7	6	11	35	15	28
			Mean	8	6	15	30	22	19

TL 09 SW 198 **0369 9399** **Woodnewton** **Block C**

Surface level (25.9 m) +85 ft
Water not struck
152 mm percussion
June 1975

Overburden 0.3 m
Mineral 1.2 m
Bedrock 2.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Alluvium	'Very clayey' sandy gravel Gravel: fine and coarse, angular flint, subangular limestone and sandstone Sand: fine and medium with coarse, quartz, flint and limestone	1.2	1.5
Oxford Clay	Clay, stiff, dark grey	2.4+	3.9

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
20	46	34	0.3–1.5	20	15	19	12	16	18

TL 09 SW 199 0388 9265 Cotterstock

Surface level (+21.2 m) +70 ft
Water not struck
152 mm percussion
September 1975

Waste 2.8 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Head	Clay, firm, brown, containing pebbles of flint, limestone, ironstone and quartzite	2.5	2.8
Lower Estuarine 'Series'	Silt, black, with abundant carbonaceous material	0.3+	3.1

TL 09 SW 200 0487 9408 Fotheringhay **Block C**

Surface level (+22 m) +72 ft
Water struck at (+19.2 m) and (+16.5 m)
152 mm percussion
June 1975

Overburden 0.9 m
Mineral 1.7 m
Bedrock 3.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.9	0.9
River Gravel (First Terrace)	'Clayey' pebbly sand Gravel: fine with coarse Sand: fine with medium and coarse, quartz and ironstone	1.7	2.6
Lower Estuarine 'Series'	Clay, sandy, with fine grey silt	1.4	4.0
	Clay, chocolate-brown and dark grey, sandy	0.4	4.4
	Clay, soft, friable, grey, silty	0.8	5.2
Northampton Sand	Limestone, chamositic, oolitic, shelly	1.2+	6.4

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
17	63	20	0.9–2.6	17	43	12	8	15	5

TL 09 SW 201 0450 9277 Fotheringhay **Block C**

Surface level (+17.8 m) +59 ft
Water struck at (+14.8 m)
152 mm percussion
June 1975

Overburden 0.8 m
Mineral 5.8 m
Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Alluvium	Clay, yellowish brown, sandy	0.6	0.8
River Gravel (First Terrace)	'Clayey' sandy gravel Gravel: fine with coarse angular to rounded, limestone, flint, sandstone and ironstone with shell fragments Sand: coarse with medium, quartz, ironstone and flint Fines: clay seam between 2.8 m and 3.1 m	5.8	6.6
Upper Estuarine 'Series'	Clays and silts, variegated	0.8	7.4
	Siltstone, hard, grey	0.2+	7.6

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
10	45	45	0.8–2.8	6	8	15	20	42	9
			2.8–3.1	100*					
			3.1–4.1	3	3	15	24	38	17
			4.1–5.1	4	3	16	28	35	14
			5.1–6.1	3	3	11	49	31	3
			6.1–6.6	3	5	17	28	33	14
			Mean	10	5	14	26	35	10

* Clay seam not sampled

TL 09 SW 202 0471 9141 Cotterstock **Block C**

Surface level (+17.9 m) +59 ft
Water struck at (+16.6 m)
152 mm percussion
June 1975

Overburden 1.3 m
Mineral 3.4 m
Bedrock 1.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Alluvium	Clay, brown, sandy	1.0	1.3
River Gravel (First Terrace)	Sandy gravel Gravel: fine, angular flint, subrounded limestone, rounded sandstone and ironstone Sand: medium and coarse, quartz, ironstone and flint	3.4	4.7
Lower Estuarine 'Series'	Clay, stiff, dark grey Clay, grey-brown, silty, with sand inclusions	1.6+	6.3

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
5	55	40	1.3–3.0	2	4	23	36	31	4
			3.0–4.7	7	6	19	24	25	20
			Mean	5	4	21	30	28	12

TL 09 SW 203 **0492 9018** **Cotterstock** **Block C**

Surface level (+18.3 m) +60 ft
Water struck at (+16.5 m)
152 mm percussion
June 1975

Overburden 1.8 m
Mineral 3.8 m
Bedrock 4.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Alluvium	Clay, soft, yellow-brown, sandy	1.6	1.8
River Gravel (First Terrace)	Gravel, cobbles below 3.0 m Gravel: fine, subrounded and rounded, limestone and ironstone, angular flint Sand: coarse, quartz, flint and limestone	3.8	5.6
Lower Estuarine 'Series'	Clays and silts, variegated	4.4+	10.0

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
3	45	52	1.8–2.8	3	4	17	25	38	14
			2.8–3.0	No grading data available					
			3.0–4.0	4	5	8	33	37	14
			4.0–5.6	No grading data available					
			Mean	3	4	12	29	38	14

TL 09 SE 44 0582 9379 Fotheringhay **Block C**

Surface level (+19.1 m) +63 ft
Water struck at (+16.3 m)
152 mm percussion
June 1975

Overburden 0.9 m
Mineral 4.8 m
Bedrock 3.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.9	0.9
River Gravel (First Terrace)	Sandy gravel Gravel: mainly fine subrounded and rounded, limestone with flint and ironstone Sand: mainly coarse, subrounded and rounded, sandstone, quartz and limestone with shell fragments	4.8	5.7
Lower Estuarine 'Series'	Silt, grey and black	3.3+	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
6	49	45	0.9–1.9	7	9	20	16	34	14
			1.9–2.9	7	8	15	20	38	12
			2.9–3.9	5	9	17	28	33	8
			3.9–4.9	6	16	10	28	30	10
			4.9–5.7	No grading data available					
			Mean	6	10	16	23	34	11

TL 09 SE 45 0554 9336 Fotheringhay **Block C**

Surface level (+22.8 m) +75 ft
Water not struck
152 mm percussion
June 1975

Overburden 1.5 m
Mineral 1.3 m
Bedrock 2.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil and made ground	0.8	0.8
Head	Clay, pebbly, sandy	0.7	1.5
River Gravel (Second Terrace)	'Very clayey' sandy gravel Gravel: fine, rounded limestone and ironstone, angular flint Sand: fine to coarse, rounded limestone and ironstone, angular flint	1.3	2.8
Upper Estuarine 'Series'	Silt, grey and black	2.6+	5.4

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
21	40	39	1.5–2.2	23	11	16	12	28	10
			2.2–2.8	19	14	13	15	30	10
			Mean	21	12	15	13	29	10

TL 09 SE 46 0591 9260 Fotheringhay **Block C**

Surface level (+16.6 m) +55 ft
Water struck at (+14.0 m)
152 mm percussion
June 1975

Overburden 1.6 m
Mineral 4.4 m
Bedrock 0.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Head	Clay, firm, brown, pebbly	1.1	1.6
River Gravel (First Terrace)	Sandy gravel, cobbles below 5.0 m Gravel: fine, angular flint, subangular ironstone and limestone, rounded and subrounded sandstone and quartz Sand: medium and coarse, quartz, limestone, flint and ironstone	4.4	6.0
Lower Estuarine 'Series'	Clay, grey, silty, with shells	0.7+	6.7

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}$–$\frac{1}{4}$	$+\frac{1}{4}$–1	+1–4	+4–16	+16–64
4	56	40	1.6–2.6	8	15	42	14	21	2
			2.6–3.6	3	9	27	25	26	11
			3.6–4.6	2	3	15	28	38	16
			4.6–5.6	2	3	19	29	34	12
			5.6–6.0	No grading data available					
			Mean	4	7	25	24	30	10

TL 09 SE 47 0546 9229 Fotheringhay **Block C**

Surface level (+15.8 m) +52 ft
Groundwater conditions not recorded
152 mm percussion
June 1975

Overburden 1.4 m
Mineral 2.4 m
Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
River Gravel (First Terrace)	Clay, medium brown, sandy, pebbly	1.2	1.4
	Sandy gravel Gravel: fine with coarse, limestone, flint, ironstone and quartz with trace chalk and shells Sand: coarse and medium, quartz, flint, limestone and ironstone	2.4	3.8
Upper Lias Clay	Clay, stiff, blue-grey, with shells	0.6+	4.4

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
8	65	27	1.4–2.4	11	10	29	22	20	8
			2.4–3.4	4	6	27	36	19	9
			3.4–3.8	No grading data available					
			Mean	8	8	28	29	19	8

TL 09 SE 48 0547 9155 Tansor **Block C**

Surface level (+22.0 m) +72 ft
Water struck at (+17.3 m)
152 mm percussion
June 1975

Overburden 1.4 m
Mineral 5.6 m
Bedrock 0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	1.4	1.4
River Gravel (Second Terrace)	'Clayey' sandy gravel Gravel: fine, angular, flint and limestone with ironstone and quartzite Sand: medium and coarse flint and quartz	5.6	7.0
Upper Estuarine 'Series'	Clay, variegated, silty	0.5+	7.5

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
10	58	32	1.4–2.4	15	17	31	9	20	8
			2.4–4.0	14	24	36	10	13	3
			4.0–5.0	11	8	23	19	36	3
			5.0–6.0	3	4	12	36	40	5
			6.0–7.0	4	4	18	34	31	9
			Mean	10	13	25	20	27	5

TL 09 SE 49 **0545 9033** **Tansor** **Block C**

Surface level (+19.2 m) +63 ft
Water struck at (+17.8 m)
152 mm percussion
June 1975

Overburden 0.4 m
Mineral 8.4 m
Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
River Gravel (First Terrace)	'Clayey' sandy gravel Gravel: fine, angular to rounded, limestone and flint with ironstone, quartzite and traces of chalk and quartz Sand: mainly medium, ironstone, quartz and flint Fines: clay partings between 2.1 m and 5.5 m	8.4	8.8
Lower Estuarine 'Series'	Clay, grey, silty, with shell and plant remains	0.8+	9.6

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
11	53	36	0.4–2.1	2	6	24	16	36	16
			2.1–5.5	22	24	26	5	11	12
			5.5–6.5	4	7	26	21	27	15
			6.5–7.5	4	3	17	29	33	14
			7.5–8.5	4	4	18	37	28	9
			8.5–8.8	No grading data available					
			Mean	11	13	23	17	23	13

TL 09 SE 50 0675 9355 Fotheringhay **Block C**

Surface level (+18.1 m) +60 ft
Water struck at (+16.5 m)
152 mm percussion
June 1975

Overburden 0.9 m
Mineral 4.7 m
Bedrock 3.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Head	Clay, sandy, pebbly	0.5	0.9
River Gravel (First Terrace)	Sandy gravel Gravel: fine, angular to rounded, flint, ironstone, limestone and sandstone Sand: coarse, quartz, ironstone and flint	4.7	5.6
Lower Estuarine 'Series'	Silt, dark, carbonaceous	3.4+	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
3	60	37	0.9–5.6	3	5	16	39	32	5

TL 09 SE 51 0676 9256 Fotheringhay **Block C**

Surface level (+21.5 m) +71 ft
Water struck at (+14.0 m)
152 mm percussion
June 1975

Overburden 0.8 m
Mineral 7.7 m
Bedrock 1.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.8	0.8
River Gravel (Second Terrace)	Sandy gravel, sand at base Gravel: fine to coarse, angular flint, subangular ironstone and limestone, with rounded sandstone Sand: fine to coarse, flint, ironstone and sandstone	7.7	8.5
Upper Estuarine 'Series'	Clay sandy, resting on limestone	1.4+	9.9

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
6	59	35	0.8–1.8	18	16	29	20	17	1
			1.8–2.8	6	9	19	20	37	10
			2.8–3.8	4	5	17	25	33	16
			3.8–4.8	4	6	23	30	30	7
			4.8–5.8	3	6	19	26	37	9
			5.8–7.5	3	21	14	24	21	17
			7.5–8.5	10	85	3	3		
			Mean	6	20	17	22	25	10

TL 09 SE 52 0657 9074 Tansor **Block C**

Surface level (+25.1 m) +83 ft
Groundwater conditions not recorded
152 mm percussion
June 1975

Overburden 1.0 m
Mineral 2.7 m
Bedrock 1.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	1.0	1.0
River Gravel (Second Terrace)	'Clayey' sandy gravel Gravel: fine, angular flint and subangular limestone and ironstone, with rounded sandstone and quartz Sand: mainly medium, quartz, ironstone, flint and limestone	2.7	3.7
Kellaways Clay	Clay, stiff, medium grey, fossiliferous	1.4	5.1
Cornbrash	Limestone, hard, granular	Trace	5.1

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
16	45	39	1.0–2.0	17	10	18	12	29	14
			2.0–3.0	16	11	20	19	27	8
			3.0–3.7	No grading data available					
			Mean	16	10	19	16	28	11

TL 09 SE 53 0782 9480 Fotheringhay **Block D**

Surface level (+17.8 m) +59 ft
Groundwater conditions not recorded
152 mm percussion
June 1975

Overburden 1.1 m
Mineral 3.7 m
Bedrock Trace

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Head	Clay, pebbly, sandy	0.9	1.1
River Gravel (Second Terrace)	Sandy gravel Gravel: fine to coarse, angular to rounded, limestone with flint, ironstone and quartzite Sand: mainly coarse, quartz, ironstone, limestone and flint	3.7	4.8
Lower Estuarine 'Series'	Siltstone, hard, laminated	Trace	4.8

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
5	58	37	1.1–4.0	6	7	22	32	18	10	5
			4.0–4.8	5	10	22	25	23	15	
			Mean	5	9	22	27	22	14	1

TL 09 SE 54 0711 9389 Fotheringhay **Block C**

Surface level (+19.3 m) +64 ft
Water struck at (+16.9 m)
152 mm percussion
June 1975

Overburden 0.7 m
Mineral 1.7 m
Bedrock 4.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Head	Clay, pebbly, sandy	0.5	0.7
River Gravel (Second Terrace)	'Clayey' sandy gravel Gravel: fine, angular to rounded, flint, limestone and ironstone with quartzite Sand: fine to coarse, quartz, flint, ironstone and limestone	1.7	2.4
Upper Estuarine 'Series'	Silt, chocolate-brown, carbonaceous	4.6+	7.0

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
17	51	32	0.7–2.4	17	17	17	17	25	7

TL 09 SE 55 0749 9283 Fotheringhay **Block C**

Surface level (+17.4) +57 ft
Water struck at (+15.6 m)
152 mm percussion
June 1975

Overburden 1.8 m
Mineral 5.8 m
Bedrock 2.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Alluvium	Clay, firm, orange and grey, sandy, pebbly	1.6	1.8
River Gravel (First Terrace)	Sandy gravel Gravel: fine, angular flint and limestone, subangular ironstone and subrounded sandstone. Jurassic fossils present Sand: medium and coarse, flint, limestone, ironstone, quartz	5.8	7.6
Lower Estuarine 'Series'	Silt, organic, clayey, laminated in parts	2.6+	10.2

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}$–$\frac{1}{4}$	$+\frac{1}{4}$–1	+1–4	+4–16	+16–64
3	52	45	1.8–2.8	3	6	23	25	35	8
			2.8–3.8	2	6	26	26	31	9
			3.8–5.8	3	3	15	26	40	13
			5.8–6.8	3	6	32	26	29	4
			6.8–7.6	No grading data available					
			Mean	3	4	22	26	35	10

TL 09 SE 56 0733 9186 Warmington **Block C**

Surface level (+16.4 m) +54 ft
Water struck at (+14.5 m)
152 mm percussion
June 1975

Overburden 1.9 m
Mineral 6.1 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Alluvium	Clay, sandy, with scattered pebbles	1.7	1.9
River Gravels (First Terrace)	Sandy gravel, sand content increases with depth Gravel: fine, angular to rounded, limestone with flint, ironstone and quartzite with trace chalk and shell fragments Sand: medium to coarse, limestone, flint, ironstone and quartz	6.1	8.0
Upper Lias Clay	Clay, stiff, blue-grey, shelly	0.3+	8.3

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
4	55	41	1.9–2.9	4	6	21	22	31	16
			2.9–3.9	3	4	14	27	42	10
			3.9–4.9	5	10	26	19	33	7
			4.9–5.9	4	10	36	28	18	4
			5.9–6.9	4	11	19	20	35	12
			6.9–7.9	4	8	20	31	28	9
			7.9–8.0	No grading data available					
			Mean	4	8	23	24	31	10

TL 09 SE 57 0723 9133 Warmington **Block C**

Surface level (+16.7 m) +55 ft
Groundwater conditions not recorded
152 mm percussion
June 1975

Waste 2.9 m
Bedrock 2.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Alluvium	Clay, medium brown, sandy	2.3	2.6
River Gravel (First Terrace)	'Clayey' gravel Gravel: fine, angular to rounded, limestone, flint, ironstone and sandstone Sand: fine to coarse, quartz, flint, limestone and ironstone	0.3	2.9
Upper Estuarine 'Series'	Clay, light green and grey, sandy in parts, containing organic material	2.9+	5.8

TL 09 SE 58 0754 9081 Warmington **Block C**

Surface level (+18.8 m) +62 ft
Groundwater conditions not recorded
152 mm percussion
June 1975

Waste 1.3 m
Bedrock 1.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Head	Clay, pebbly, sandy, pebbles of chalk, limestone, flint, sandstone and ironstone	1.1	1.3
Blisworth Clay	Clay, firm, variegated, fossiliferous	1.7+	3.0

TL 09 SE 59 0833 9461 Fotheringhay **Block D**

Surface level (+13.8 m) +46 ft
Water struck at +12.3 m
152 mm percussion
June 1975

Overburden 1.6 m
Mineral 3.9 m
Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Alluvium	Clay, blue-grey, becoming yellow-brown with depth	1.4	1.6
River Gravel (First Terrace)	Sandy gravel Gravel: fine, subangular to angular flint and ironstone and subrounded limestone, with subrounded sandstone and quartz. Jurassic fossils present Sand: coarse, flint, quartz, limestone and ironstone	3.9	5.5
Upper Lias Clay	Clay, stiff, blue-grey, shelly	0.6+	6.1

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
2	50	48	1.6–2.6	2	3	20	27	37	12
			2.6–3.6	2	3	22	27	28	18
			3.6–4.6	2	3	15	32	40	9
			Mean	2	3	18	29	35	13

TL 09 SE 60 0871 9422 Elton **Block D**

Surface level (+14.9 m) +49 ft
Water struck at +12.0 m
152 mm percussion
June 1975

Overburden 2.9 m
Mineral 1.8 m
Waste 1.0 m
Bedrock 0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Head	Clay, sandy, with pebbles of flint, limestone and chalk	2.4	2.9
River Gravel (First Terrace)	Sandy gravel Gravel: fine, angular to subrounded, flint and limestone, with ironstone, quartzite, and trace chalk Sand: medium and coarse, quartz, flint, ironstone and limestone	1.8	4.7
	Clay, dull yellow-brown, sandy	1.0	5.7
Upper Estuarine 'Series'	Silt, grey and black	0.5+	6.2

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}$–$\frac{1}{4}$	$+\frac{1}{4}$–1	+1–4	+4–16	+16–64
7	63	30	2.9–3.9	10	9	38	21	19	3
			3.9–4.7	4	6	21	30	31	9
			Mean	7	8	30	25	24	6

TL 09 SE 61 0797 9376 Elton **Block C**

Surface level (+16.6 m) +55 ft
Water struck at (+14.2 m)
152 mm percussion
August 1975

Overburden 2.2 m
Mineral 1.8 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Alluvium	Clay, soft to firm, dark blue-grey	1.9	2.2
River Gravel (First Terrace)	'Clayey' sandy gravel Gravel: mostly fine, rounded to angular, flint, ironstone and limestone, with quartzite Sand: medium and coarse, flint, quartz, limestone and ironstone	1.8	4.0
Lower Estuarine 'Series'	Silt, light grey, clayey, with carbonaceous material	0.3+	4.3

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
10	46	44	2.2–3.2	6	4	16	21	42	12
			3.2–4.0	14	5	27	20	24	10
			Mean	10	4	21	21	34	10

TL 09 SE 62 **0676 9152** **Warmington** **Block C**

Surface level (+15.2 m) +50 ft
Water struck at (+10.6 m)
152 mm percussion
January 1976

Overburden 4.6 m
Mineral 2.0 m
Bedrock 4.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Alluvium	Silt and clay, soft, glutinous, pale brown, becoming black with scattered shells and carbonaceous material	4.4	4.6
River Gravel (First Terrace)	Sandy gravel Gravel: fine and coarse, angular to subrounded flint, subrounded limestone and ironstone, with quartzite	2.0	6.6
Lower Estuarine 'Series'	Silt, grey, carbonaceous, with mica flakes	4.4+	11.0

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
7	46	47	4.6–5.6	4	13	10	10	33	30
			5.6–6.6	10	40	9	10	19	12
			Mean	7	26	10	10	26	21

TL 19 NW 137 1107 9762 Ailsworth **Block E**

Surface level (+7.5 m) +25 ft
Water struck at (+5.9 m)
152 mm percussion
September 1975

Overburden 1.1 m
Mineral 3.3 m
Bedrock 1.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Alluvium	Clay, medium orange-brown, sandy	0.8	1.1
River Gravel (First Terrace)	Sandy gravel Gravel: mainly fine, angular and subangular flint and ironstone, angular to rounded limestone, and angular to rounded quartzite Sand: mainly coarse, flint, ironstone and limestone	3.3	4.4
Lower Estuarine 'Series'	Clay, glutinous, black, with carbonaceous remains	1.2+	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
6	62	32	1.1–1.6	6	20	32	11	22	9
			1.6–3.4	5	4	18	39	23	12
			3.4–4.4	7	1	8	55	22	8
			Mean	6	5	17	40	22	10

TL 19 NW 138 1127 9717 Waternewton **Block D**

Surface level (+13.2 m) +44 ft
Groundwater conditions not recorded
152 mm percussion
September 1975

Overburden 0.6 m
Mineral 6.4 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
River Gravel (Second Terrace)	'Clayey' sandy gravel Gravel: fine with coarse, rounded and subrounded limestone, ironstone and sandstone with angular flint Sand: medium and coarse, quartz, flint, ironstone and limestone; ironstone predominant near the base	6.4	7.0
Lower Estuarine 'Series'	Clay, firm to stiff, light and medium grey, silty, with carbonaceous patches and shell fragments	0.3+	7.3

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
15	57	28	0.6–2.6	23	19	32	14	8	3
			2.6–4.4	13	10	23	27	16	11
			4.4–5.4	16	10	25	22	20	6
			5.4–7.0	7	6	14	26	31	18
			Mean	15	11	24	22	18	10

TL 19 NW 136 1095 9863 Ailsworth **Block E**

Surface level (+14.3 m) +47 ft
Water not struck
152 mm percussion
September 1975

Overburden 1.3 m
Mineral 2.2 m
Bedrock Trace

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
River Gravel (Second Terrace)	Clay, medium brown, sandy, pebbly	0.9	1.3
	'Very clayey' sandy gravel Gravel: fine, subangular limestone, rounded sandstone and quartzite, angular flint, angular to subrounded ironstone Sand: medium, flint, quartz, limestone and ironstone Fines: seams of black silt, especially near the base	2.2	3.5
Lincolnshire Limestone	Limestone, hard, oolitic	Trace	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
25	50	25	1.3–2.3	20	9	20	19	25	7
			2.3–3.5	28	16	29	6	15	6
			Mean	25	13	25	12	19	6

TL 19 NW 139 1237 9796 Castor **Block E**

Surface level (+8.2 m) +27 ft
Water struck at (+7.1 m)
152 mm percussion
September 1975

Overburden 1.1 m
Mineral 3.2 m
Bedrock 1.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Head	Clay, orange-brown, sandy, with pebbles of flint	0.5	1.1
River Gravel (First Terrace)	Sandy gravel Gravel: fine, angular to subrounded flint, subangular to rounded oolitic limestone and ironstone, with rounded red sandstone and quartzite Sand: medium and coarse, flint, quartz, ironstone and limestone	3.2	4.3
Lower Estuarine 'Series'	Silt, medium grey, clayey, with patches of orange-brown silt	1.7+	6.0

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}$–$\frac{1}{4}$	$+\frac{1}{4}$–1	+1–4	+4–16	+16–64
9	59	32	1.1–2.5	8	10	21	28	24	9
			2.5–3.5	9	11	32	19	28	2
			3.5–4.3	No grading data available					
			Mean	9	10	25	24	26	6

TL 19 NW 140 1290 9716 Castor **Block E**

Surface level (+12.9 m) +43 ft
Water struck at (+8.5 m)
152 mm percussion
September 1975

Overburden 0.4 m
Mineral 3.5 m
Waste 0.5 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
River Gravel (Second Terrace)	'Very clayey' sandy gravel Gravel: fine, angular to rounded, flint, limestone and ironstone with quartzite Sand: mainly medium, flint, quartz, limestone and ironstone Fines: clay seam between 1.4 m and 1.6 m	3.5	3.9
	Clay, firm to stiff, mottled brown and orange-brown, pebbly, sandy	0.5	4.4
Lincolnshire Limestone	Limestone, hard, granular, shelly	0.3+	4.7

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}$–$\frac{1}{4}$	$+\frac{1}{4}$–1	+1–4	+4–16	+16–64
31	51	18	0.4–1.4	39	24	23	5	6	3
			1.4–1.6	100*					
			1.6–2.3	19	13	32	16	15	5
			2.3–2.9	21	5	15	30	24	5
			2.9–3.9	24	13	29	12	20	3
			Mean	31	14	24	13	15	3

* Clay seam not sampled

TL 19 NW 141 **1197 9665** **Chesterton** **Block D**

Surface level (+6.3 m) +21 ft
Water struck at (+4.7 m)
152 mm percussion
September 1975

Overburden 1.3 m
Mineral 9.7 m
Bedrock 0.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	1.3	1.3
River Gravel (First Terrace)	Sandy gravel Gravel: fine with coarse, angular to rounded, limestone and flint, with ironstone and trace shell fragments Sand: medium and coarse, flint, quartz, ironstone and limestone Fines: thin clay seam at c. 8.5 m	9.7	11.0
Lower Estuarine 'Series'	Silt, grey, clayey, laminated	0.9+	11.9

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
7	55	38	1.3–1.6	12	21	17	36	19	4
			1.6–2.6	11	20	32	13	20	4
			2.6–3.6	9	13	29	14	26	9
			3.6–5.0	7	4	23	25	32	8
			5.0–8.0	4	5	24	20	17	30
			8.0–10.10	6	8	31	22	28	5
			10.0–11.0	6	6	16	31	35	7
			Mean	7	8	26	21	24	14

TL 19 NW 142 1267 9618 Chesterton **Block D**

Surface level (+7.3 m) +24 ft
Water struck at (+5.1 m)
152 mm percussion
September 1975

Overburden 1.4 m
Mineral 5.7 m
Bedrock 1.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
River Gravel (First Terrace)	Clay, brown, sandy	1.1	1.4
	Sandy gravel Gravel: mainly fine, subangular to subrounded, ironstone, limestone, flint and quartzite with quartz and sandstone and trace shell fragments Sand: medium and coarse, flint, quartz, limestone and ironstone Fines: thin clay seams c. 5.0 m	5.7	7.1
Upper Estuarine 'Series'	Silt and clay, grey	1.9+	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
7	54	39	1.4–2.4	19	12	26	17	22	4
			2.4–3.4	7	5	21	24	32	11
			3.4–4.4	4	10	29	21	24	11
			4.4–5.4	5	8	27	20	34	8
			5.4–7.1	4	6	23	22	26	19
			Mean	7	8	25	21	28	11

TL 19 NW 143 1350 9711 Castor **Block E**

Surface level (+7.0 m) +23 ft
Water struck at (+5.1 m)
152 mm percussion
September 1975

Overburden 1.2 m
Mineral 2.3 m
Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
River Gravels (First Terrace)	Clay, sandy, with pebbles of flint and ironstone	0.7	1.2
	Sandy gravel Gravel: fine, flint, ironstone and limestone with sandstone and quartz Sand: coarse, flint, quartz, limestone and ironstone	2.3	3.5
Upper Lias Clay	Clay, stiff, blue-grey, fossiliferous	0.8+	4.3

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
9	56	35	1.2–1.9	16	8	23	17	28	9
			1.9–3.5	7	3	11	45	28	7
			Mean	9	5	15	36	28	7

TL 19 NW 144 1333 9644 Castor **Block E**

Surface level (+5.8 m) +19 ft
Water struck at (+3.3 m)
152 mm percussion
September 1975

Overburden 2.5 m
Mineral 5.0 m
Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Alluvium	Clay, brown and blue-grey, organic	2.0	2.5
River Gravel (First Terrace)	Gravel Gravel: fine with coarse, angular to rounded, limestone and flint, with ironstone and quartzite Sand: coarse with medium, mainly flint and ironstone	5.0	7.5
Lower Estuarine 'Series'	Silt, grey, laminated in parts	1.0+	8.5

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
8	46	46	2.5–3.5	12	3	17	21	37	10
			3.5–6.0	7	4	20	17	29	24
			6.0–7.0	5	3	15	41	23	9
			7.0–7.5	11	13	17	28	28	4
			Mean	8	4	18	24	30	16

TL 19 NW 145 1386 9596 Alwalton **Block D**

Surface level (+18.4 m) +61 ft
Water not struck
152 mm percussion
August 1975

Waste 3.2 m
Bedrock 0.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
River Gravel (Third Terrace)	Clay, variegated, sandy with pebbles of flint, chalk, sandstone and limestone	2.9	3.2
Kellways Clay	Clay, stiff, grey with silt and sand patches, and shells	0.4	3.6
Cornbrash	Limestone, hard, silty, fossiliferous	Trace	3.6

TL 19 SW 60 1049 9304 Elton

Surface level (+57.1 m) +187 ft
Water not struck
152 mm percussion
September 1975

Waste 9.7 m
Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Boulder Clay	Clay, stiff, sandy, with pebbles of chalk and flint, containing Jurassic fossils	9.5	9.7
Oxford Clay	Clay, stiff, fissured, greenish grey	0.8+	10.5

TL 19 SW 61 1026 9093 Warmington

Surface level (+61.7 m) +203 ft
Water struck at (+59.3 m)
152 mm percussion
January 1976

Waste 20.0 m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, firm, pale brown, becoming grey with depth, silty, with abundant chalk fragments	19.7+	20.0

TL 19 SE 78 1765 9052 Yaxley

Surface level (+1.9 m) +6 ft
Water not struck
152 mm percussion
September 1975

Waste 1.4 m
Bedrock 1.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, glutinous, clayey, containing fragments of wood	1.4	1.4
Oxford Clay	Clay, soft, greenish grey, becoming firm with depth	1.2+	2.6

TL 19 SE 79 1869 9160 Yaxley

Surface level (+0.4 m) +1 ft
Water struck at (−4.2 m)
152 mm percussion
July 1975

Waste 7.3 m
Bedrock 0.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	1.1	1.1
Nordelph Peat	Peat, dark brown, containing roots and plant material	3.5	4.6
Barroway Drove Beds	Clay, soft to firm, light greenish grey, silty	2.7	7.3
Oxford Clay	Clay, stiff, blue-grey, containing shells	0.9+	8.2

TL 19 SE 80 1841 9047 Yaxley

Surface level (+1.3 m) +5 ft
Water not struck
152 mm percussion
August 1975

Waste 3.7 m
Bedrock 2.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	1.3	1.3
Nordelph Peat	Peat, loose, dark brown, with thin seams of silt, and abundant organic material	2.4	3.7
Oxford Clay	Clay, soft, variegated, silty, becoming stiff and blue-grey with depth	2.2+	5.9

TL 19 SE 81 1981 9218 Yaxley

Surface level (−0.5 m) −2 ft
Water struck at (−3.6 m)
152 mm percussion
July 1975

Overburden 3.1 m
Mineral 2.7 m
Bedrock 1.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.9	0.9
Nordelph Peat	Peat, soft, dark brown with abundant organic material	2.2	3.1
River Gravel (First Terrace)	Sandy gravel Gravel: fine, angular to rounded, limestone and flint with ironstone and quartzite Sand: medium and coarse, flint, quartz, ironstone and limestone	2.7	5.8
Oxford Clay	Clay, stiff, grey, containing shells	1.1+	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
8	58	34	3.1–4.8	8	4	24	22	40	2
			4.8–5.8	7	12	39	20	20	2
			Mean	8	7	30	21	32	2

TL 19 SE 82 1975 9166 Yaxley

Surface level (−0.4 m) −2 ft
Groundwater conditions not recorded
152 mm percussion
July 1975

Waste 5.3 m
Bedrock 2.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, soft, dark brown with organic remains	5.3	5.3
Oxford Clay	Clay, stiff, blue-grey, with shells	2.7+	8.0

TL 19 SE 83 1948 9080 Yaxley

Surface level (−1.2 m) −4 ft
Water not struck
152 mm percussion
August 1975

Waste 4.6 m
Bedrock 1.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Nordelph Peat	Peat, soft, brown, with organic remains	3.4	3.4
Barroway Drove Beds	Clay, glutinous, light grey, silty, with plant remains	1.2	4.6
Oxford Clay	Clay, firm becoming stiff with depth, silty, shell material present	1.4+	6.0

SP 98 NW 722 9257 8548 Brigstock **Block A**

Surface level (+71.0 m) +233 ft
Groundwater conditions not recorded
203 mm percussion
July 1974

Overburden 1.8 m
Mineral 3.2 m
Waste 0.5 m
Bedrock 2.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	1.8	1.8
Glacial Sand and Gravel	'Clayey' pebbly sand Gravel: fine, subrounded ironstone Sand: medium with fine, subangular to rounded, flint, quartz and ironstone	3.2	5.0
Boulder Clay	Clay, soft, medium brown, pebbly	0.5	5.5
Upper Estuarine 'Series'	Clay, firm, olive-grey, laminated	2.5+	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
12	70	18	1.8–2.8	15	19	41	6	15	4
			2.8–3.8	7	23	45	8	15	2
			3.8–5.0	16	23	35	9	14	3
			Mean	12	22	40	8	15	3

SP 98 NW 723 9310 8504 Brigstock **Block A**

Surface level (+85.3 m) +280 ft
Water not struck
203 mm percussion
July 1974

Waste 11.2 m
Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	1.0	1.0
Boulder Clay	Clay, medium brown, with chalk. Becoming dark blue-grey with gritty partings at depth	10.2	11.2
Oxford Clay	Clay, stiff, silty, olive-grey	0.8+	12.0

SP 98 NE 255 9823 8981 Benefield **Block A**

Surface level (+69.8 m) +229 ft
Water struck at (+62.8 m)
203 mm percussion
July 1974

Overburden 4.0 m
Mineral 4.8 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Boulder Clay	Clay, blue-grey, containing chalk and subangular flint. Weathering to yellowish brown	3.5	4.0
Glacial Sand and Gravel	'Clayey' pebbly sand Gravel: fine, subangular to rounded, ironstone with flint and limestone Sand: medium, subangular to rounded, quartz, flint and ironstone	4.8	8.8
?Cornbrash	Shelly limestone, hard, dark grey	0.2+	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
15	72	13	4.0–5.0	31	15	21	17	15	1
			5.0–6.0	19	18	29	15	18	1
			6.0–7.0	11	13	68	3	5	0
			7.0–8.0	5	13	48	7	7	0
			8.0–8.8	6	8	55	11	19	1
			Mean	15	11	50	11	12	1

SP 98 NE 256 9896 8990 Benefield **Block A**

Surface level (+81.4 m) +267 ft
Water struck at (+78.3 m)
203 mm percussion
July 1974

Waste 10.0 m
Bedrock 1.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Boulder Clay	Clay, dark grey, with chalk, ironstone and shale fragments	8.8	9.0
Glacial Sand and Gravel	Sandy gravel Gravel: fine, subangular to rounded, platy ironstone with traces of chalk and quartz Sand: medium to coarse, well rounded, quartz with limestone and ironstone	1.0	10.0
Oxford Clay	Clay, stiff, silty, dark grey containing belemnites	1.4+	11.4

SP 98 NE 257 **9939 8953** **Benefield** **Block A**

Surface level (+63.1 m) +207 ft
Water not struck
203 mm percussion
July 1974

Waste 2.4 m
Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.8	0.8
Glacial Sand and Gravel	Silts and clays, orange, grey and brown, interbedded	1.6	2.4
Blisworth Clay	Clay, firm, blue-grey	1.0+	3.4

SP 98 NE 258 **9961 8864** **Benefield** **Block A**

Surface level (+82.0 m) +269 ft
Water not struck
203 mm percussion
December 1974

Waste 4.7 m
Bedrock 1.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, sandy, yellow-brown, with scattered chalk and angular flint fragments, some limestone and sandstone cobbles. Becomes blue-grey with depth	4.4	4.7
Oxford Clay	Clay, stiff, dark grey, with shell debris	1.3+	6.0

SP 98 SW 394 **9485 8494** **Brigstock** **Block A**

Surface level (+50.6 m) +166 ft
Water struck at (+47.0 m)
203 mm percussion
June 1974

Waste 1.9 m
Bedrock 4.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Alluvium	Clay and silt, brown, organic	1.9	1.9
Blisworth Clay	Clay, soft, medium grey, silty, with limestone fragments	1.3	3.2
	Clay, stiff, dark grey-green	2.7	5.9
Blisworth Limestone	Limestone, hard	0.1+	6.0

SP 98 SE 340 9548 8465 Brigstock **Block A**

Surface level (+73.8 m) +242 ft
Water not struck
203 mm percussion
June 1974

Overburden 9.6 m
Mineral 4.7 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Boulder Clay	Clay, stiff, brown, with chalk. Becoming blue-grey with depth	7.4	7.8
	Clay, grey	1.8	9.6
Glacial Sand and Gravel	'Very clayey' pebbly sand Gravel: fine, subangular, flint and ironstone Sand: medium with coarse, subangular and rounded, flint and ironstone with quartz	4.7	14.3
Oxford Clay	Clay, stiff, dark grey	0.3+	14.6

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
21	60	19	9.6–11.6	20	10	37	13	20	
			11.6–14.3	22	4	36	17	17	2
			Mean	21	8	36	16	18	1

SP 98 SE 341 9538 8359 Brigstock **Block A**

Surface level (+46.3 m) +152 ft
Water not struck
203 mm percussion
June 1974

Overburden 1.9 m
Mineral 1.1 m
Bedrock 1.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.8	0.8
Alluvium	Clay, firm, rust brown, with sand partings	1.1	1.9
	'Very clayey' gravel Gravel: coarse, rounded and subangular, flint and quartzite Sand: fine to coarse, subangular and rounded, flint and quartzite	1.1	3.0
Oxford Clay	Silt, coarse blue-grey, laminated	1.5+	4.5

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
25	24	51	1.9–3.0	25	9	9	6	12	28	11

SP 98 SE 342 9623 8361 Sudborough **Block A**

Surface level (+78.6 m) +258 ft
Water not struck
203 mm percussion
June 1974

Waste 10.8 m
Bedrock 1.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Boulder Clay	Clay, khaki-brown, becoming medium grey at depth, containing fine chalk fragments	10.4	10.8
Oxford Clay	Clay, stiff, olive-grey, fossiliferous	1.2+	12.0

SP 98 SE 343 9708 8292 Sudborough **Block A**

Surface level (+70.7 m) +232 ft
Water not struck
203 mm percussion
June 1974

Waste 5.5 m
Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, light khaki-brown, becoming stiff and dark grey at depth. Contains chalk fragments	5.2	5.5
Oxford Clay	Clay, firm, olive-grey, with echinoid fragments	1.0+	6.5

SP 98 SE 344 9646 8206 Sudborough **Block A**

Surface level (+39.0 m) +128 ft
Water struck at (+38.0 m)
203 mm percussion
June 1974

Overburden 1.9 m
Mineral 1.3 m
Waste 0.2 m
Bedrock 0.8 m

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	1.3	1.3
Alluvium	Silt, dark grey and black, laminated with clay partings and gastropod shells	0.6	1.9
	Gravel Gravel: fine, subangular, flint and quartz with quartzite and ironstone Sand: coarse with medium, subangular to rounded, flint and quartz with quartzite and ironstone	1.3	3.2
	Clay, stiff, blue-grey, silty, ironstained	0.2	3.4
Northampton Sand	Ironstone, sandy, weathering to rust brown	0.8+	4.2

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}$–$\frac{1}{4}$	$+\frac{1}{4}$–1	+1–4	+4–16	+16–64
3	34	63	1.9–3.2	3	4	11	19	49	14

SP 98 SE 345 9758 8076 Lowick **Block A**

Surface level (+34.7 m) +114 ft
Water struck at (+33.7 m)
203 mm percussion
June 1974

Waste 3.4 m
Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.9	0.9
Alluvium	Clay, light grey, silty, becoming medium grey and sandy at depth	2.1	3.0
	Gravel Gravel: coarse, grey-brown, angular flint with rounded quartzite and ironstone Sand: fine to coarse, subangular, composition similar to gravel	0.4	3.4
Upper Lias Clay	Clay, very stiff, blue-grey	0.6+	4.0

SP 98 SE 346 **9825 8177** **Aldwincle** **Block A**

Surface level (+74.4 m) +244 ft
Water not struck
203 mm percussion
June 1974

Waste 11.9 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Boulder Clay	Clay with chalk, stiff, khaki-brown, becoming blue-grey with fine sandy partings at depth	11.4	11.9
Oxford Clay	Clay, firm, dark grey	0.3+	12.2

SP 98 SE 347 **9912 8155** **Aldwincle** **Block A**

Surface level (+69.5 m) +228 ft
Water not struck
203 mm percussion
June 1974

Waste 8.8 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.1	0.1
Boulder Clay	Clay with chalk, light khaki-brown, becoming firm and grey-brown at depth	8.7	8.8
Oxford Clay	Clay, firm, olive-grey, with fossils	0.2+	9.0

TL 08 NW 177 **0100 8939** **Benefield** **Block A**

Surface level (+62.5 m) +205 ft
Water not struck
152 mm percussion
June 1975

Waste 8.1 m
Bedrock 1.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Boulder Clay	Clay, medium brown, sandy, with pebbles of chalk, flint and limestone. Becoming grey below 3.7 m	7.7	8.1
Oxford Clay	Clay, friable to firm, dark grey with shells	1.9+	10.0

TL 08 NW 178 0092 8881 Oundle **Block A**

Surface level (+68.0 m) +223 ft
Groundwater conditions not recorded
203 mm percussion
December 1974

Overburden 1.8 m
Mineral 1.8 m
Bedrock 2.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, stiff, medium brown, pebbly. Pebbles of chalk, quartz and flint	0.9	1.2
	Clay, very sandy, pebbly. Pebbles fine and medium of quartzite, flint and ironstone with shelly limestone	0.6	1.8
Glacial Sand and Gravel	Sandy gravel Gravel: fine, subangular, flint, quartz and ironstone Sand: medium, subangular, quartz, flint and ironstone	1.8	3.6
Oxford Clay	Clay, stiff, dark grey	2.2+	5.8

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
3	59	38	1.8–2.8	3	3	53	13	25	3
			2.8–3.6	2	2	34	12	36	14
			Mean	3	2	44	13	30	8

TL 08 NW 179 0210 8907 Oundle **Block A**

Surface level (+63.1 m) +207 ft
Water struck at (+55.9 m)
203 mm percussion
July 1974

Overburden 4.6 m
Mineral 2.6 m
Waste 1.9 m
Bedrock 0.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, medium brown becoming dark grey at depth. Contains pebbles of chalk and limestone	4.3	4.6
Glacial Sand and Gravel	Pebbly sand Gravel: fine, subangular to rounded, flint, ironstone and limestone Sand: medium, subangular to rounded, quartz with limestone and ironstone	2.6	7.2
Boulder Clay	Clay, stiff, dark grey-brown, pebbly	1.1	8.3
	Silt, clayey, dark blue, grey and light grey-brown, laminated	0.8	9.1
Oxford Clay	Clay, firm, light grey-green with shell debris	0.9+	10.0

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
9	71	20	4.6–5.3	14	5	44	18	18	1
			5.3–6.3	11	7	53	12	16	1
			6.3–7.2	3	8	56	9	22	2
			Mean	9	7	51	13	19	1

TL 08 NW 180 0309 8767 Oundle **Block B**

Surface level (+21.2 m) +69 ft
Water struck at (+18.4 m)
152 mm percussion
September 1975

Overburden 2.7 m
Mineral 2.8 m
Bedrock 1.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Alluvium	Clay, firm, sandy, with pebbles of ironstone, sandstone and flint, and with carbonaceous remains	2.3	2.7
River Gravel (First Terrace)	'Clayey' sandy gravel, 'very clayey' in top 1.0 m Gravel: fine with coarse, mainly angular, flint and limestone with ironstone, sandstone and quartz. Cobbles below 5.0 m. Trace shell fragments Sand: medium and coarse, composition similar to gravel	2.8	5.
Upper Lias Clay	Clay, stiff, dark blue-grey, containing some shells	1.1+	6.6

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
10	47	43	2.7–3.7	20	12	21	13	17	17
			3.7–4.7	6	6	25	20	36	7
			4.7–5.5	3	2	20	22	39	14
			Mean	10	7	22	18	30	13

TL 08 NW 181 0326 8648 Stoke Doyle **Block B**

Surface level (+24.4 m) +80 ft
Water struck at (+21.0 m)
203 mm percussion
July 1974

Overburden 3.5 m
Mineral 3.2 m
Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	1.2	1.2
Alluvium	Loam, sandy, pebbly	1.4	2.6
	Clay, orange-brown, pebbly	0.9	3.5
River Gravel (First Terrace)	'Clayey' sandy gravel Gravel: fine with coarse, subangular to rounded, flint and limestone with sandstone Sand: medium, subangular, flint and quartz with sandstone and limestone Fines: silt seam between 5.1 m and 5.3 m	3.2	6.7
Upper Lias Clay	Clay, stiff, blue-grey	0.8+	7.5

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
12	56	32	3.5–4.5	4	6	30	19	27	14
			4.5–5.1	4	6	26	16	31	17
			5.1–5.3	100*					
			5.3–6.7	9	12	47	10	11	11
			Mean	12	8	35	13	19	13

* Silt seam not sampled

TL 08 NW 182 0371 8567 Lilford-cum-Wigsthorpe **Block B**

Surface level (+23.1 m) +76 ft
Water struck at (+20.8 m)
203 mm percussion
May 1974

Overburden 2.3 m
Mineral 2.2 m
Waste 1.9 m
Bedrock 1.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Alluvium	Clay, silty, light khaki-brown, becoming medium grey at depth	2.1	2.3
River Gravel (First Terrace)	Sandy gravel Gravel: fine, subangular, flint with shell debris Sand: medium with coarse, black flint with trace quartz and shell debris	2.2	4.5
	Clay, dark grey, with sand partings	1.9	6.4
Upper Estuarine 'Series'	Silt and clay, variegated	1.1+	7.5

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
5	59	36	2.3–3.3	4	5	31	20	34	6
			3.3–4.5	5	7	34	20	29	5
			Mean	5	6	33	20	31	5

TL 08 NW 183 0404 8918 Oundle **Block B**

Surface level (+21.4 m) +70 ft
Water struck at (+19.5 m)
203 mm percussion
May 1974

Overburden 1.4 m
Mineral 4.7 m
Bedrock 0.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	1.4	1.4
River Gravel (First Terrace)	Gravel Gravel: fine, subangular, quartz, ironstone and flint Sand: fine to medium quartz with coarse subangular flint and rounded quartz	4.7	6.1
Upper Lias Clay	Clay, stiff, dark grey, silty	0.7+	6.8

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
2	47	51	1.4–2.4	8	17	22	12	29	12
			2.4–3.4	2	5	27	23	34	9
			3.4–4.4	1	2	13	17	42	25
			4.4–5.4	0	5	22	21	38	14
			5.4–6.1	2	2	24	19	38	15
			Mean	2	7	22	18	36	15

TL 08 NW 184 0489 8916 Oundle **Block B**

Surface level (+21.3 m) +70 ft
Water struck at (+19.0 m)
203 mm percussion
December 1974

Overburden 2.3 m
Mineral 2.1 m
Bedrock 1.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Head	Clay, brown, sandy, silty with pebbles of subangular flint and some carbonaceous material	2.1	2.3
River Gravel (First Terrace)	Sandy gravel Gravel: fine, angular and rounded, flint, quartz and sandstone Sand: fine to medium, flint and quartz	2.1	4.4
Upper Estuarine 'Series'	Silt and clay, blue-grey	1.6+	6.0

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}$–$\frac{1}{4}$	$+\frac{1}{4}$–1	+1–4	+4–16	+16–64
9	64	27	2.3–4.2	9	36	19	9	22	5
			4.2–4.4	No grading data available					

TL 08 NW 185 0447 8881 Oundle **Block B**

Surface level (+20.1 m) +66 ft
Water struck at (+18.3 m)
203 mm percussion
May 1974

Overburden 1.8 m
Mineral 3.7 m
Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Alluvium	Clay, light khaki-brown becoming greenish grey with depth. Contains some coarse flint, sand and coarse subangular flint pebbles	1.2	1.4
	Clay, dark grey, silty with fine flint pebbles	0.4	1.8
River Gravel (First Terrace)	Gravel Gravel: fine, subangular to rounded, quartz, limestone and quartzite, with flint and ironstone Sand: medium and coarse, subangular, flint and quartz with ironstone	3.7	5.5
Upper Lias Clay	Clay, dark blue-grey, silty with cement stone nodules	1.0+	6.5

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}$–$\frac{1}{4}$	$+\frac{1}{4}$–1	+1–4	+4–16	+16–64
1	49	50	1.8–2.8	1	3	23	22	41	10
			2.8–3.8	0	3	18	19	43	17
			3.8–5.5	3	3	25	25	34	10
			Mean	1	3	23	23	38	12

TL 08 NW 186 0476 8811 Oundle **Block B**

Surface level (+23.5 m) +77 ft
Water struck at (+21.5 m)
203 mm percussion
July 1974

Overburden 2.0 m
Mineral 1.5 m
Bedrock 1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil and made ground	1.2	1.2
Alluvium	Clay with pebbles of flint with ironstone and limestone	0.8	2.0
River Gravel (First Terrace)	Sandy gravel Gravel: fine with coarse, subangular, flint, limestone, quartzite, ironstone and sandstone, with quartz Sand: medium, angular and rounded, flint, quartz and ironstone	1.5	3.5
Upper Lias Clay	Clay, firm, blue-grey, silty	1.0+	4.5

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
7	50	43	2.0–3.0	9	8	39	11	25	8
			3.0–3.5	3	2	20	13	40	22
			Mean	7	6	33	11	30	13

TL 08 NW 187 0420 8764 Oundle **Block B**

Surface level (+21.3 m) +70 ft
Water struck at (+19.7 m)
203 mm percussion
July 1974

Overburden 1.6 m
Mineral 2.1 m
Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	1.6	1.6
River Gravel (First Terrace)	Gravel Gravel: fine with coarse, subangular, flint and limestone with ironstone Sand: medium to coarse, subangular, quartz, ironstone, flint and limestone	2.1	3.7
Upper Lias Clay	Clay, firm, blue-grey, silty	0.8+	4.5

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
3	46	51	1.6–2.6	3	2	20	21	34	20
			2.6–3.7	3	9	25	14	32	17
			Mean	3	6	23	17	33	18

TL 08 NW 188 0470 8748 Oundle **Block B**

Surface level (+28.9 m) +95 ft
Water not struck
203 mm percussion
December 1974

Overburden 0.9 m
Mineral 4.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.9	0.9
River Gravel (Second Terrace)	Gravel Gravel: fine, subangular to rounded flint and limestone with ironstone Sand: medium and coarse, rounded to subangular, flint and quartz Borehole abandoned because of rising gravel	4.3+	5.2

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}$–$\frac{1}{4}$	$+\frac{1}{4}$–1	+1–4	+4–16	+16–64
4	46	50	0.9–2.5	6	7	34	24	25	4
			2.5–4.6	1	2	11	17	56	13
			4.6–5.2	1	1	7	17	59	15
			Mean	4	4	21	21	41	9

TL 08 NW 189 0483 8693 Barnwell **Block B**

Surface level (+20.1 m) +66 ft
Water struck at (+17.8 m)
203 mm percussion
May 1974

Overburden 2.3 m
Mineral 2.9 m
Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Alluvium	Clay, light khaki-brown, iron stained	0.6	0.8
	Clay, firm, very light blue-grey	1.5	2.3
River Gravel (First Terrace)	Sandy gravel Gravel: fine, subangular to rounded, limestone, quartz, quartzite, flint and ironstone Sand: coarse with medium, subangular quartz, flint and ironstone	2.9	5.2
Upper Lias Clay	Clay, firm, medium grey	0.8+	6.0

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}$–$\frac{1}{4}$	$+\frac{1}{4}$–1	+1–4	+4–16	+16–64
2	50	48	2.3–3.3	2	2	15	25	46	10
			3.3–4.3	2	4	25	25	38	6
			4.3–5.2	2	4	20	30	35	9
			Mean	2	3	20	27	40	8

TL 08 NE 2 0535 8989 Tansor **Block B**

Surface level (+18.9 m) +62 ft
Water struck at (+15.9 m)
203 mm percussion
July 1974

Overburden 2.0 m
Mineral 1.6 m
Bedrock 1.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	2.0	2.0
River Gravel (First Terrace)	'Very clayey' sandy gravel Gravel: fine, subangular to rounded, flint, ironstone and limestone Sand: medium with fine, flint and quartz with ironstone	1.6	3.6
Upper Estuarine 'Series'	Clays, variegated, with silt and sand partings	1.4+	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
27	53	20	2.0–3.0	37	22	23	6	10	2
			3.0–3.6	10	7	38	12	13	10
			Mean	27	16	29	8	15	5

TL 08 NE 3 0573 8977 Tansor **Block B**

Surface level (+34.1 m) +112 ft
Water not struck
203 mm percussion
July 1974

Waste 2.0 m
Bedrock 2.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
River Gravel (Third Terrace)	Clay, red-brown	1.0	1.3
	Clay, stiff, light grey, with silt laminations	0.7	2.0
Oxford Clay	Clay, stiff, dark blue-grey	2.0+	4.0

TL 08 NW 190 0431 8674 Oundle **Block B**

Surface level (+21.0 m) +69 ft
Water not struck
203 mm percussion
May 1974

Overburden 1.3 m
Mineral 3.5 m
Waste 0.5 m
Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.8	0.8
	Clay, slightly sandy, rust brown	0.5	1.3
River Gravel (First Terrace)	Gravel Gravel: fine, subangular, flint, limestone, quartz and ironstone Sand: medium with coarse, flint, quartz and ironstone	3.5	4.8
	Clay, dark grey-brown, silty, with high organic content at base	0.5	5.3
Upper Lias Clay	Clay, stiff, dark blue-grey	0.8+	6.1

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
2	44	54	1.3–2.9	4	6	32	16	28	14	
			2.9–3.9	1	1	12	19	48	19	
			3.9–4.8	2	2	17	20	40	8	11
			Mean	2	4	22	18	37	14	3

TL 08 NE 4 0539 8787 Ashton **Block B**

Surface level (+20.7 m) +68 ft
Water struck at (+14.7 m)
203 mm percussion
July 1974

Waste 1.6 m
Bedrock 6.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.8	0.8
Alluvium	Clay, stiff, medium brown, with traces of fine sand	0.8	1.6
Blisworth Clay	Clays and silts, variegated	0.7	2.3
	Sand, clayey, fine, white with contorted clay and silt laminae	4.0	6.3
	Silt, coarse, light grey	1.3	7.6
?Blisworth Limestone	Limestone, hard, oolitic, silty	0.1+	7.7

TL 08 NE 5 0537 8716 Oundle **Block B**

Surface level (+20.7 m) +68 ft
Water struck at (+19.7 m)
203 mm percussion
July 1974

Overburden 1.0 m
Mineral 3.0 m
Bedrock 1.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	1.0	1.0
River Gravel (First Terrace)	Gravel Gravel: fine with coarse, subangular to rounded, flint, limestone and quartzite, with quartz and ironstone Sand: medium to coarse, subangular, flint with quartz, ironstone and limestone	3.0	4.0
Lower Estuarine 'Series'	Silt, light and dark grey, laminated	1.7+	5.7

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
3	38	59	1.0–2.0	3	5	26	17	33	16
			2.0–3.0	1	3	15	16	38	27
			3.0–4.0	4	3	10	20	45	18
			Mean	3	3	17	18	39	20

TL 08 NE 6 0564 8686 Oundle **Block B**

Surface level (+20.7 m) +68 ft
Water struck at (+18.7 m)
203 mm percussion
July 1974

Overburden 2.4 m
Mineral 4.5 m
Bedrock 1.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Alluvium	Clay, light brown, silty, becoming blue-grey at depth	2.0	2.4
River Gravel (First Terrace)	Gravel Gravel: fine, subangular, limestone and flint, with ironstone and quartzite Sand: coarse, subangular, flint	4.5	6.9
Lower Estuarine 'Series'	Silt, medium and dark grey, laminated, grading into a firm dark grey clay	1.2+	8.1

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
2	35	63	2.4–3.4	1	1	4	17	55	22
			3.4–4.4	2	2	8	25	52	11
			4.4–5.4	1	2	8	25	42	23
			5.4–6.9	3	2	12	30	41	12
			Mean	2	1	9	25	47	16

TL 08 NE 7 0599 8586 Barnwell

Surface level (+58.5 m) +192 ft
Water not struck
203 mm percussion
July 1974

Waste 8.5 m
Bedrock 1.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay with chalk, light khaki-brown, becoming medium grey with depth	8.2	8.5
Oxford Clay	Clay, firm, dark olive-grey, fossiliferous	1.5+	10.0

TL 08 NE 8 0620 8960 Tansor **Block B**

Surface level (+29.9 m) +98 ft
Water not struck
203 mm percussion
July 1974

Waste 1.7 m
Bedrock 0.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
River Gravel (Second Terrace)	Clay, silty, rust brown, sandy and pebbly, pebble content increases with depth	1.5	1.7
Cornbrash	Limestone, shelly	0.4+	2.1

TL 08 SW 20 0041 8191 Aldwincle **Block B**

Surface level (+41.5 m) +136 ft
Water not struck
203 mm percussion
June 1974

Overburden 0.6 m
Mineral 1.0 m
Bedrock 1.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
River Gravel (Third Terrace)	'Clayey' sandy gravel Gravel: fine, subangular to rounded, quartzite, flint, limestone and quartz Sand: medium, subangular, flint and quartz	1.0	1.6
Oxford Clay	Clay, stiff, silty, blue-grey	1.4+	3.0

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
16	47	37	0.6–1.6	16	10	23	14	29	8

TL 08 SW 21 0114 8290 Thorpe Achurch **Block B**

Surface level (+26.5 m) +87 ft
Water struck at (+24.8 m)
203 mm percussion
June 1974

Waste 4.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	1.7	1.7
River Gravel (First Terrace)	Sand clayey, red-brown, with scattered angular pebbles of flint	0.4	2.1
	No recovery	2.4	4.5
	Borehole abandoned		

TL 08 SW 22 0102 8229 Achurch **Block B**

Surface level (+26.5 m) +87 ft
Water struck at (+22.9 m)
203 mm percussion
June 1974

Overburden 3.7 m
Mineral 3.3 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Alluvium	Clay, firm, brown with sand and silt	1.2	1.5
	Clay, soft, dark grey, silty	2.2	3.7
River Gravel (First Terrace)	Gravel Gravel: fine with coarse, rounded quartzite, angular flint, subangular limestone with ironstone Sand: coarse to medium, subangular to rounded, quartz, flint and ironstone	3.3	7.0
Upper Estuarine 'Series'	Clay, light grey, silty	0.3+	7.3

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
5	34	61	3.7–4.7	4	3	17	24	41	11
			4.7–5.7	1	1	7	12	41	38
			5.7–7.0	8	5	15	18	28	26
			Mean	5	3	13	18	36	25

TL 08 SW 23 0110 8199 Aldwincle **Block B**

Surface level (+26.3 m) +87 ft
Water struck at (+25.2 m)
152 mm percussion
October 1975

Overburden 1.1 m
Mineral 4.0 m
Bedrock 0.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Head	Clay, medium brown and light grey, sandy in parts, with pebbles of flint	0.5	1.1
River Gravels (First Terrace)	'Clayey' sandy gravel Gravel: fine flint and ironstone with coarse limestone, flint and sandstone Sand: mainly medium, composition similar to gravel	4.0	5.1
Upper Estuarine 'Series'	Silt and clay, grey	0.9+	6.0

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}$–$\frac{1}{4}$	$+\frac{1}{4}$–1	+1–4	+4–16	+16–64
17	51	32	1.1–2.4	35	8	12	10	22	13
			2.4–3.4	13	8	29	24	21	5
			3.4–5.1	5	14	31	16	20	13
			Mean	17	10	25	16	21	11

TL 08 SW 24 0189 8177 Aldwincle **Block B**

Surface level (+26.8 m) +88 ft
Water struck at (+24.7 m)
203 mm percussion
June 1974

Overburden 2.1 m
Mineral 3.1 m
Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Alluvium	Clay, glutinous, blue-grey	1.7	2.1
River Gravel (First Terrace)	Gravel Gravel: fine angular flint, rounded ironstone and subangular limestone, with coarse rounded quartzite Sand: medium to coarse, subangular to rounded, flint, quartz and ironstone with quartzite and limestone	3.1	5.2
Upper Estuarine 'Series'	Clay, firm, grey, silty	0.8+	6.0

GRADING

Mean for deposit *percentages*			Depth below surface (m)	*percentages*					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}$–$\frac{1}{4}$	$+\frac{1}{4}$–1	+1–4	+4–16	+16–64
2	33	65	2.1–3.0	2	2	16	16	36	28
			3.0–4.0	2	2	16	18	40	22
			4.0–5.2	2	2	13	14	39	30
			Mean	2	2	15	16	38	27

TL 08 SW 25 0122 8155 Aldwincle **Block B**

Surface level (+31.4 m) +103 ft
Water not struck
203 mm percussion
June 1974

Waste 2.1 m
Bedrock 1.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
River Gravel (Second Terrace)	Clay, light yellow-brown, with pebbles of limestone, flint and quartz	0.7	1.3
	Clay, sandy	0.3	1.6
	Clay, light grey, with flint pebbles, and shell partings	0.5	2.1
Upper Estuarine 'Series'	Clay, firm, blue-grey, silty	1.2+	3.3

TL 08 SW 26 0254 8390 Pilton **Block B**

Surface level (+24.1 m) +79 ft
Water struck at (+22.2 m)
203 mm percussion
June 1974

Overburden 1.0 m
Mineral 2.8 m
Bedrock 1.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Alluvium	Clay, firm, light tan, silty, containing fine fragments of flint, and limestone ooliths	0.6	1.0
River Gravel (First Terrace)	'Clayey' gravel Gravel: fine, subangular to rounded, flint, limestone, ironstone, quartz and quartzite Sand: medium to coarse, subangular, flint and quartz with limestone and ironstone	2.8	3.8
Lower Estuarine 'Series'	Clay, firm, dark blue-grey, silty	1.3+	5.1

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
13	43	44	1.0–2.0	30	19	18	8	21	4
			2.0–3.0	2	2	15	18	45	18
			3.0–3.8	5	6	24	20	35	10
			Mean	13	9	19	15	33	11

TL 08 SW 27 0249 8361 Pilton **Block B**

Surface level (+24.7 m) +81 ft
Water not struck
203 mm percussion
June 1974

Waste 1.1 m
Bedrock 1.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Head	Mainly limestone fragments	0.9	1.1
Upper Estuarine 'Series'	Clay, firm, blue-grey, silty	1.9+	3.0

TL 08 SW 28 0201 8079 Titchmarsh **Block B**

Surface level (+30.5 m) +100 ft
Groundwater conditions not recorded
203 mm percussion
June 1974

Overburden 3.0 m
Mineral 2.6 m
Waste 0.7 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
River Gravel (First Terrace)	Silt, firm, iron stained, clayey, containing scattered flint pebbles	0.5	1.0
	Clay with sand	2.0	3.0
	'Clayey' sandy gravel Gravel: mainly fine, subangular, flint and quartz Sand: fine to medium, rounded quartz and subangular flint	2.6	5.6
Boulder Clay	Clay, friable, medium grey, containing chalk and flint pebbles	0.7	6.3
Oxford Clay	Clay, stiff, olive-grey, with shell fragments	0.2+	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
18	59	23	3.0–4.0	23	37	25	7	7	1
			4.0–5.6	14	17	25	12	20	12
			Mean	18	24	25	10	15	8

TL 08 SW 29 0243 8090 Titchmarsh **Block B**

Surface level (+26.5 m) +87 ft
Water struck at (+24.7 m)
203 mm percussion
June 1974

Overburden 1.6 m
Mineral 1.2 m
Bedrock 1.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Alluvium	Clay, stiff, light brown, sandy and pebbly	1.0	1.6
	'Very clayey' sandy gravel Gravel: fine, subangular, flint, limestone and ironstone Sand: mainly medium, flint and quartz with ironstone	1.2	2.8
Oxford Clay	Clay, firm, blue-grey, silty	1.7+	4.5

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
30	42	28	1.6–2.8	30	9	21	12	22	6

TL 08 SW 30 0312 8487 Lilford-cum-Wigsthorpe **Block B**

Surface level (+24.4 m) +80 ft
Water struck at (+21.5 m)
203 mm percussion
June 1974

Waste 1.8 m
Bedrock 3.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Alluvium	Clay, light brown, silty, with scattered flint pebbles	1.6	1.8
Lower Estuarine 'Series'	Clay, soft light blue-grey, silty. Becoming firm with depth	3.0+	4.8

TL 08 SW 31 0370 8128 Thorpe Achurch **Block B**

Surface level (+32.0 m) +105 ft
Water not struck
203 mm percussion
June 1974

Waste 0.2 m
Bedrock 3.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Oxford Clay	Clay, dark grey	3.9+	4.1

TL 08 SW 32 0312 8027 Titchmarsh **Block B**

Surface level (+30.5 m) +100 ft
Water struck at (+28.0 m)
203 mm percussion
June 1974

Overburden 0.7 m
Mineral 2.3 m
Bedrock 1.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.7	0.7
Alluvium	'Clayey' sandy gravel Gravel: mainly fine, subangular to rounded, flint, limestone and quartz Sand: medium to coarse, subangular, flint and quartz	2.3	3.0
Oxford Clay	Clay, stiff, medium brown, becoming dark grey with depth	1.3+	4.3

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
15	43	42	0.7–3.0	15	9	19	15	29	13

TL 08 SW 33 0473 8397 Barnwell **Block B**

Surface level (+36.6 m) +120 ft
Water not struck
203 mm percussion
June 1974

Waste 2.7 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	1.2	1.2
River Gravel (Third Terrace	Clay, sandy, with fine angular pebbles of flint, and flaggy fragments of limestone	1.1	2.3
	Clay, soft, glutinous	0.2	2.5
	Clay, pebbly, sandy	0.2	2.7
Cornbrash	Limestone	0.3+	3.0

TL 08 SW 34 0409 8360 Barnwell **Block B**

Surface level (+62.8 m) +206 ft
Water not struck
203 mm percussion
June 1974

Waste 8.2 m
Bedrock 0.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.1	0.1
Boulder Clay	Clay, dark grey-brown, containing pebbles of chalk and flint	8.1	8.2
Oxford Clay	Clay, dark olive-grey	0.4+	8.6

TL 08 SW 35 0460 8286 Lilford-cum-Wigsthorpe **Block B**

Surface level (+42.4 m) +139 ft
Water not struck
203 mm percussion
June 1974

Overburden 1.2 m
Mineral 1.1 m
Bedrock 2.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
River Gravels (Third Terrace)	Clay, becoming increasingly sandy with depth	0.8	1.2
	'Very clayey' sand Sand: fine, quartz and flint	1.1	2.3
Oxford Clay	Clay, firm, olive-grey, silty	2.0+	4.3

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
37	62	1	1.2–2.3	37	60	2	0	0	1

APPENDIX G

LIST OF WORKINGS

	Grid reference	*Deposit*
ACTIVE		
Thrapston	SP 995 800	First Terrace
Tansor	TL 046 920	First Terrace
Ferry Meadows, Castor	TL 140 975	First Terrace
ABANDONED		
Elton	TL 078 845	Second Terrace
Brigstock	SP 953 848	Glacial Sand and Gravel
Oundle	TL 037 869	First Terrace
Wansford	TL 082 992	First Terrace

APPENDIX H

CONVERSION TABLE, METRES TO FEET (to nearest 0.5 ft)

m	ft	m	ft	m	ft	m	ft	m	ft
0.1	0.5	6.1	20	12.1	39.5	18.1	59.5	24.1	79
0.2	0.5	6.2	20.5	12.2	40	18.2	59.5	24.2	79.5
0.3	1	6.3	20.5	12.3	40.5	18.3	60	24.3	79.5
0.4	1.5	6.4	21	12.4	40.5	18.4	60.5	24.4	80
0.5	1.5	6.5	21.5	12.5	41	18.5	60.5	24.5	80.5
0.6	2	6.6	21.5	12.6	41.5	18.6	61	24.6	80.5
0.7	2.5	6.7	22	12.7	41.5	18.7	61.5	24.7	81
0.8	2.5	6.8	22.5	12.8	42	18.8	61.5	24.8	81.5
0.9	3	6.9	22.5	12.9	42.5	18.9	62	24.9	81.5
1.0	3.5	7.0	23	13.0	42.5	19.0	62.5	25.0	82
1.1	3.5	7.1	23.5	13.1	43	19.1	62.5	25.1	82.5
1.2	4	7.2	23.5	13.2	43.5	19.2	63	25.2	82.5
1.3	4.5	7.3	24	13.3	43.5	19.3	63.5	25.3	83
1.4	4.5	7.4	24.5	13.4	44	19.4	63.5	25.4	83.5
1.5	5	7.5	24.5	13.5	44.5	19.5	64	25.5	83.5
1.6	5	7.6	25	13.6	44.5	19.6	64.5	25.6	84
1.7	5.5	7.7	25.5	13.7	45	19.7	64.5	25.7	84.5
1.8	6	7.8	25.5	13.8	45.5	19.8	65	25.8	84.5
1.9	6	7.9	26	13.9	45.5	19.9	65.5	25.9	85
2.0	6.5	8.0	26	14.0	46	20.0	65.5	26.0	85.5
2.1	7	8.1	26.5	14.1	46.5	20.1	66	26.1	85.5
2.2	7	8.2	27	14.2	46.5	20.2	66.5	26.2	86
2.3	7.5	8.3	27	14.3	47	20.3	66.5	26.3	86.5
2.4	8	8.4	27.5	14.4	47	20.4	67	26.4	86.5
2.5	8	8.5	28	14.5	47.5	20.5	67.5	26.5	87
2.6	8.5	8.6	28	14.6	48	20.6	67.5	26.6	87.5
2.7	9	8.7	28.5	14.7	48	20.7	68	26.7	87.5
2.8	9	8.8	29	14.8	48.5	20.8	68	26.8	88
2.9	9.5	8.9	29	14.9	49	20.9	68.5	26.9	88.5
3.0	10	9.0	29.5	15.0	49	21.0	69	27.0	88.5
3.1	10	9.1	30	15.1	49.5	21.1	69	27.1	89
3.2	10.5	9.2	30	15.2	50	21.2	69.5	27.2	89
3.3	11	9.3	30.5	15.3	50	21.3	70	27.3	89.5
3.4	11	9.4	31	15.4	50.5	21.4	70	27.4	90
3.5	11.5	9.5	31	15.5	51	21.5	70.5	27.5	90
3.6	12	9.6	31.5	15.6	51	21.6	71	27.6	90.5
3.7	12	9.7	32	15.7	51.5	21.7	71	27.7	91
3.8	12.5	9.8	32	15.8	52	21.8	71.5	27.8	91
3.9	13	9.9	32.5	15.9	52	21.9	72	27.9	91.5
4.0	13	10.0	33	16.0	52.5	22.0	72	28.0	92
4.1	13.5	10.1	33	16.1	53	22.1	72.5	28.1	92
4.2	14	10.2	33.5	16.2	53	22.2	73	28.2	92.5
4.3	14	10.3	34	16.3	53.5	22.3	73	28.3	93
4.4	14.5	10.4	34	16.4	54	22.4	73.5	28.4	93
4.5	15	10.5	34.5	16.5	54	22.5	74	28.5	93.5
4.6	15	10.6	35	16.6	54.5	22.6	74	28.6	94
4.7	15.5	10.7	35	16.7	55	22.7	74.5	28.7	94
4.8	15.5	10.8	35.5	16.8	55	22.8	75	28.8	94.5
4.9	16	10.9	36	16.9	55.5	22.9	75	28.9	95
5.0	16.5	11.0	36	17.0	56	23.0	75.5	29.0	95
5.1	17	11.1	36.5	17.1	56	23.1	76	29.1	95.5
5.2	17	11.2	36.5	17.2	56.5	23.2	76	29.2	96
5.3	17.5	11.3	37	17.3	57	23.3	76.5	29.3	96
5.4	17.5	11.4	37.5	17.4	57	23.4	77	29.4	96.5
5.5	18	11.5	37.5	17.5	57.5	23.5	77	29.5	97
5.6	18.5	11.6	38	17.6	57.5	23.6	77.5	29.6	97
5.7	18.5	11.7	38.5	17.7	58	23.7	78	29.7	97.5
5.8	19	11.8	38.5	17.8	58.5	23.8	78	29.8	98
5.9	19.5	11.9	39	17.9	58.5	23.9	78.5	29.9	98
6.0	19.5	12.0	39.5	18.0	59	24.0	78.5	30.0	98.5

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INSTITUTE OF GEOLOGICAL SCIENCES

INDUSTRIAL MINERALS ASSESSMENT UNIT

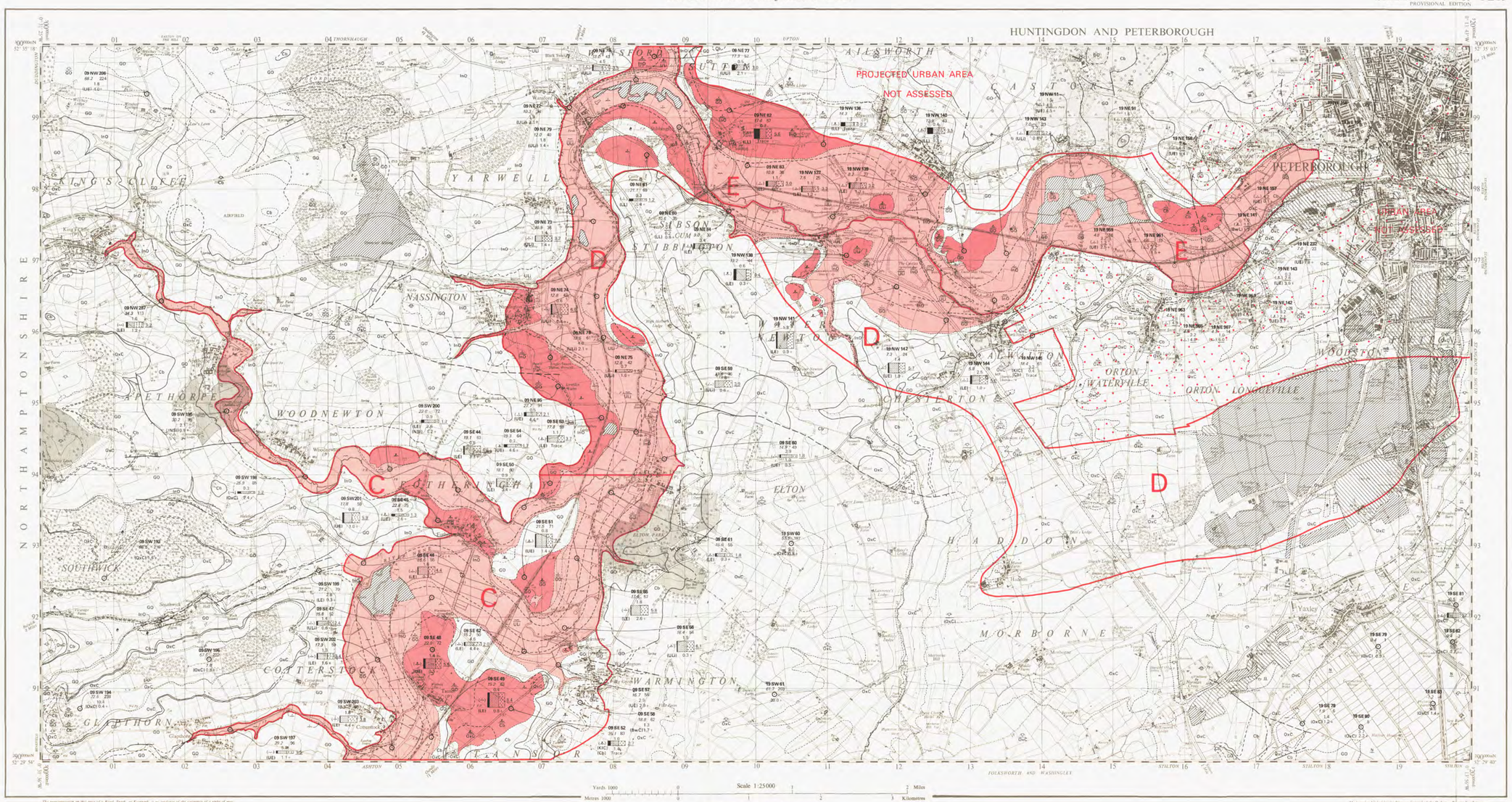
THE SAND AND GRAVEL RESOURCES OF THE AREA SOUTH-WEST OF PETERBOROUGH, CAMBRIDGESHIRE AND NORTHAMPTONSHIRE. SHEET 1.

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

ORDNANCE SURVEY
SHEET TL09 & TL19
PROVISIONAL EDITION

HUNTINGDON AND PETERBOROUGH

PROJECTED URBAN AREA
NOT ASSESSED



Scale 1:25000

Yards 1000 0 1 2 Miles

Metres 1000 0 1 2 3 Kilometres

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

Published by the Director General of the Ordnance Survey, Southampton.

Original One-inch Geological Survey published in 1872 and 1877.
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T.Whitehead, H.G. Dines, G.A. Kellaway and G.W. Green, District Geologists.
Partly included in One-inch New series Geological Sheets 157 and 171 and 1:25 000 Peterborough Sheet, published 1967,1969 and 1972, respectively
Worked out brick clay and sand and gravel areas shown to 1976.
Worked out ironstone areas shown to 1961.

Sand and Gravel Survey by A.M. Harrison and S.J. Booth, 1975-76.
R.G. Thurrell, Head, Industrial Minerals Assessment Unit.

1:25,000 Sand and Gravel Resources Sheet published 1981.
G.M. Brown, D.Sc., F.R.S., Director, Institute of Geological Sciences.
100 81

The GRID lines on this sheet are at 1 Kilometre interval.
Heights are in feet above Mean Sea Level at Newlyn.
(conversion factor 0.3)
1 square inch on this map represents 1944.8 acres on the ground.

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 at a whole or each Resource Block are given in the Report.

Compiled from 6" sheets last revised 1954-1955
Orbit partial systematic revision 1938-50 has been incorporated.
Major roads revised 1966-71

SK 80	SK 90 157	TF 00	TF 10	TF 20 198
SP 89	SP 99	TL 09 SHEET 1	TL 19	TL 29
SP 88	SP 98 171	TL 08 SHEET 2	TL 18	TL 28 172
SP 87	SP 97	TL 07	TL 17	TL 27

Diagram showing the relation of Sheets 1 and 2 with the National Grid 1:25 000 Sheets the 1:50 000 Geological Sheets 157 and 171, the New Series One-inch Geological Sheets 198 and 172, and the Two and a Half-inch Peterborough Geological Sheet (shaded)

Made and published for the Institute of Geological Sciences by the Director General of the Ordnance Survey, Southampton.

THE SAND AND GRAVEL RESOURCES OF THE AREA SOUTH-WEST OF PETERBOROUGH, CAMBRIDGESHIRE AND NORTHAMPTONSHIRE. SHEET 1.

60 (SHEET 1)

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

EXPLANATION OF SYMBOLS AND ABBREVIATIONS (SHEET 1)

DRIFT

- Alluvium- mainly clay. A-40
- Shell Marl- calcareous plant detritus. SM-3
- Nordelph Peat NP-1
- First Terrace 1T-23
- Second Terrace 2T-16
- Third Terrace 3T-14
- Terrace undifferentiated TU-3

(gravels and sands of the River Nene and its tributaries.)

- Head- pebbly clay. H-26
- Woodston Beds- clays and soft mudstones with seams of gravel and shelly sand. W-1
- Boulder Clay- grey,brown-weathering clay, stony. BC-21
- Glacial Sand and Gravel- sands and gravels. GS-33
- Glacial Lake Deposits- laminated silts and clays with erratics. GL-3

HOLOCENE / PLEISTOCENE — QUATERNARY

SOLID

- OxC Oxford Clay- incorporating Kellaways Clay (KIC) and Kellaways Sand (KIS).
- Cb Combrash- hard shelly limestone.
- GO Great Oolite Series- incorporating Upper Estuarine 'Series' (UE), Blisworth Limestone (BwL) and Blisworth Clay (BwC).
- InO Inferior Oolite- incorporating Northampton Sand Ironstone (NSI), Lower Estuarine Series (LE) and Lincolnshire Limestone (LL).
- UU Upper Lias- blue-grey clay.

JURASSIC

- Made ground; including refuse dumps, fly-ash dumps and large railway embankments MG-4
- Worked-out ground (sand and gravel,brick clay and ironstone) WO-15

BOUNDARY LINES

- Geological boundary, Drift
- Geological boundary, Solid
- Fault at surface, crossmark indicates downthrow side
- Inferred boundary between recognised categories of deposits
- Resource Block boundary

Broken lines denote uncertainty

BOREHOLE DATA

SITE LOCATIONS

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

I.M.A.U. BOREHOLES

Borehole Registration Number → 19 NW 142
Borehole Site
Geological Classification (Not all boreholes proved sub-drift bedrock as mapped)
Grading Diagram
Thicknesses in metres

7.2 — Surface level in metres and feet above and below O.D.(Newlyn)
24
1.4 — Overburden
(UE) 5.7 — Mineral (sand and gravel)
(UE) 1.9+ — Bedrock

Notes:
(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 figures in italics are the metric conversions of the measurements recorded in feet.
(iv) The Geological Classification is given only for mineral and bedrock.

Borehole Registration Number

Each I.M.A.U. borehole is identified by a Registration Number e.g.19 NW 142. The first number and letters refer to the quarter sheet and the second number to the I.G.S. serial number for that quarter. The unique designation for borehole 19 NW 142 is TL 19 NW 142.

Grading Diagrams

Each grading diagram shows the mean partical size distribution of a distinct deposit of mineral

Sand (-1 to 4mm)
Fines (-1 to 0mm) Gravel (-1 to 4mm)

The height of the diagram is proprionsal to the mineral thickness.
The widths of the divisions show the proportions of, **Fines, Sand** and **Gravel**

OTHER BOREHOLES

The layout of information is the same as for I.M.A.U. boreholes, although data available may not be as comprehensive. They are registered in the same series as I.M.A.U. boreholes. The final depth of deep boreholes is given in metres above or below (+) (-) O.D. (Newlyn).

CATEGORIES OF DEPOSIT

- Exposed mineral CAT-E6
- Continuous or almost continuous spreads of mineral beneath overburden CAT-C2
- Sand and gravel either not potentially workable (see Report) or absent CAT-A2
- Sand and gravel not assessed CAT-N1

RESOURCE BLOCKS

For the purpose of assessment, the mineral is divided into Resource Blocks (see Report). Each is designated by a letter.

Detailed records may be consulted on application to the Head, Industrial Minerals Assessment Unit, Institute of Geological Sciences, Keyworth, Nottingham NG12 5GG.

INSTITUTE OF GEOLOGICAL SCIENCES

INDUSTRIAL MINERALS ASSESSMENT UNIT

THE SAND AND GRAVEL RESOURCES OF THE AREA SOUTH-WEST OF PETERBOROUGH, CAMBRIDGESHIRE AND NORTHAMPTONSHIRE. SHEET 2.

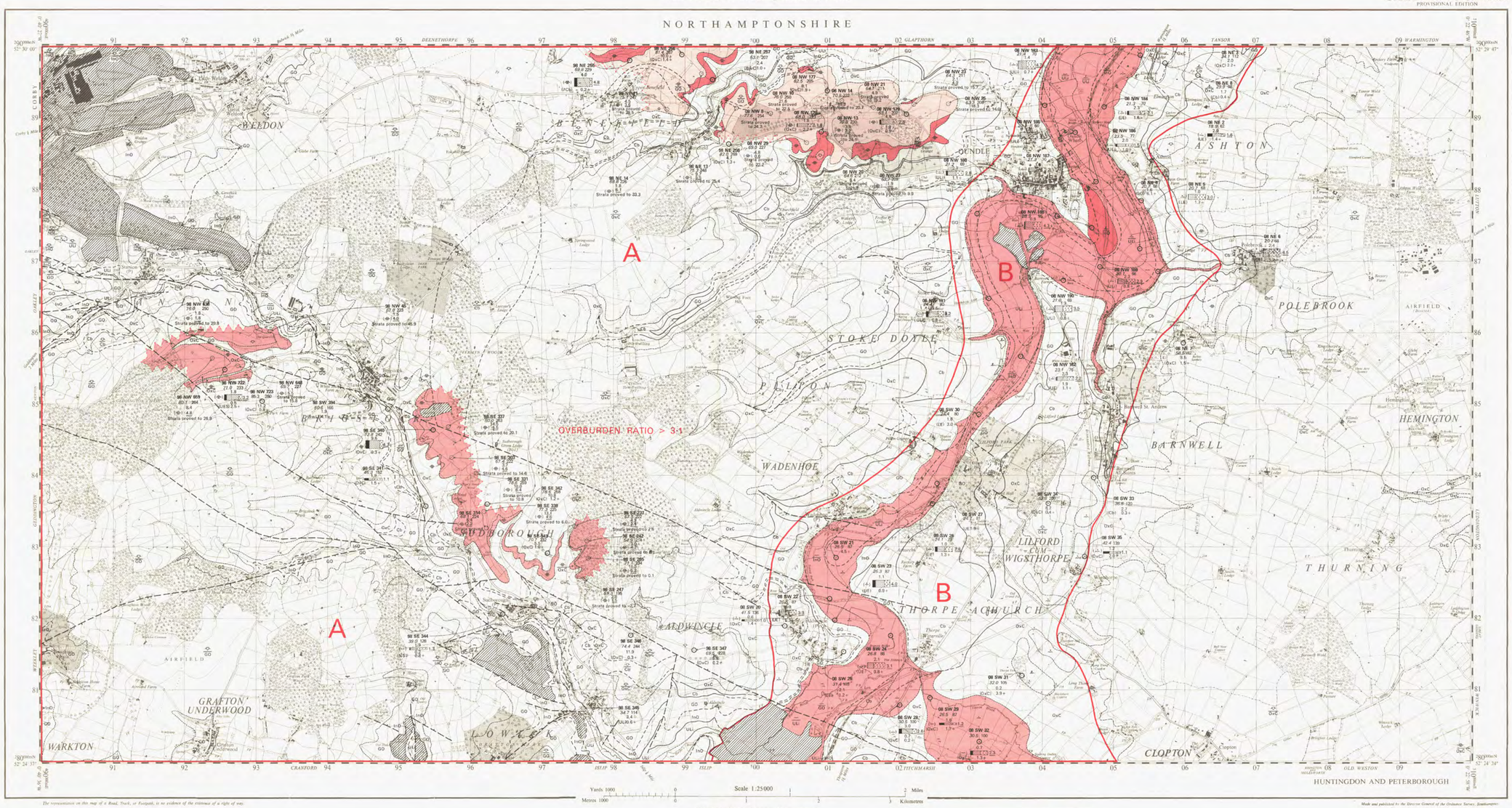
Scale 1:25 000 or about 2½ Inches to 1 Mile

ORDNANCE SURVEY
SHEET SP98 & TL08
PROVISIONAL EDITION

THE SAND AND GRAVEL RESOURCES OF THE AREA SOUTH-WEST OF PETERBOROUGH, CAMBRIDGESHIRE AND NORTHAMPTONSHIRE. SHEET 2.

60 (SHEET 2)

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



Yards 1000 0 Scale 1:25000 2 Miles
Metres 1000 0 1 2 3 Kilometres

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

The GRID used on this sheet is at 1 Kilometre interval.
Heights are in feet above Mean Sea Level at Newlyn.
Figures such as this may represent 99 639 acres on the ground.

Compiled from 6" sheets last fully revised 1899-1924. Other partial systematic revision 1937-50 has been incorporated.

Made and published by the Director General of the Ordnance Survey, Southampton.

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,particulary 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.

Original One – Inch Geological Survey published in 1854,1872 and 1877.
Six – Inch Geological Survey by J.H.Taylor, P.E. Prentice and P.A.Sabine in 1939–45 ; T.H. Whitehead,District Geologist.
Included in One – Inch New Series Geological Sheet 171, published in 1949.
Worked out sand and gravel areas shown to 1975.Worked out ironstone areas shown to 1960.

Sand and Gravel Survey by A.M.Harrisson,A.H.Fowcett and J.W.Merritt,1974 – 75.
R.G.Thurrell , Head, Industrial Minerals Assessment Unit.

1:25 000 Sand and Gravel Resources Sheet published 1981.
G.M. Brown, D.Sc, F.R.S., Director, Institute of Geological Sciences.

EXPLANATION OF SYMBOLS AND ABBREVIATIONS (SHEET 2)

DRIFT

	Alluvium - mainly clay	A-40	HOLOCENE
	First Terrace	1T-23	PLEISTOCENE
	Second Terrace	2T-16	
	Third Terrace	3T-14	
	Boulder Clay - grey,brown - weathering clay,stony	BC-21	QUATERNARY
	Glacial Sand and Gravel - gravel and sandy gravel,'very clayey' in parts	GS-13	

SOLID

OxC	Oxford Clay - incorporating Kellaways Clay (KIC) and Kellaways Sand (KIS)	JURASSIC
Cb	Cornbrash - hard shelly limestone	
GO	Great Oolite 'Series' - incorporating Upper Estuarine 'Series'(UE) ,Blisworth Limestone (BwL) and Blisworth Clay (BwC)	
InO	Inferior Oolite - incorporating Northampton Sand Ironstone (NSI), Lower Estuarine 'Series' (LE) and Lincolnshire Limestone (LL)	
ULl	Upper Lias - blue-grey clay	
	Worked-out Ground (sand and gravel and ironstone)	WO-16

BOUNDARY LINES

- Geological boundary,Drift
- Geological boundary ,Solid
- Fault at surface,crossmark indicates downthrow side
- Inferred boundary between recognised categories of deposits
- Resource Block boundary

Broken lines denote uncertainty

BOREHOLE DATA

SITE LOCATIONS

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

I.M.A.U. BOREHOLES

Borehole Registration Number — 08 NW 190
Borehole Site — 21.0 (+) — Surface Level in metres and feet above O.D. (Newlyn)
Geological Classification — (As) — Overburden
(Not all boreholes proved sub-drift bedrock as mapped) — 0.5 — Mineral (sand and gravel)
(ULl) — 0.6+ — Waste
Grading Diagram — Bedrock
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 figures in *italics* are the metric conversions of the measurements recorded in feet.
(iv) The Geological Classification is given only for mineral and bedrock.

Borehole Registration Number

Each I.M.A.U. borehole is identified by a registration number e.g.08 NW 190.The first number and letters refer to the quarter sheet,and the second number to the L.G.S. serial number for that quarter. The unique designation for borehole 08 NW 190 is TL 08 NW 190.

Grading Diagrams

Each grading diagram shows the mean partical size distribution of a distinct deposit of mineral

Sand (+ 1/16 -4mm) — Fines (- 1/16 mm) — Gravel (+ -4mm)

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 as I.M.A.U. boreholes. The final depth of deep boreholes is given in metres above or below O.D. (Newlyn).

CATEGORIES OF DEPOSIT

- Exposed mineral. CAT-E6
- Continuous or almost continuous spreads of mineral beneath overburden. CAT-C2
- Discontinuous spreads of mineral beneath overburden. CAT-D1
- Sand and gravel either not potentially workable(see Report)or absent. CAT-A2

RESOURCE BLOCKS

For the purpose of assessment the mineral is divided into Resource Blocks (see Report). Each is designated by a letter.

Detailed records may be consulted on application to the Head, Industrial Minerals Assessment Unit, Institute of Geological Sciences, Keyworth, Nottingham NG12 5GG.

SK 80	SK 90	TF 00	TF 10		TF 20
107			108		
SP 89	SP 99	TL 09	TL 19		TL 29
		SHEET 1			
		SHEET 2			
SP 88	SP 98	TL 08	TL 18		TL 28
171			172		
SP 87	SP 97	TL 07	TL 17		TL 27

Diagram showing the relation of Sheets 1 and 2 with the National Grid 1:25 000 Sheets, the 1:50 000 Geological Sheets 157 and 171, the New Series One-Inch Geological Sheets 158 and 172, and the Two and a Half-Inch Peterborough Geological Sheet (shaded)

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