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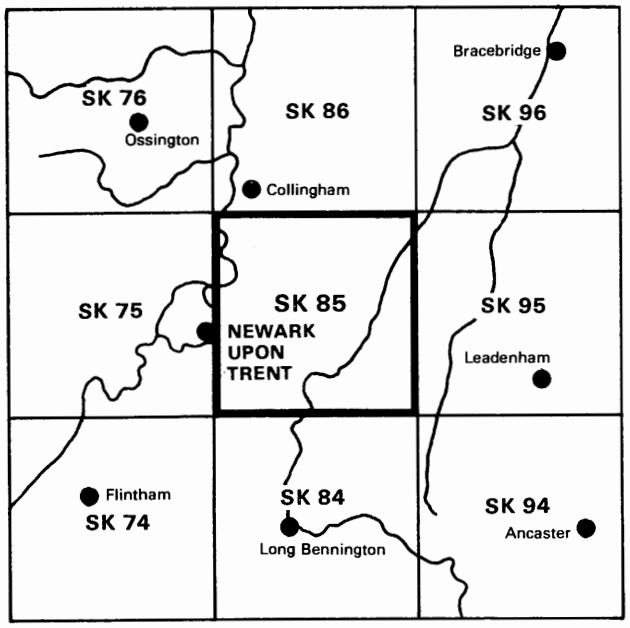

The sand and gravel resources of the country east of Newark upon Trent, Nottinghamshire

Description of 1:25 000 resource sheet SK 85

J. R. Gozzard, BSc

London Her Majesty's Stationery Office 1976

The Institute of Geological Sciences was formed by the incorporation of the Geological Survey of Great Britain and the Museum of Practical Geology with Overseas Geological Surveys and is a constituent body of the Natural Environment Research Council.

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

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

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

The survey was conducted by Mr J.R. Gozzard, under the supervision of Mr D. Price and assisted by Mr J.H. Lovell who helped in the drilling and sampling programme. The work, which was controlled from the sub-unit based in Leeds (J.H. Hull, Officer-in-Charge), is based on a one-inch scale geological survey published in 1886 on Old Series Lincoln Sheet 83, republished with minor amendments on 1:50 000 scale New Series Lincoln Sheet (114) in 1973, and a six-inch scale geological survey carried out in 1907-1908 and published on New Series one-inch Ollerton and Nottingham (113 and 126) sheets. The geological lines, now presented at the 1:25 000 scale incorporate minor amendments resulting in part from the present work.

Mr J.W. Gardner, CBE (Land Agent) has been responsible for negotiating access to land for drilling. The ready cooperation of landowners and tenants in this work is gratefully acknowledged.

Kingsley Dunham
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1 December 1975

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Dr A. W. Woodland succeeded Sir Kingsley Dunham as Director on 1 January 1976.

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Summary

The geological maps of the Institute of Geological Sciences, pre-existing borehole information, and 50 boreholes drilled for the Mineral Assessment Unit form the basis of the assessment of sand and gravel resources in the area east of Newark upon Trent, Nottinghamshire.

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 map is divided into five resource blocks containing between 2.8 and 12.8 km² of potentially workable sand and gravel. For the blocks assessed statistically the geology of the deposits is described and the mineral-bearing area, the mean thickness of overburden and mineral, and the mean grading of the mineral are stated. Detailed borehole data are given. The geology, the position of the boreholes and the outlines of the resource blocks are shown on the accompanying map.

Sommaire

Les sources des renseignements qui constituent les bases de l'évaluation des ressources en sable et en gravier dans la région de Newark upon Trent, Nottinghamshire, comprennent les cartes géologiques de l'Institute of Geological Sciences, des données obtenues des trous de sonde déjà en existence, et de 50 trous de sonde forés pour le Mineral Assessment Unit.

Dans la région tous les dépôts qui pourraient être exploités pour le sable et le gravier ont été étudiés et on s'est servi d'une méthode statistique simple pour en évaluer le volume. Les évaluations de volume sont tenues d'être symétriquement à 95 pour cent exactes.

La carte 1:25 000 est divisée en cinq blocs de ressource avec d'entre 2.8 à 12.8 km² de sable et de gravier. Pour les blocs évalués statistiquement on décrit la géologie des dépôts et on donne l'étendue du terrain minéralisé, l'épaisseur moyenne de recouvrement et de minéral, et le triage moyen de minéral. On présente des données détaillées des trous de sonde. La situation des trous de sonde, la géologie et les profils des blocs de ressource sont montrés sur la carte.

Zusammenfassung

Die geologischen Karten vom Institute of Geological Sciences, vorherexistierende Information über Bohrlöcher, und 50 für die Mineral Assessment Unit gebohrten Bohrlöcher, bilden den Grund für die Einschätzung der Sand- und Schottermittel im Newark upon Trent Gebiet, Nottinghamshire.

Alle Ablagerungen im Gebiet, die möglich bearbeitbar für Sand und Schotter sind, wurden untersucht, und eine einfache statistische Methode wurde benutzt, um das Volumen zu schätzen. Man gibt die Zuverlässigkeit der Volumenschatzungen mit symmetrischen 95 Prozent Vertrauensgrenzen.

Man teilt die 1:25 000 Karte in 5 Mittelsblöcke, die zwischen 2.8 und 12.8 km² von Sand und Schotter umfassen. Man beschreibt die Geologie der Ablagerungen für die statistisch bewerteten Blöcke. Das mineralhaltige Gebiet, die mittlere Dicke von Überlastung und Mineral, und die mittlere Klassifizierung von Mineral werden bestimmt Ausführliche Bohrlöcherdaten werden auch gegeben. Die Geologie, die Lage der Bohrlöcher und die Skizzen der Blöcke werden auf der Begleitkarte gezeigt.

The sand and gravel resources of the country east of Newark upon Trent, Nottinghamshire

Description of 1:25 000 resource sheet SK 85

J. R. GOZZARD

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 geological evidence. The sites available for inspection, measurement, and sampling are too widely spaced to permit the mineral bodies to be outlined completely or the grade established throughout" (Bureau of Mines and Geological Survey, 1948, p. 15).

If 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 BS sieve, about 1/16 mm) should not exceed 40 per cent.
d. The deposit must 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.

If a deposit of sand and gravel broadly meets these criteria, it 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 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 grade material, are placed at 1/16 mm and 4 mm respectively (see Appendix C).

The volume and other characteristics are assessed within resource blocks, each of which, ideally, contains approximately 10 km^2 of sand and gravel. No account is taken of any factors, for example, roads, villages and 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.

Description of resource sheet SK 85

GENERAL

The area described lies to the east of Newark upon Trent (see Fig. 1) and is bisected by the watershed separating the drainage systems of the River Trent and River Witham. The Trent flows northwards from Newark in a broad shallow valley in the north-west part of the area. Canalised for part of its length, the Witham also flows northwards along the eastern margin of the district. The land falls away on either side of the watershed from 113 ft (34 m) OD and 119 ft (36 m) OD at Danethorpe Hill and Coddington respectively to about 25 ft (8 m) OD along the Trent and 45 ft (14 m) OD along the Witham.

The area is almost entirely agricultural except in and around Newark where many services and some light industry are to be found.

GEOLOGY

The geological sequence is summarised in Table 1, where deposits are listed as far as possible in order of increasing age. The relationships of the deposits are illustrated in the schematic cross-section, Fig. 2, which is drawn at right angles to the strike of the solid rocks.

Table 1. Stratigraphy.

DRIFT	
Recent and Pleistocene	Alluvium
	River Gravel (Floodplain Terrace)
	Older River Gravel (Beeston Terrace)
	Glacial Sand and gravel (Hilton Terrace)
SOLID	
Jurassic	Lower Lias
Permo-Triassic	Rhaetic
	Keuper Marl

SOLID

Keuper Marl

The uppermost 61 m (200 ft) of this formation outcrops over the western third of the area. It consists of reddish brown mudstones with thin beds of dolomitic sandstone overlain by greenish grey mudstones (Tea Green Marls). Except for small areas near South Collingham and Newark it is concealed by superficial deposits.

Rhaetic

Overlying the Keuper are Rhaetic strata averaging about 9 m (30 ft) in thickness. They comprise Rhaetavicula [Pteria] contorta Shales or Westbury Beds, consisting of dark grey to black fissile mudstones, overlain by Cotham Beds, which are bluish grey and greenish grey mudstones containing sporadic bands of compact argillaceous limestone.

Lower Lias

These beds succeed the Rhaetic and are found in the eastern two-thirds of the area. They comprise dark blue and grey shales and mudstones intercalated with thin argillaceous limestones. The lowest subdivision (the Hydraulic Limestone) attains its maximum thickness at Beacon Hill [813 538] near Newark and forms a prominent scarp. Fossils are abundant and include bivalves and crinoids some of which have weathered out and been incorporated into the basal layers of the overlying gravel deposits.

DRIFT

Glacial Sand and Gravel

These deposits include pebbly sands, sandy gravels and gravels which in places may be 'clayey' (see Appendix C). They cap the hills at Norton Disney, Danethorpe and Coddington, and are shown as Glacial Sand and Gravel on the Institute's maps. However, Straw (1963) correlated them with the Hilton Terrace of the middle and upper Trent, for which a fluvioglacial origin has been suggested by Stevenson and Mitchell (1955), whereas Pocock (1929) and Clayton (1953) have advocated a purely fluvial derivation. These relatively high-level gravels are thought to have formed when the Trent flowed north-eastwards to and through the Lincoln Gap, its former course through the Ancaster Gap and any outlet to the north being blocked by ice (Posnansky, 1960; Straw, 1963).

Older River Gravel

Under this heading are considered some of the Plateau Gravel of the Primary Survey, shown as Older River Sand and Gravel on the 1973 1:50 000 edition of the Lincoln Sheet (114) and the Older River Gravel of later surveyors working in the western part of the district. These deposits are gravels and sandy gravels and cover most of the central part of the district at a general height of about 55 ft (17 m) OD. Straw (1963) correlated them with the Beeston Terrace which is well developed in the middle and upper parts of the Trent Valley. He assigned the aggradation of this terrace to a period when ice caused the diversion of the Trent through the Lincoln Gap. The relative heights of terraces within the district are shown in Fig. 3.

River Gravel

Considered by Straw (1963) to be the downstream equivalent of the Floodplain Terrace of the River Trent, these deposits occur in two

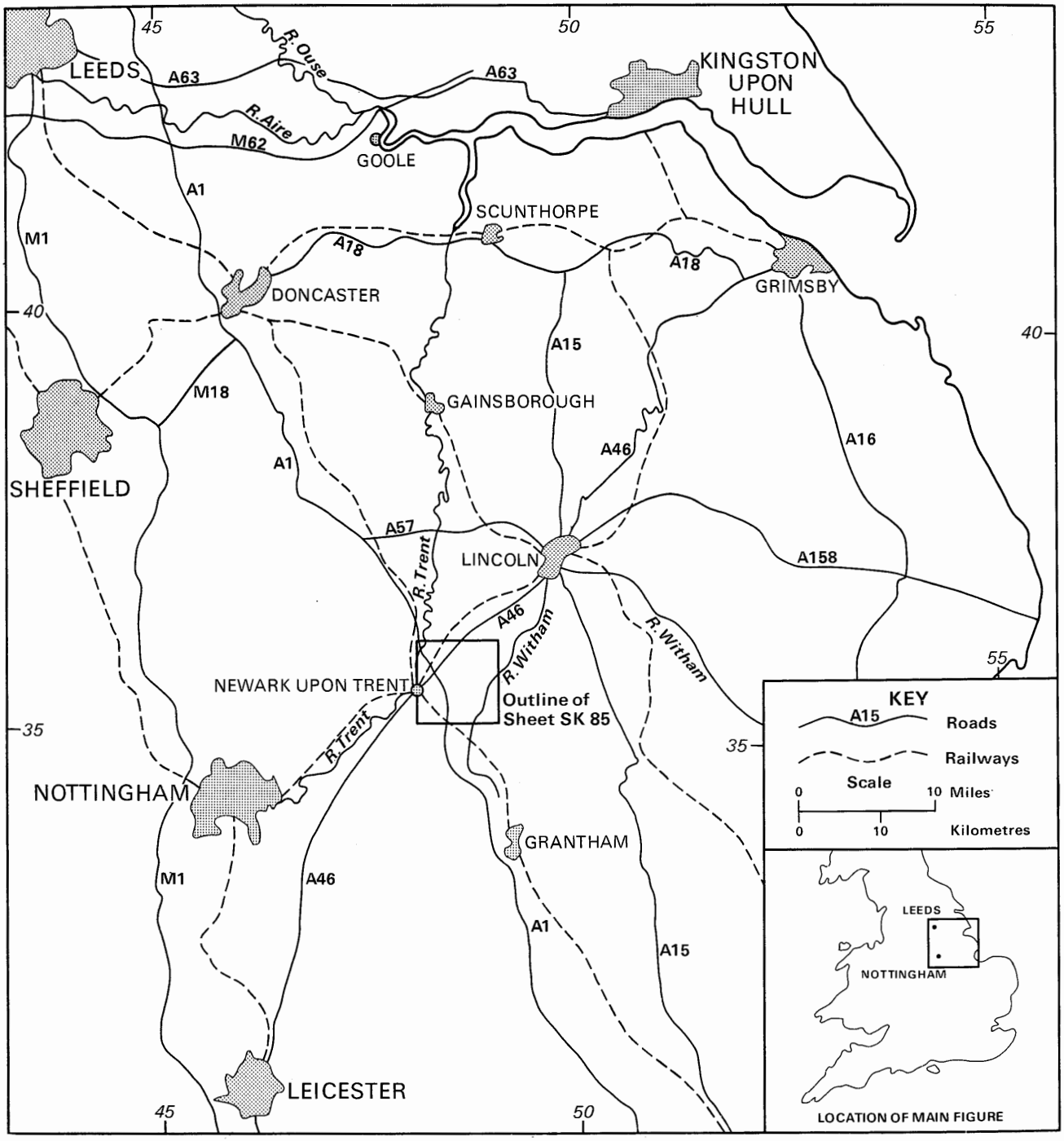


Fig. 1. Map showing the location of sheet SK 85

widely separate areas, each associated with a different river system.

North of Newark, gravels and sandy gravels, mainly covered by alluvium, occur, along the present course of the River Trent at a height of about 25 ft (8 m) OD. These deposits are considered to have been laid down by the Trent when northwards drainage was again impeded by ice.

In the south-east, near Fenton, thin sands and pebbly sands associated with clays and silts are found at a height of about 50 ft (15 m) OD. Though shown on the Lincoln Geological Sheet as Older River Sand and Gravel, they were probably deposited by the River Witham when the Trent was depositing its Floodplain Terrace.

Alluvium

Both the rivers Trent and Witham have

Table 2. Pebble count analyses (per cent by number and weight +4 mm fraction).

			Quartzite	Quartz	Flint and Chert	Sand-stone	Lime-stone	Mudstone and Siltstone	Igneous
HILTON TERRACE									
Borehole No.	Depth (m)								
NW 61	4.3-5.4	No %	57	21	7	-	-	15	-
		Wt %	90	3	2	-	-	5	-
SW 29	2.9-3.9	No %	52	21	10	5	-	12	-
		Wt %	79	7	5	6	-	3	-
BEESTON TERRACE									
Borehole No.	Depth (m)								
SW 22	7.4-8.2	No %	59	18	20	-	-	3	-
		Wt %	81	14	4	-	-	1	-
SW 28	6.6-7.6	No %	60	20	14	2	3	1	-
		Wt %	89	3	5	trace	3	trace	-
NE 3	3.3-4.3	No %	60	19	20	trace	-	1	-
		Wt %	78	13	8	1	-	trace	-
NE 5	6.7-7.7	No %	62	24	12	2	-	trace	-
FLOODPLAIN TERRACE									
Borehole No.	Depth (m)								
NW 43	2.8-3.8	No %	59	25	13	trace	-	3	trace

considerable spreads of alluvium along their courses. Along the Trent Valley interbedded clays, silts and subordinate sands, up to 3.2 m thick near Winthorpe, largely conceal the River Gravel. Peaty horizons are developed locally, although plant and tree remains are common throughout.

The alluvium along the River Witham is similar to that of the Trent but it rests directly on the Lower Lias bedrock.

COMPOSITION OF THE SAND AND GRAVEL

Within the district there are three potentially workable sand and gravel deposits, namely Glacial Sand and Gravel (Hilton Terrace), Older River Gravel (Beeston Terrace) and River Gravel (Floodplain Terrace). Pebble count analyses of samples from these deposits are given in Table 2.

Glacial Sand and Gravel (Hilton Terrace)

Comprising partly 'clayey' pebbly sands, sandy gravels and gravels, these deposits have a mean grading of fines 10 per cent, sand 60 per cent and gravel 30 per cent. Well rounded pebbles of quartzite dominate the gravel fraction but rounded quartz and mudstone and subangular flint and chert pebbles are also generally present; subordinate amounts of sandstone may be present. The sand fraction is usually medium grained and comprises subangular to subrounded quartz and quartzite with subordinate amounts of flint, chert and other rock fragments.

Older River Gravel (Beeston Terrace)

The Older River Gravel consists mainly of gravels and sandy gravels which, although not varying greatly in composition, do vary somewhat in thickness, the mean being 6.6 m (21.5 ft)[1]. The mean grading of the deposit is fines 4 per cent, sand 46 per cent and gravel 50 per cent.

The gravel consists predominantly of well rounded quartzite pebbles, together with lesser amounts of rounded quartz and subangular flint and chert. Subordinate amounts of subrounded sandstone and mudstone are common (Table 2). The sand is medium grained and comprises subangular to rounded grains of quartz, quartzite, flint and chert.

River Gravel (Floodplain Terrace)

Having a mean grading of fines 3 per cent, sand 39 per cent and gravel 58 per cent, these gravels and sandy gravels are similar in composition to the Older River Gravel deposits but locally contain a higher proportion of sand-grade in the upper layers.

THE MAP

The sand and gravel resource map is folded into the pocket at the end of this report. The base map is the Ordnance Survey 1:25 000 Outline Edition in grey, on which the 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 derived from the sources indicated on the diagram at the foot of the map. The classification of sand and gravel deposits is not always consistent between surveys. Thus the deposits shown as River Gravel and Older River Gravel on the resource map were called Plateau Gravels in the eastern part of the district on the Old Series one-inch map of Lincoln (Sheet 83) and Older River Sand and Gravel on the recent (1973) 1:50 000 version (Sheet 114). The geological boundaries are the best interpretation of the information available at the time of survey, but discrepancies may be revealed by future investigations.

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

Mineral Resource Information

For assessment purposes, the map is divided into areas of mineral and areas where sand and gravel are either not assessed, not potentially workable or absent (for definitions of 'mineral' and 'potentially workable' see page 1).

On sheet SK 85 the mineral is subdivided into areas where it outcrops (except for thin soil) and areas where it is present in continuous spreads beneath overburden. However, within these areas there may be small patches where sand and gravel is absent or not potentially workable. Areas where bedrock outcrops, where superficial deposits do not contain mineral and where sand and gravel is deemed to be not potentially workable are shown uncoloured. Areas of unassessed sand and gravel, for example, built up areas, are indicated by a red stipple.

For the most part, the distribution of categories of deposits is based on the mapped geological boundaries. Where there is a transition from one category to another, which is independent of the geological lines and which could not be accurately delineated during this survey, inferred boundaries have been inserted. Such boundaries are shown by a distinctive symbol. 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 size being limited only by cartographic considerations. For the purpose of measuring area the centre-line of the symbol is used.

[1]Conversions to feet of depths and thicknesses measured in metres have been rounded to the nearest 0.5 ft

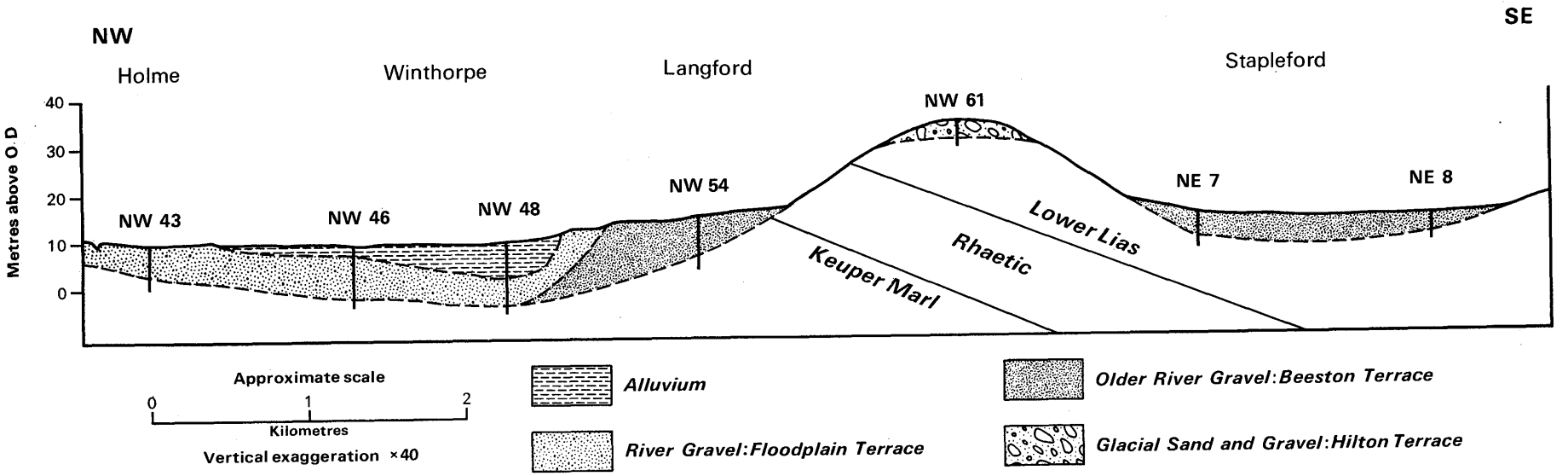


Fig. 2. Schematic cross-section between Holme and Stapleford

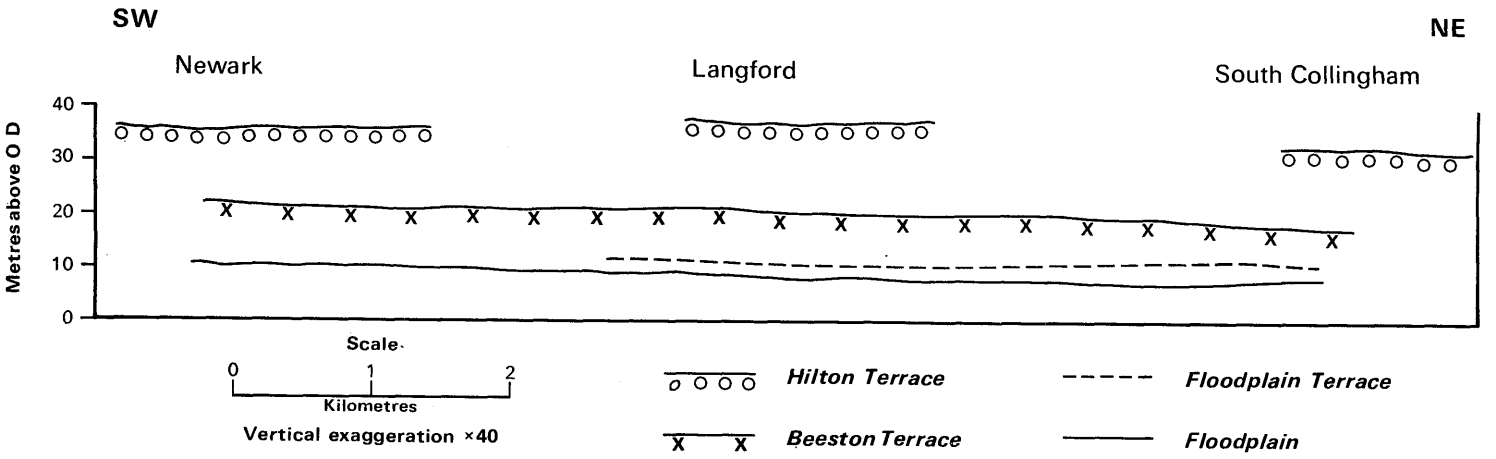
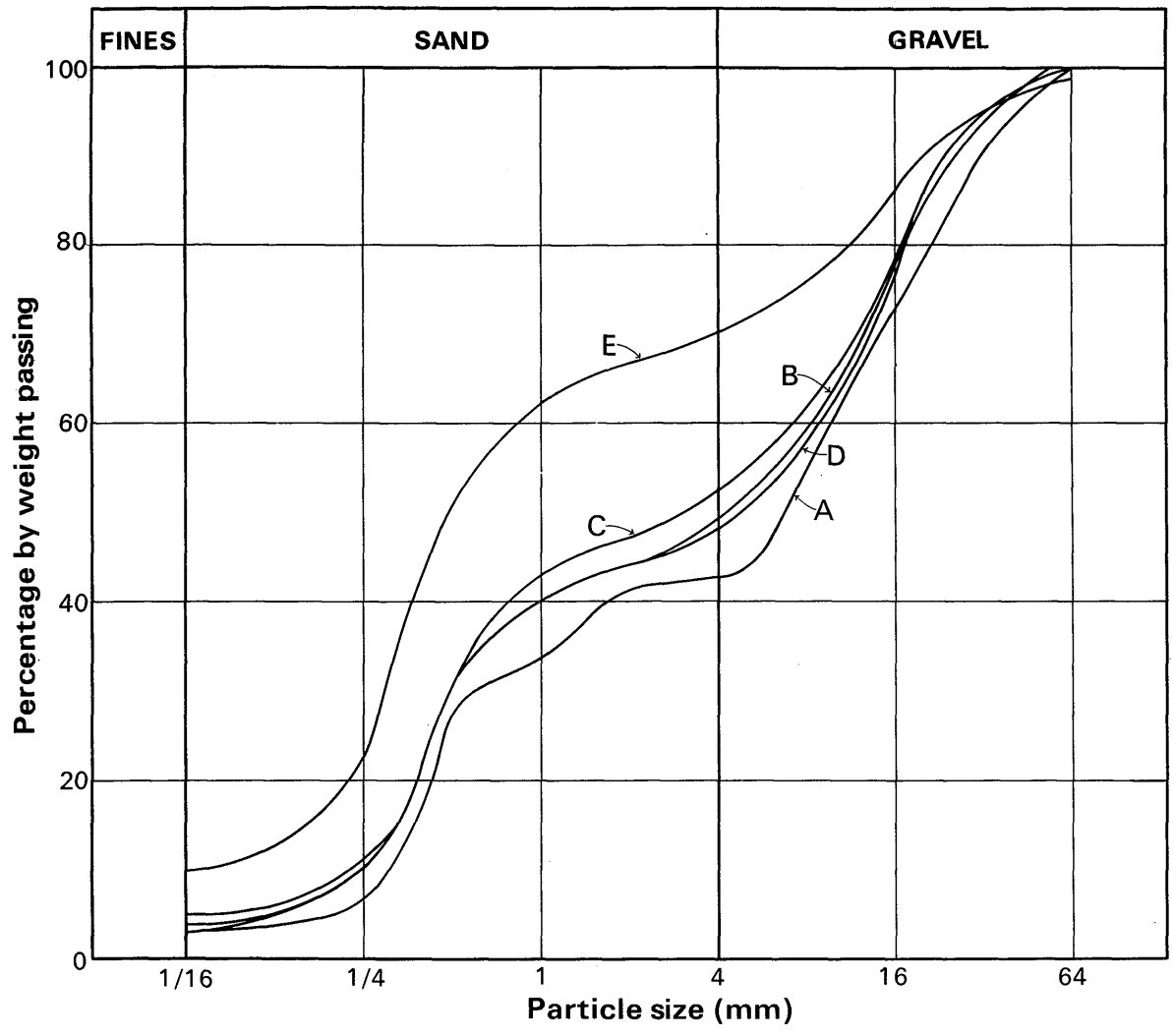


Fig. 3. The vertical relationships of the terraces of the River Trent



RESOURCE BLOCK	PERCENTAGE BY WEIGHT PASSING					
	1/16 mm	1/4 mm	1 mm	4 mm	16 mm	64 mm
A	3	7	33	42	73	100
B	3	10	40	49	78	100
C	4	10	43	52	78	100
D	5	11	40	48	77	100
E	10	23	62	70	87	99

Fig. 4. Mean particle size distribution for the assessed thickness of sand and gravel in resource blocks A to E

Table 3. The sand and gravel resources of sheet SK 85.

Resource block	Area		Mean thickness				Volume of mineral				Mean grading percentage		
	Block	Mineral	Overburden		Mineral				Limits at the 95% probability level		Fines	Sand	Gravel
	km^2	km^2	m	ft	m	ft	million m^3	million yd^3	± %	± Vol. million m^3	-1/16 mm	-4 +1/16 mm	+4mm
A	8.7	8.7	1.2	4	5.2	17	45	59	20	9	3	39	58
B	12.8	12.8	0.5	1.5	6.6	21.5	84	110	30	25	3	46	51
C	11.2	11.2	0.6	2	6.3	20.5	71	93	30	21	4	48	48
D	8.0	8.0	0.5	1.5	6.4	21	51	67	18	9	5	43	52
E	12.4	2.8	0.6	2	4.9	16	14	18	speculative		10	60	30
A to E	53.1	43.5	0.7	2.5	6.1	20	265	347	12	32			

N.B. The resources in blocks A, B, C and D have been statistically assessed; those in block E, inferred (see Appendix B).

RESULTS

The statistical results are summarised in Table 3. Fuller grading particulars are shown in Fig. 4, the cumulative grading curves being based on up to 12 data points.

Accuracy of Results

For the four resource blocks on sheet SK 85 assessed statistically the accuracy of the results at the 95 per cent probability level (that is, that in 19 cases out of 20 the true volume present will lie within the stated limits) ranges from 18 to 30 per cent. However, the true values are more likely to be nearer the figures estimated than either of the limits. Moreover it is likely that approximately the same percentage limits would apply to the estimate of volume for a much smaller parcel of ground (say 1 km^2) containing similar sand and gravel deposits if the results from the same number of sample points were used in the calculation. Thus, if closer limits are needed for the quotation of reserves, data from an increased number of sample points will be required. This point can be illustrated by considering the whole of the potentially workable sand and gravel occurring within sheet SK 85. The volume (265 million m^3) can be estimated to limits of ± 12 per cent at the 95 per cent probability level by a calculation based on data from 44 sample points spread across all resource blocks. 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 land for mineral working.

NOTES ON RESOURCE BLOCKS

Mineral underlies about half the area shown on the resource map. However, about 5.5 km^2 of its outcrop is beneath Newark upon Trent and has not been assessed. The remainder of the potentially workable sand and gravel has been divided into five resource blocks (Fig. 5). Block A consists of all the sand and gravel (River Gravel or Floodplain Terrace) lying within the Trent Valley; blocks B, C and D include all the Older River Gravel or Beeston Terrace deposits of the district divided arbitrarily into three parts; and Block E comprises a number of small outcrops of Glacial Sand and Gravel (Hilton Terrace) between Newark upon Trent and the northern margin of the district, for which only an inferred assessment is appropriate.

Boreholes located east of Fenton and Beckingham have shown that the River Gravel deposits there are too thin to be potentially workable. Similarly, evidence from the ground to the east suggests that the sand and gravel in the Older River Gravel around Carlton Barn [8992 5876] is generally less than 1 m thick. These deposits are therefore not classified as mineral and are not included in any resource block.

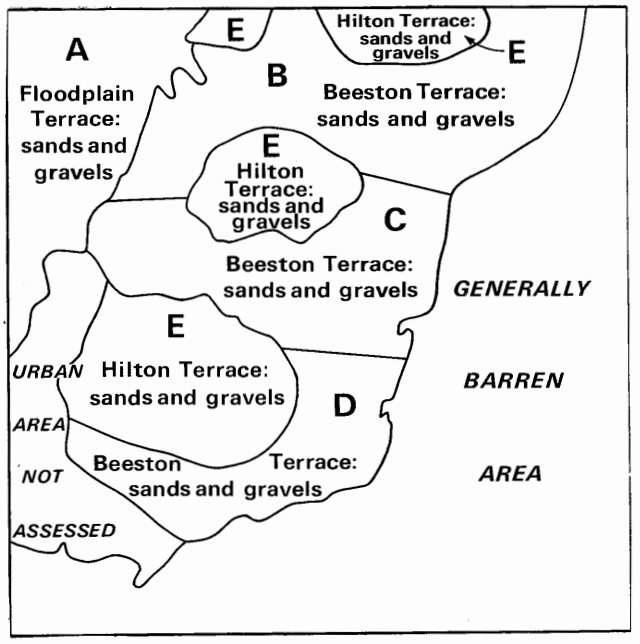


Fig. 5. The drift geology summarised in relation to the resource block boundaries

Block A

This block (see Fig. 5) includes all the potentially workable sand and gravel of the River Gravel (Floodplain Terrace) of the River Trent. About two-thirds of the block is covered by alluvial clays and silts but otherwise overburden is limited to thin sandy soil. The alluvium has a mean thickness of 1.2 m (4.0 ft), but thicknesses up to 3.2 m have been proved (see Table 4). Thicknesses of mineral encountered in the eight Mineral Assessment Unit boreholes range from 1.7 m (5.5 ft) to 7.9 m (26.0 ft); the mean proved thickness is 5.2 m (17.0 ft). Mean grading characteristics for each borehole in the block are shown in Table 4 and Fig. 6. Borehole NW 47 proved pebbly sand with only 20 per cent gravel but the gravel content of the other boreholes ranges from 39 to 72 per cent. The mean grading of the block is fines 3 per cent, sand 39 per cent and gravel 58 per cent (Fig. 4). There is little vertical variation in grading within the deposit, although two boreholes (NW 43 and NW 49) were much sandier in their upper levels. The estimated mineral volume is 45 million m^3 ± 9 million m^3. (All limits

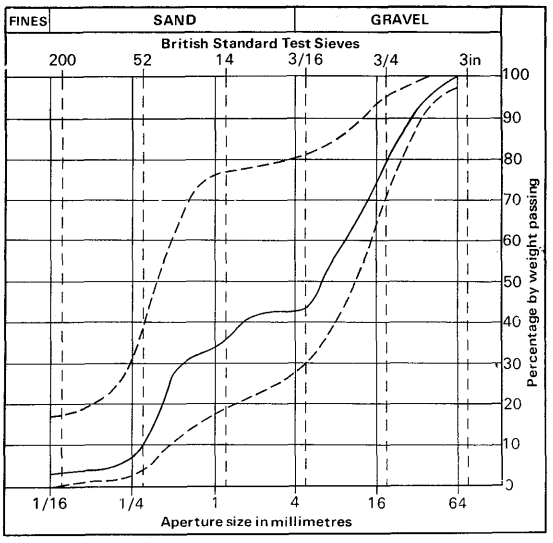


Fig. 6. Grading characteristics of the mineral in block A; the continuous line represents the weighted mean grading of the block; the broken lines denote the envelope within which the mean grading curves for individual boreholes fall

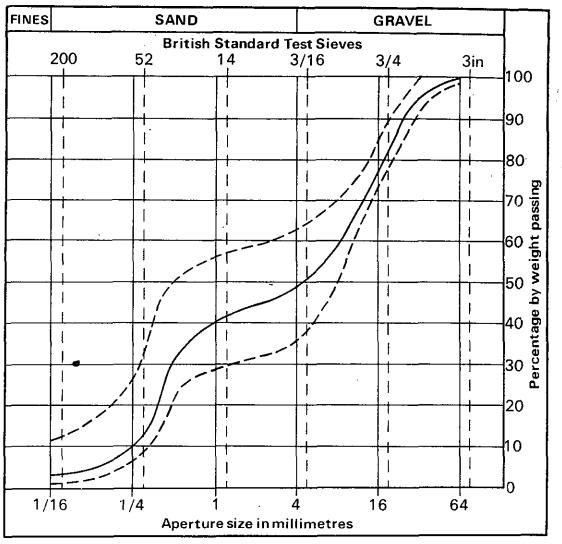


Fig. 7. Grading characteristics of the mineral in block B (For explanation see Fig. 6)

quoted for volume estimates are calculated for the symmetrical 95 per cent probability level).

Block B

This block comprises Older River Gravel of the Beeston Terrace. The deposit infills two valleys to the north-east and west-north-west of Moor Farm [864 576] which probably mark former courses of the River Trent. Data from MAU boreholes within the block are summarised in Table 5 and Fig. 7. Proved thicknesses of mineral mainly fall within the range from 5.0 m (16.5 ft) to 9.8 m (32.0 ft) but borehole NW 51 close to the western margin of the block, proved only 2.6 m (8.5 ft) of 'clayey' sandy gravel and borehole NW 62 found no sand or gravel; the mean mineral thickness is 6.6 m (21.5 ft). In all boreholes which proved mineral there was more than 38 per cent of gravel, while the fines content was less than 7 per cent, except in borehole NW 51 where 12 per cent was recorded. Only in two boreholes (NW 53 and NE 4) were clay bands present, 0.8 m (2.5 ft) and 0.2 m (0.5 ft) thick respectively. Overburden is absent, save for a sandy soil. Neither lateral nor vertical variation of grade are marked within the block. The mean grading of the mineral is fines 3 per cent, sand 46 per cent and gravel 51 per cent and the estimated volume 84 million $m^3 \pm 25$ million m^3.

Block C

As in block B the potentially workable sand and gravel of this block belongs to the Older River Gravel, except for a small patch of River Gravel at Winthorpe [814 566]. The deposit infills two valleys which diverge from Tinderbox [853 547]; one runs to the north-west to join the Trent channel at Winthorpe, the other northwards through Stapleford. Except for three small patches of alluvium between Winthorpe and Coddington, overburden is limited to thin sandy soil. Mineral thicknesses proved (see Table 6) range from 1.1 m (3.5 ft) to 12.1 m (39.5 ft), the mean thickness being 6.3 m (20.5 ft). Borehole NW 60 proved only 24 per cent gravel but the gravel content of the other boreholes ranges from 32 to 69 per cent, with 40 per cent commonly exceeded (see Table 6). Variation of grade is not marked, but in some boreholes the mineral tends to be more 'clayey' and more sandy at the top. The mean grading of the mineral is fines 4 per cent, sand 48 per cent and gravel 48 per cent. Waste partings were found in only three boreholes, NW 55, 57 and 58. The estimated volume of mineral is 71 million $m^3 \pm 21$ million m^3.

Block D

This block comprises the potentially workable sand and gravel of the Older River Gravel (Beeston Terrace) found between Newark upon Trent and Barnby in the Willows. The mineral infills two valleys, one running to the north from Corporation Farm [852 531] diverging into the two valleys of block C. The other runs to the west from Corporation Farm to join the Trent channel at Newark. Overburden is generally limited to sandy soil but at borehole SW 26 mineral is overlain by 1.2 m (4.0 ft) of pebbly sandy silt. Proved thicknesses of mineral which range from 4.4 m (14.5 ft) to

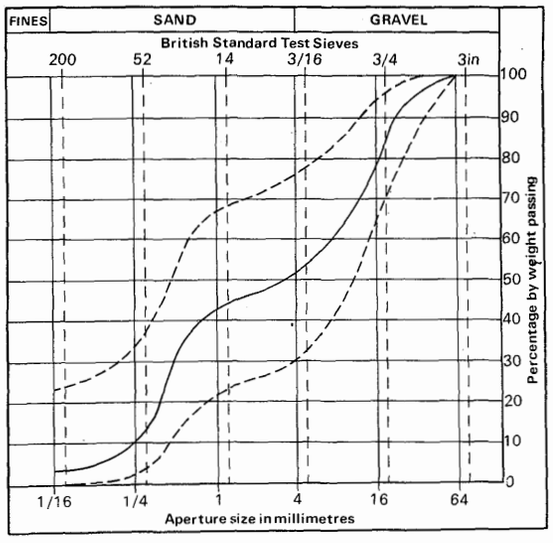


Fig. 8. Grading characteristics of the mineral in block C (For explanation see Fig. 6)

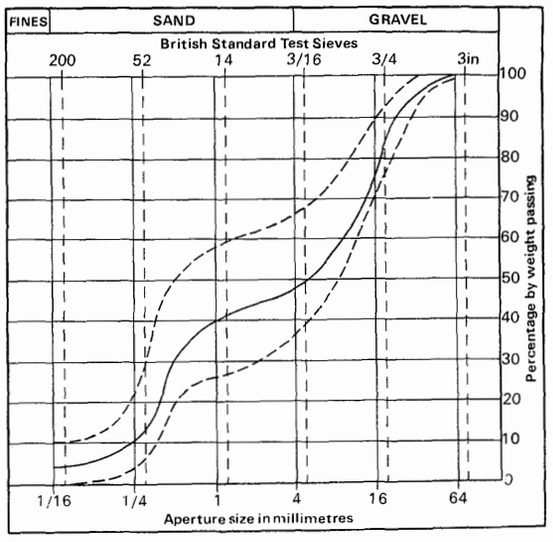


Fig. 9. Grading characteristics of the mineral in block D (For explanation see Fig.6)

8.4 m (28.0 ft) are given in Table 7; the mean thickness is 6.4 m (21.0 ft). The mean grading of the block (Table 3; Fig. 9) is similar to that of block C, fines 5 per cent, sand 43 per cent and gravel 52 per cent. Three boreholes (SE 11, SW 24 and SW 28) proved that the upper part of the mineral, on average 1.3 m (4.5 ft) thick, is much more sandy and 'clayey' than the remainder of the deposit; otherwise lateral and vertical variation of grading are not very pronounced. The estimate of the volume of mineral is 51 million $m^3 \pm 9$ million m^3.

Block E

Glacial Sand and Gravel (Hilton Terrace) is the only potentially workable sand and gravel in this block which encompasses the isolated outcrops at Norton Disney, Danethorpe Hill and Coddington with a combined area of only 2.8 km^2. The mineral rests on flat-topped hills where the overburden is limited to sandy soil. Proved thicknesses of mineral (Table 8) range from 3.1 m (10.0 ft) to 6.3 m (20.5 ft) giving a mean of 4.9 m (16.0 ft). Borehole NE 11 on the patch of Glacial Sand and Gravel around Blundy's Farm [867 595] proved only 0.4 m (1.5 ft) of pebbly sand beneath 0.5 m (1.5 ft) overburden and it is inferred that the sand and gravel of the whole of this small outcrop is not potentially workable. The mean grading of the block, calculated from the results of four boreholes, is fines 10 per cent, sand 60 per cent and gravel 30 per cent (Table 8; Fig. 10). The inferred estimate of the volume of material is 14 million m^3.

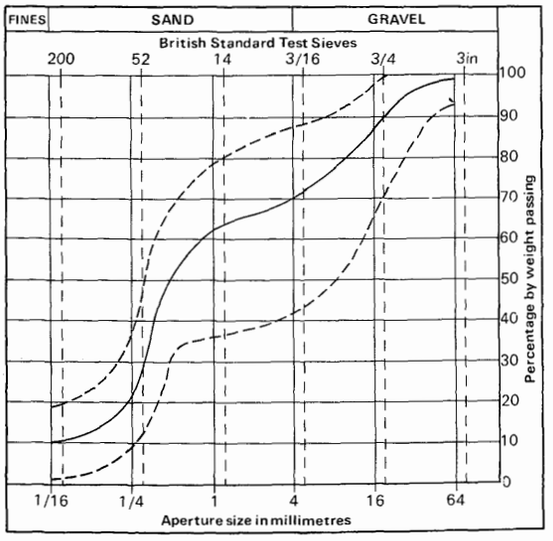


Fig. 10. Grading characteristics of the mineral in block E (For explanation see Fig. 6)

Table 4. Data from assessment boreholes: block A.

Recorded Thickness			Mean grading percentage					
Borehole number	Mineral (m)	Overburden (m)	Fines -16 mm	Fine sand -¼+1/16 mm	Medium sand -1+¼mm	Coarse sand -4+1mm	Fine gravel -16+4 mm	Coarse gravel +16mm
NW 43	5.4	0.4	7	9	24	5	22	33
NW 44	6.4	1.1	1	1	18	8	36	36
NW 45	1.7	0.6	17	14	27	3	16	23
NW 46	7.9	1.5	trace	3	30	9	27	31
NW 47	2.8	1.2	1	2	73	4	13	7
NW 48	6.7	1.9	2	6	30	9	28	25
NW 49	6.8	1.0	3	11	30	9	28	19
NW 50	3.5	3.2	trace	2	15	12	42	29

Table 5. Data from assessment boreholes: block B.

Recorded thickness			Mean grading percentage					
Borehole number	Mineral (m)	Overburden (m)	Fines -16 mm	Fine sand -¼+1/16 mm	Medium sand -1+¼mm	Coarse sand -4+1mm	Fine gravel -16+4 mm	Coarse gravel +16mm
NW 51	2.6	0.6	12	15	29	6	21	17
NW 52	9.7	0.3	7	5	31	7	24	26
NW 53	7.7	0.4	2	5	27	9	30	27
NW 54	9.2	0.3	4	6	35	8	28	19
NW 62	Absent	-	-	-	-	-	-	-
NE 1	5.7	0.5	2	6	20	8	39	25
NE 2	7.6	0.5	1	8	40	9	27	15
NE 3	9.8	0.3	2	4	33	12	27	22
NE 4	6.6	0.4	7	2	23	11	35	22
NE 5	7.2	0.5	2	12	35	7	22	22
NE 6	8.3	0.6	3	6	25	8	33	25
NE 12	5.0	0.5	2	5	29	12	39	13

Table 6. Data from assessment boreholes: block C.

Recorded thickness			Mean grading percentage					
Borehole number	Mineral (m)	Overburden (m)	Fines -1/16 mm	Fine sand -¼+1/16 mm	Medium sand -1+¼mm	Coarse sand -4+1mm	Fine gravel -16+4 mm	Coarse gravel +16mm
NW 55	5.9	0.6	8	8	37	11	23	13
NW 56	8.4	0.4	5	7	31	8	18	31
NW 57	4.0	0.3	6	11	36	7	24	16
NW 58	5.8	0.5	3	3	24	7	35	28
NW 59	8.0	1.9	trace	2	20	9	33	36
NW 60	12.1	0.6	5	8	54	9	17	7
NE 7	6.9	0.5	6	7	30	10	25	22
NE 8	1.1	1.2	24	9	26	9	21	11
NE 9	7.4	0.1	1	4	28	9	29	29
NE 10	2.8	0.3	7	7	26	12	23	25
SW 22	7.8	0.4	2	4	38	9	29	18
SE 9	5.7	0.3	2	3	19	12	34	30

Table 7. Data from assessment boreholes: block D.

Recorded thickness			Mean grading percentage					
Borehole number	Mineral (m)	Overburden (m)	Fines -1/16 mm	Fine sand -¼+1/16 mm	Medium sand -1+¼mm	Coarse sand -4+1mm	Fine gravel -16+4 mm	Coarse gravel +16mm
SW 23	6.1	0.3	7	13	36	5	23	16
SW 24	5.8	0.6	7	9	42	8	23	11
SW 25	7.7	0.3	5	5	23	8	36	23
SW 26	5.6	1.2	2	4	24	8	31	31
SW 27	7.1	0.4	1	4	39	9	24	23
SW 28	8.4	0.4	4	4	18	10	6	28
SE 10	6.0	0.4	3	4	21	9	32	31
SE 11	4.4	0.4	10	13	34	7	19	17

Table 8. Data from assessment boreholes: block E.

Borehole number	Recorded thickness		Mean grading percentage					
	Mineral (m)	Overburden (m)	Fines -1/16 mm	Fine sand -¼+1/16 mm	Medium sand -1+¼mm	Coarse sand -4+1mm	Fine gravel -16+4 mm	Coarse gravel +16mm
NW 61	5.5	0.2	6	5	36	10	24	19
NE 13	6.3	0.7	6	19	52	8	10	5
SW 29	3.1	0.8	12	8	16	6	24	34
SW 30	4.5	0.7	19	20	39	7	7	6

Appendix A: Field Procedure

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 km^2, 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 position 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 which are reproduced in Appendix F.

Detailed records may be consulted upon application to the Officer-in-Charge, Mineral Assessment Unit, Institute of Geological Sciences, Ring Road, Halton, Leeds LS15 8TQ

Appendix B: Statistical Procedure

Statistical Assessment

1. A statistical assessment is made of an area of mineral greater than 2 km^2, if there is a minimum of five evenly spaced boreholes in the resource block (for smaller areas see para. 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

$$S_V = \sqrt{S_A^2 + S_{\bar{l}_m}^2} \quad \ldots\ldots(1)$$

4. The above relationship may be transposed such that

$$S_V = S_{\bar{l}_m} \sqrt{1 + \frac{S_A^2}{S_{\bar{l}_m}^2}} \quad \ldots\ldots(2)$$

From this it can be seen that as $\frac{S_A^2}{S_{\bar{l}_m}^2}$ 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, $\bar{l}_m = \frac{\sum (l_{m_1} + l_{m_2} \ldots\ldots l_{m_n})}{n}$

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

$$S_{\bar{l}} = \frac{1}{\bar{l}_m} \sqrt{\frac{(l_m - \bar{l}_m)^2}{(n - 1)}}$$

where l_m is any value in the series l_{m_1} to l_{m_n}.

6. The sampled area in each resource block is coloured pink on the map. Wherever possible, calculations relate to the mineral within mapped geological boundaries (which may not necessarily correspond to the limits of a deposit). Where the area is not defined by a mapped boundary, that is, where the boundary is inferred, a distinctive symbol is used. Experience suggests that the errors in determining area are small relative to those in thickness.
The relationship

$\frac{S_A}{S_{\bar{l}_m}} \leqslant 1/3$ is assumed in all cases

It follows from equation (2) that

$$S_{\bar{l}_m} \leqslant S_V \leqslant 1.05\ S_{\bar{l}_m} \quad \ldots\ldots(3)$$

7. The limits on the estimate of mean thickness of mineral, $L_{\bar{l}_m}$, may be expressed in absolute units

$$\pm \frac{t}{\sqrt{n}} \times S_{\bar{l}_m}$$

or as a percentage

$$\pm \frac{t}{\sqrt{n}} \times S_{\bar{l}_m} \times \frac{100}{\bar{l}_m} \text{ per cent}$$

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	∞	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 Ed. Cambridge University Press, 1962). When n is greater than 20, 1.96 is used (the value of t when n is infinity).

9. In calculating confidence limits for volume, L_V, the following inequality corresponding to equation (3) is applied:

$$L_{\bar{l}_m} \leqslant L_V \leqslant 1.05\ L_{\bar{l}_m}$$

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

$$\frac{1.05 \times t}{\bar{l}_m} \times \sqrt{\frac{\Sigma(l_m - \bar{l}_m)^2}{n(n-1)}} \times 100 \text{ per cent}$$

and when n is greater than 20, as

$$\frac{1.05 \times 1.96}{\bar{l}_m} \times \sqrt{\frac{\Sigma(l_m - \bar{l}_m)^2}{n(n-1)}} \times 100 \text{ per cent}$$

11. The application of this procedure to a fictitious area is illustrated in Figs. 11 and 12.

INFERRED ASSESSMENT

12. If the sampled area of mineral in a resource block is between 0.25 km^2 and 2 km^2 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 km^2.

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 1/16 mm) and coarser than pebbles (more than 64 mm 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 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 Fig. 13). 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, p. 22).

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 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 (-$\frac{1}{4}$ +1/16 mm), medium (-1 +$\frac{1}{4}$ mm) and coarse (-4 +1 mm). The boundary at 16 mm distinguishes a range of finer gravel (-16 +4 mm), often characterised by abundance of worn tough pebbles of vein quartz, from larger pebbles often of notably different materials. The boundary at 64 mm, distinguishes pebbles from cobbles. The term 'gravel' is used loosely to denote both pebble-sized and cobble-sized material.

The size distribution of borehole samples is determined by sieve analysis. The grading is tabulated on the borehole record sheets (Appendix F), the intercepts corresponding with the simple geometric scale 1/16 mm, $\frac{1}{4}$ mm, 1 mm, 4 mm, 16 mm and so on as required. Original sample grading results 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
64 mm	Cobble		Gravel
16 mm	Pebble	Coarse	
4 mm		Fine	
1 mm	Sand	Coarse	Sand
¼ mm		Medium	
1/16 mm		Fine	
	Fines (silt and clay)		Fines

Block Calculation — 1:25 000 Block } Fictitious

Area

Block: 11.08 km^2
Mineral: 8.32 km^2

Volume

Overburden: 21 million m^3
Mineral: 54 million m^3

Mean Thickness

Overburden: 2.5 m
Mineral: 6.5 m

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 m^3

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	MAU 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	Hydrogeological Dept record
123/45	½	2.0		4.6		
1	¼	2.7	2.5	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	$\Sigma w = 8$	$\Sigma wl_o = 20.1$		$\Sigma wl_m = 52.0$		
Means		$\bar{l}_o = 2.5$		$\bar{l}_m = 6.5$		

Calculation of confidence limits

l_m	$(l_m - \bar{l}_m)$	$(l_m - \bar{l}_m)^2$
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

$\Sigma(l_m - \bar{l}_m)^2 = 15.82$

$n = 8$

$t = 2.365$

L_V is calculated as

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

$$= 1.05 \times \frac{2.365}{6.5} \sqrt{\frac{15.82}{8 \times 7}} \times 100$$

$= 20.3$

$\simeq 20$ per cent

Fig. 11. Example of resource block assessment: calculation and results

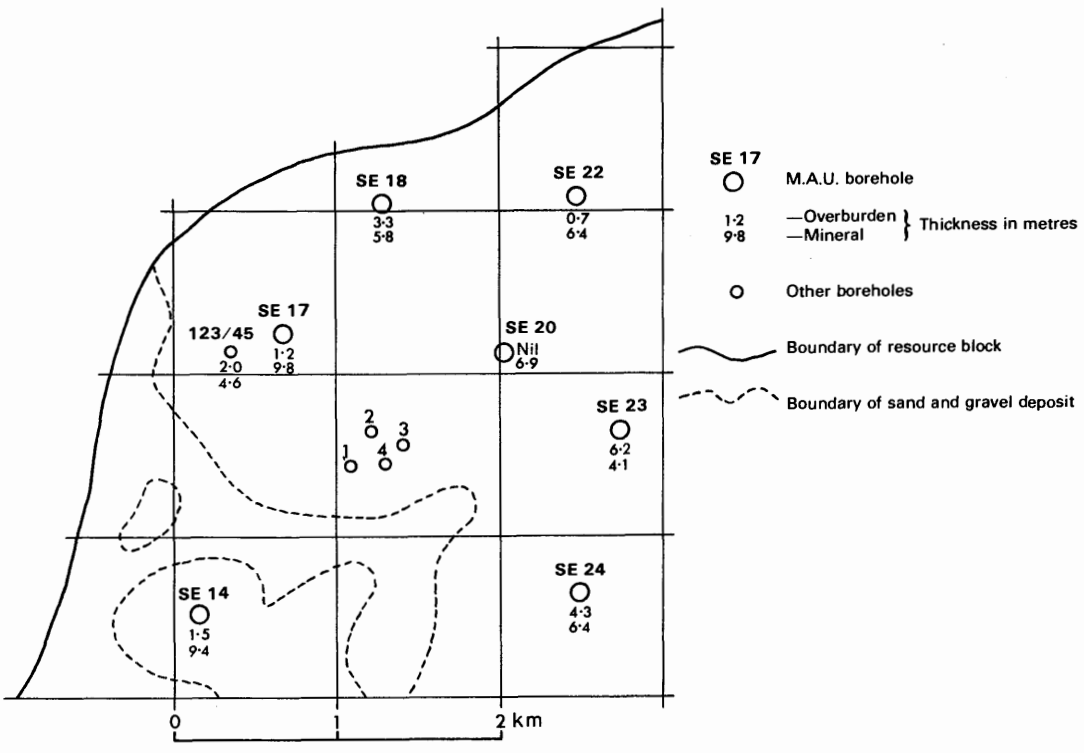


Fig. 12. Example of resource block assessment: map of fictitious block

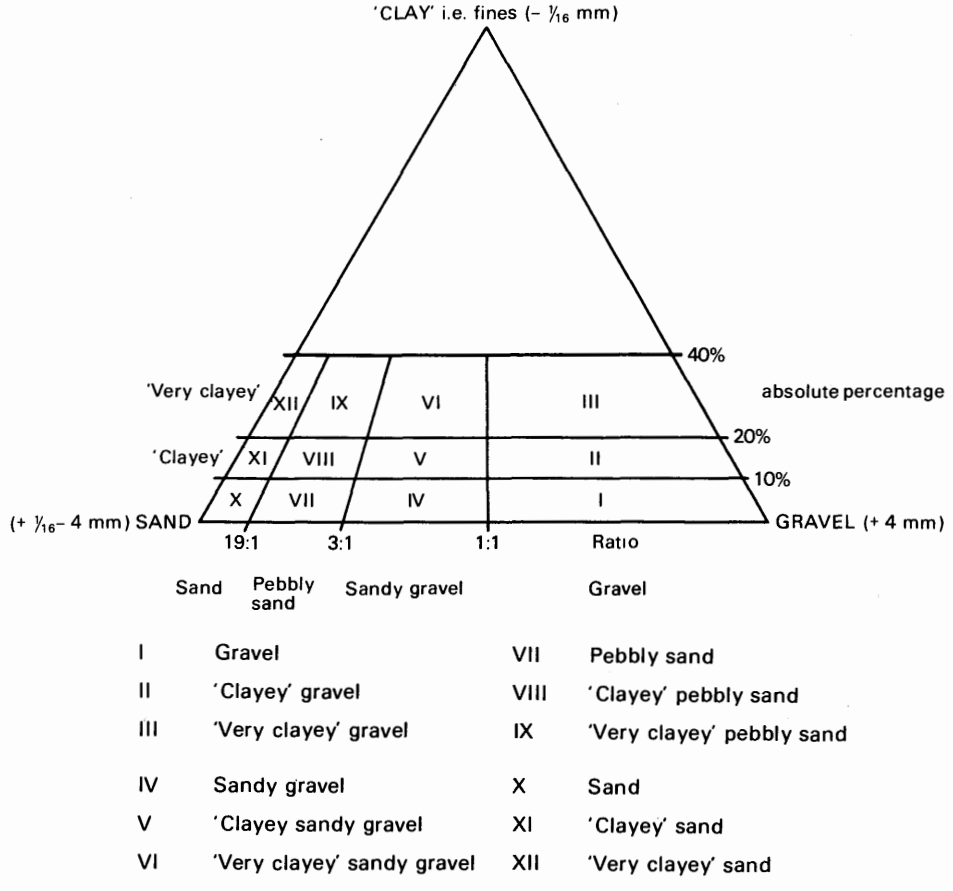


Fig. 13. Diagram to show the descriptive categories used in the classification of sand and gravel

Appendix D: Explanation of the Borehole Records

ANNOTATED EXAMPLE

SK 85 NE 6 [1] 8550 5828 [2] Stapleford Lane, South Collingham [3] Block B

Surface level (+16.5 m) +54 ft [4]
Water level +14.7 m (+48 ft) [5]
February 1972 [6]

Overburden [7] 0.6 m (2.0 ft)
Mineral 8.3 m (27.0 ft) [9]
Bedrock 1.6 m+ (5.0 ft+)

		Thickness m	(ft)	Depth [8] m	(ft)
	Soil	0.6	(2.0)	0.6	(2.0)
Older River [10] Gravel (Beeston Terrace)	Gravel, [11] sandy at top Gravel: fine to coarse, subangular to well rounded quartz and quartzite with rare chalk and serpentinite, and angular to subrounded chert Sand: medium, subangular to rounded quartz and lithic grains	8.3	(27.0)	8.9	(29.0)
Lower Lias	Mudstone, light grey	1.6+	(5.0+)	10.5	(34.5)

	%	mm	%
[14] Gravel	58	+16	25
		-16+4	33
Sand	39	-4+1	8
		-1+¼	25
		-¼+1/16	6
Fines	3	-1/16	3

Depth below [12] surface (m)	Percentages [13] Fines	Sand	Gravel
0.6 - 0.8	3	97	trace
0.8 - 1.3	23	72	5
1.3 - 2.3	2	26	72
2.3 - 3.3	2	30	68
3.3 - 4.1	5	78	17
4.1 - 5.1	2	31	67
5.1 - 6.1	2	27	71
6.1 - 7.1	trace	40	60
7.1 - 8.1	trace	27	73
8.1 - 8.9	trace	37	63

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

1. Borehole Registration Number
Each Mineral Assessment Unit (MAU) 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 SK 85
2) The quarter of the 1:25 000 sheet on which the borehole lies and the number of the borehole in a series for that quarter, for example NE 6

Thus the full Registration Number is SK 85 NE 6. Usually this is abbreviated to NE 6 in the text.

2. The National Grid Reference
All National Grid references in this publication lie within the 100 km square SK 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
Four kinds of entry are made: the record indicates 1 the level at which groundwater stood on completion of drilling (in metres and feet above or below OD); 2 that water was encountered but its level not recorded; or 3 that water was not encountered; or 4 that no note of groundwater conditions was recorded.

6. Type of drill and date of drilling.
Unless otherwise stated, all boreholes were drilled by a Pilcon shell and auger rig using 8-in casing. The month and year of completion of the hole 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. Conversions from metres to feet (shown in brackets) have been rounded off to the nearest 0.5 ft. Where figures have been rounded in this way there may be a discrepancy between the sum of the thicknesses and the recorded depths.

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

10. Geological Classification
The geological classification (page 2) is given whenever 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. The description of other rocks is based on visual examination, in field.

12. Sampling
A continuous series of bulk samples is taken throughout the thickness of sand and gravel. A new sample is commenced whenever there is an appreciable lithological change within the sand and gravel or at every 3 ft or 1 m of depth.

13. Grading Results
The limits are as follows: gravel, +4 mm; sand, -4 to +1/16 mm; fines, -1/16 mm.

14. Mean Grading
The grading of the full thickness of the mineral horizon identified in the log is the mean of the individual sample gradings weighted by the thicknesses represented, if these vary. The classification used is shown in Table 3.

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

Appendix E: List of Boreholes Used in the Assessment of Resources

Borehole No. by sheet quadrant	Grid reference (all fall in 100 km square SK)	Page No.
SK 85 NW		
43	8029 5937	24
44	8142 5940	25
45	8240 5939	26
46	8085 5840	27
47	8193 5843	28
48	8145 5755	29
49	8009 5737	30
50	8071 5666	31
51	8262 5892	32
52	8360 5833	33
53	8451 5880	34
54	8260 5788	35
55	8288 5655	36
56	8180 5635	37
57	8367 5612	38
58	8476 5537	39
59	8308 5557	40
60	8340 5506	41
61	8397 5743	42
62	8468 5979	42
SK 85 NE		
1	8637 5879	43
2	8724 5904	44
3	8831 5970	45
4	8740 5814	46
5	8636 5761	47
6	8550 5828	48
SK 85 NE		
7	8570 5710	49
8	8668 5641	50
9	8557 5578	51
10	8639 5537	51
11	8666 5944	52
12	8854 5854	52
13	8586 5944	53
SK 85 SW		
22	8445 5475	54
23	8449 5351	55
24	8322 5275	56
25	8236 5248	57
26	8148 5296	58
27	8450 5255	59
28	8333 5188	60
29	8324 5359	61
30	8262 5467	62
SK 85 SE		
9	8540 5481	63
10	8535 5391	64
11	8541 5280	65
12	8999 5333	66
13	8948 5229	67
14	8971 5142	67
15	8916 5080	68
16	8987 5007	68

Appendix F: Mineral Assessment Unit Borehole Records

SK 85 NW 43 8029 5937 Holme Block A

Surface level (+9.1 m) +30 ft
Water level +7.3 m (+24 ft)
March 1972

Overburden 0.4 m (1.5 ft)
Mineral 5.4 m (17.5 ft)
Bedrock 1.2 m + (4.0 ft +)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.4	(1.5)	0.4	(1.5)
River Gravel (Floodplain Terrace)	A. 'Very clayey' sand, less clayey at base Sand: medium, subangular to subrounded quartz and quartzite, with angular to subrounded chert Fines: brown	1.4	(4.5)	1.8	(6.0)
	B. Gravel Gravel: fine to coarse, subrounded to well rounded quartz and quartzite, with subangular chert Sand: medium, subrounded quartz and quartzite, with angular to subrounded chert	4.0	(13.0)	5.8	(19.0)
Keuper Marl	Mudstone, red	1.2+	(4.0+)	7.0	(23.0)

	%	mm	%	Depth below surface (m)	Percentages Fines	Sand	Gravel
A. Gravel	1	+16	0	0.4-1.4	35	65	0
		-16+4	1	1.4-1.8	4	95	1
Sand	73	-4+1	1				
		-1+$\frac{1}{4}$	40				
		-$\frac{1}{4}$+1/16	32				
Fines	26	1/16	26				
B. Gravel	74	+64	4	1.8-2.8	1	21	78
		-64+16	40	2.8-3.8	trace	43	57
		-16+4	30	3.8-4.8	0	8	92
				4.8-5.8	trace	32	68
Sand	25	-4+1	6				
		-1+$\frac{1}{4}$	18				
		-$\frac{1}{4}$+1/16	1				
Fines	1	-1/16	1				

SK 85 NW 44 8142 5940

Holme Block A

Surface level (+7.3m) +24 ft
Water level +6.3m (+21 ft)
March 1972

Overburden 1.1m (3.5 ft)
Mineral 6.4m (21.0 ft)
Bedrock 1.5 m + (5.0 ft+)

			Thickness m	(ft)	Depth m	(ft)
Alluvium		Clay, pale brown	1.1	(3.5)	1.1	(3.5)
River Gravel (Floodplain Terrace)	A.	'Clayey' sand Sand: medium, subangular to subrounded quartz and quartzite	0.2	(0.5)	1.3	(4.5)
	B.	Gravel Gravel: fine to coarse, subangular to well rounded quartz and quartzite, with angular to subrounded chert Sand: medium, subangular to subrounded quartz and rock fragments	6.2	(20.5)	7.5	(24.5)
Keuper Marl		Mudstone, red	1.5 +	(5.0 +)	9.0	(29.5)

		%	mm	%
A+B	Gravel	72	+16	36
			-16+4	36
	Sand	27	-4+1	7
			-1+¼	18
			-¼+1/16	2
	Fines	1	-1/16	1

Depth below surface (m)	Percentage Fines	Sand	Gravel
1.1 - 1.3	19	80	1
1.3 - 2.3	trace	20	80
2.3 - 3.3	trace	20	80
3.3 - 4.3	trace	31	69
4.3 - 5.3	trace	30	70
5.3 - 6.3	trace	22	78
6.3 - 7.3	trace	28	72
7.3 - 7.5	2	25	73

SK 85 NW 45 8240 5939 — Trow Bridge, Langford — Block A

Surface level (+10.7 m) +35 ft
Water not encountered
March 1972

Overburden 0.6 m (2.0 ft)
Mineral 1.7 m (5.5 ft)
Bedrock 1.7 m+ (5.5 ft+)

	Soil	Thickness m	Thickness (ft)	Depth m	Depth (ft)
		0.6	(2.0)	0.6	(2.0)
River Gravel (Floodplain Terrace)	'Clayey' sandy gravel Gravel: coarse, subrounded to well rounded quartz and quartzite, with angular to sub-rounded chert Sand: medium, subangular to well rounded quartz with rock fragments Fines: pale grey and brown silt	1.7	(5.5)	2.3	(7.5)
Keuper Marl	Mudstone, red	1.7+	(5.5+)	4.0	(13.0)

	%	mm	%
Gravel	39	+16	23
		-16+4	16
Sand	44	- 4+1	3
		- 1+$\frac{1}{4}$	27
		- $\frac{1}{4}$+1/16	14
Fines	17	-1/16	17

Depth below surface (m)	Percentage Fines	Sand	Gravel
0.6 - 1.6	19	62	19
1.6 - 2.3	15	18	67

SK 85 NW 46 8085 5840

Holme Block A

Surface level (+7.3m) +24 ft
Water level +6.3 m (+21 ft)
March 1972

Overburden 1.5 m (5.0 ft)
Mineral 7.9 m (26.0 ft)
Bedrock 1.6 m+ (5.0 ft+)

		Thickness m	(ft)	Depth m	(ft)
Alluvium	Clay, pale brown	1.5	(5.0)	1.5	(5.0)
River Gravel (Floodplain Terrace)	Gravel, sandier at top Gravel: fine to coarse, sub-rounded to well rounded quartz and quartzite, with subangular chert Sand: medium, subangular to subrounded quartzite, chert and other rock fragments	7.9	(26.0)	9.4	(31.0)
Keuper Marl	Mudstone, red	1.6+	(5.0+)	11.0	(36.0)

	%	mm	%
Gravel	58	+16	31
		-16+4	27
Sand	42	- 4+1	9
		- 1+¼	30
		- ¼+1/16	3
Fines	trace	- 1/16	trace

Depth below surface (m)	Percentage Fines	Sand	Gravel
1.5 - 2.5	trace	55	45
2.5 - 2.7	1	65	34
2.7 - 3.0	2	74	24
3.0 - 4.0	trace	48	52
4.0 - 5.0	0	14	86
5.0 - 6.0	trace	33	67
6.0 - 7.0	trace	25	75
7.0 - 8.0	trace	52	48
8.0 - 9.0	trace	49	51
9.0 - 9.4	2	50	48

SK 85 NW 47 8193 5843

The Fleet, Langford Block A

Surface level (+7.0 m) +23 ft
Water level not recorded
March 1972

Overburden 1.2 m (4.0 ft)
Mineral 2.8 m (9.0 ft)
Bedrock 1.5 m + (5.0 ft+)

		Thickness m	(ft)	Depth m	(ft)
Alluvium	Clay, pale greenish grey	1.2	(4.0)	1.2	(4.0)
River Gravel (Floodplain Terrace)	Pebbly sand Gravel: fine, subrounded to well rounded quartzite, with angular to subangular chert Sand: medium, subangular to subrounded quartzite and chert, with other rock fragments	2.8	(9.0)	4.0	(13.0)
Keuper Marl	Mudstone, red	1.5+	(5.0+)	5.5	(18.0)

	%	mm	%
Gravel	20	+16	7
		-16+4	13
Sand	79	- 4+1	3
		- 1+¼	73
		- ¼+1/16	3
Fines	1	-1/16	1

Depth below surface (m)	Percentage Fines	Sand	Gravel
1.2 - 2.2	3	91	6
2.2 - 3.2	trace	94	6
3.2 - 3.6	trace	63	37
3.6 - 4.0	trace	24	76

SK 85 NW 48 8145 5755 Winthorpe Block A

Surface level (+7.9 m) +26 ft
Water level +6.2m (+20 ft)
Shell and auger 6 in
October 1972

Overburden 4.0 m (13.0 ft)
Mineral 6.3 m (20.5 ft)
Bedrock 1.7 m+ (5.5 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.2	(0.5)	0.2	(0.5)
Alluvium	Clay, grey and brown and dark grey with 0.4 m 'very clayey' sand parting	3.8	(12.5)	4.0	(13.0)
River Gravel (Floodplain Terrace)	Gravel gravel: fine to coarse, subangular to well rounded quartz and quartzite, with sandstone, and angular to sub-rounded flint and chert Sand: medium, angular to rounded quartz, quartzite and other lithic grains	6.3	(20.5)	10.3	(34.0)
Keuper Marl	Mudstone, red	1.7+	(5.5+)	12.0	(39.5)

	%	mm	%
Gravel	56	+16	26
		-16+4	30
Sand	43	- 4+1	10
		- 1+$\frac{1}{4}$	28
		- $\frac{1}{4}$+1/16	5
Fines	1	- 1/16	1

Depth below surface (m)	Percentage Fines	Sand	Gravel
4.0 - 5.0	3	33	46
5.0 - 6.0	trace	39	64
6.0 - 7.0	1	37	62
7.0 - 8.0	trace	22	78
8.0 - 9.0	1	67	32
9.0 - 10.0	1	61	38
10.0 - 10.3	trace	40	60

SK 85 NW 49 8009 5737

Holme Block A

Surface level (+9.1 m) +30 ft
Water level not recorded
Shell and auger 6 in
September 1972

Overburden 1.0 m (3.5 ft)
Mineral 6.8 m (22.5 ft)
Bedrock 1.2 m+ (4.0 ft+)

			Thickness m	(ft)	Depth m	(ft)
		Soil	0.2	(0.5)	0.2	(0.5)
Alluvium		Silt, pale brown	0.8	(2.5)	1.0	(3.5)
River Gravel (Floodplain Terrace)	A.	'Very clayey' sand Sand: medium; subangular to rounded quartz and lithic grains Fines: brown	0.9	(3.0)	1.9	(6.0)
	B.	Gravel and sandy gravel Gravel: fine, subrounded to well rounded quartz and quartzite, with sandstone, and some subangular flint and chert Sand: medium, subangular to well rounded quartz, quartzite and other lithic grains	5.9	(19.5)	7.8	(25.5)
Keuper Marl		Mudstone, red	1.2+	(4.0+)	9.0	(29.5)

		%	mm	%	Depth below surface (m)	Percentage Fines	Sand	Gravel
A.	Gravel	0	+16	0	1.0 - 1.9	22	78	0
			+16+4	0				
	Sand	78	- 4+1	2				
			- 1+$\frac{1}{4}$	41				
			- $\frac{1}{4}$+1/16	35				
	Fines	22	-1/16	22				
B.	Gravel	54	+16	22	1.9 - 2.9	trace	34	66
			-16+4	32	2.9 - 3.9	trace	43	57
					3.9 - 4.9	trace	40	60
	Sand	46	- 4+1	10	4.9 - 5.9	1	47	52
			- 1+$\frac{1}{4}$	29	5.9 - 6.9	trace	58	42
			- $\frac{1}{4}$+1/16	7	6.9 - 7.8	1	53	46
	Fines	trace	- 1/16	trace				

SK 85 NW 50 8071 5666

Winthorpe Block A

Surface level (+9.8 m) +32 ft
Water level +8.2 m (+27 ft)
March 1972

Overburden 3.2 m (10.5 ft)
Mineral 3.5 m (11.5 ft)
Bedrock 1.3 m+ (4.5 ft+)

		Thickness m	Thickness (ft)	Depth m	Depth (ft)
Alluvium River Gravel (Floodplain Terrace)	Sandy silt, brown with medium, angular to subangular quartz and others lithic grains	3.2	(10.5)	3.2	(10.5)
	Gravel Gravel: fine to coarse, subrounded to well rounded quartzite and limestone, with subangular chert Sand: medium, subangular to subrounded quartzite and subrounded chert and lithic grains	3.5	(11.5)	6.7	(22.0)
Keuper Marl	Mudstone, red and greenish grey	1.3+	(4.5+)	8.0	(26.0)

	%	mm	%	Depth below surface (m)	Percentage Fines	Sand	Gravel
Gravel	71	+16	29	3.2 - 4.2	trace	29	71
		-16+4	42	4.2 - 5.2	trace	24	74
				5.2 - 6.2	trace	32	68
Sand	29	-4+1	12	6.2 - 6.7	trace	29	71
		$-1+\frac{1}{4}$	15				
		$-\frac{1}{4}+1/16$	2				
Fines	trace	-1/16	trace				

SK 85 NW 51 8262 5892

Old Hall, Langford Block B

Surface level (+14.0m) +46 ft
Water not encountered
March 1972

Overburden 0.6 m (2.0 ft)
Mineral 2.6 m (8.5 ft)
Bedrock 1.8 m+ (6.0 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.6	(2.0)	0.6	(2.0)
Older River Gravel (Beeston Terrace)	Gravel, 'clayey' and sandier at top Gravel: fine to coarse subrounded to well rounded quartz and quartzite, with angular to subrounded chert Sand: medium, subangular to well rounded quartz and rock fragments	2.6	(8.5)	3.2	(10.5)
Keuper Marl	Mudstone, red	1.8+	(6.0+)	5.0	(16.5)

	%	mm	%
Gravel	38	+16	17
		-16+4	21
Sand	50	-4+1	6
		-1+$\frac{1}{4}$	29
		-$\frac{1}{4}$+1/16	15
Fines	12	-1/16	12

Depth below surface (m)	Percentage Fines	Sand	Gravel
0.6 - 1.6	17	66	17
1.6 - 2.6	8	41	51
2.6 - 3.2	9	41	50

SK 85 NW 52 8360 5833

Brough School Block B

Surface level (+17.4 m) +57 ft
Water level +14.0 m (+46 ft)
March 1972

Overburden 0.3 m (1.0 ft)
Mineral 9.7 m (32.0 ft)
Bedrock 2.0 m+ (6.5 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.3	(1.0)	0.3	(1.0)
Older River Gravel (Beeston Terrace)	Gravel and sandy gravel; thin silt parting at 7.1 m Gravel: fine to coarse, subrounded to well rounded quartz and quartzite, with subangular chert Sand: medium subangular to subrounded quartz and quartzite, with angular chert Fines: light grey silt	9.7	(32.0)	10.0	(33.0)
Rhaetic	Mudstone, grey and brown	2.0+	(6.5+)	12.0	(39.5)

	%	mm	%
Gravel	50	+16	26
		-16+4	24
Sand	43	-4+1	7
		-1+¼	31
		-¼+1/16	5
Fines	7	-1/16	7

Depth below surface (m)	Percentage Fines	Sand	Gravel
0.3 - 1.1	21	58	21
1.1 - 2.1	1	41	58
2.1 - 3.1	1	54	45
3.1 - 4.1	trace	63	37
4.1 - 5.1	trace	67	33
5.1 - 6.1	trace	59	41
6.1 - 6.6	trace	62	38
6.6 - 6.8	36	27	37
6.8 - 7.1	5	29	66
7.1 - 7.7	57	18	25
7.7 - 8.7	1	17	82
8.7 - 9.7	5	10	85
9.7 -10.0	trace	27	73

SK 85 NW 53 8451 5880 Field House, South Collingham Block B

Surface level (+16.5 m) +54 ft
Water level not recorded
Shell and auger 6 in
October 1972

Overburden 0.4 m (1.5 ft)
Mineral 3.0 m (10.0 ft)
Waste 0.8 m (2.5 ft)
Mineral 4.7 m (15.5 ft)
Bedrock 1.6 m+ (5.0 ft+)

			Thickness m	(ft)	Depth m	(ft)
		Soil	0.4	(1.5)	0.4	(1.5)
Older River Gravel (Beeston Terrace)	A.	Gravel, sandier at top Gravel: fine to coarse, subrounded to well rounded quartz and quartzite, with occasional subrounded chert Sand: medium, angular to rounded chert, quartz and lithic grains	3.0	(10.0)	3.4	(11.0)
		Silt, dark brown and grey	0.8	(2.5)	4.2	(14.0)
	B.	Gravel Gravel: fine to coarse, subangular to well rounded quartz and quartzite, with subrounded chert Sand: medium, angular to rounded quartz and lithic grains	4.7	(15.5)	8.9	(29.0)
Lower Lias		Mudstone, grey	1.6+	(5.0+)	10.5	(34.5)

		%	mm	%	Depth below surface (m)	Percentage Fines	Sand	Gravel
A.	Gravel	51	+16	24	0.4 - 1.4	1	57	42
			-16+4	27	1.4 - 2.4	7	40	53
					2.4 - 3.4	3	38	59
	Sand	46	-4+1	8				
			-1+¼	32				
			-¼+1/16	6				
	Fines	3	-1/16	3				
B.	Gravel	61	+16	29	4.2 - 5.2	trace	47	53
			-16+4	32	5.2 - 6.2	trace	44	56
					6.2 - 7.2	1	38	61
	Sand	39	- 4+1	10	7.2 - 8.2	trace	31	69
			- 1+¼	24	8.2 - 8.9	1	32	67
			- ¼+1/16	5				
	Fines	trace	-1/16	trace				

SK 85 NW 54 8260 5788 — Langford — Block B

Surface level (+14.9 m) +49 ft
Water level not recorded
Shell and auger 6 in
October 1972

Overburden 0.3 m (1.0 ft)
Mineral 9.2 m (30.0 ft)
Bedrock 1.5 m+ (5.0 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.3	(1.0)	0.3	(1.0)
Older River Gravel (Beeston Terrace)	Gravel and sandy gravel; 'clayey' at top Gravel: fine to coarse, subrounded to well rounded quartz and quartzite, with angular to rounded chert Sand: medium, subangular to rounded quartz, quartzite and other lithic grains	9.2	(30.0)	9.5	(31.0)
Keuper Marl	Mudstone, red	1.5+	(5.0+)	11.0	(36.0)

	%	mm	%
Gravel	47	+16	19
		-16+4	28
Sand	49	- 4+1	8
		- 1+ $\frac{1}{4}$	35
		- $\frac{1}{4}$+1/16	6
Fines	4	- 1/16	4

Depth below surface (m)	Percentage Fines	Sand	Gravel
0.3 - 1.3	12	53	35
1.3 - 2.3	11	81	8
2.3 - 3.3	4	66	30
3.3 - 4.3	1	36	73
4.3 - 5.3	trace	43	57
5.3 - 6.3	4	56	40
6.3 - 7.3	trace	52	48
7.3 - 8.3	1	35	64
8.3 - 9.3	trace	36	64
9.3 - 9.5	1	38	61

SK 85 NW 55 8288 5655

Winthorpe Airfield Block C

Surface level (+18.9 m) +62 ft
Water level +17.0 m (+56 ft)
March 1972

Overburden 0.6 m (2.0 ft)
Mineral 4.2 m (14.0 ft)
Waste 0.2 m (0.5 ft)
Mineral 1.7 m (5.5 ft)
Waste 1.0 m (3.5 ft)
Bedrock 1.3 m+ (4.5 ft+)

			Thickness m	(ft)	Depth m	(ft)
		Soil	0.6	(2.0)	0.6	(2.0)
Older River Gravel (Beeston Terrace)	A.	Sandy gravel; thin silt parting at 1.1 m Gravel: fine to coarse, subangular to well rounded quartz and quartzite, with subrounded chert Sand: medium, subangular to rounded quartz and lithic grains	4.2	(14.0)	4.8	(15.5)
		Clay, light brown	0.2	(0.5)	5.0	(16.5)
	B.	Gravel and sandy gravel Gravel: fine to coarse, subangular to rounded quartz and quartzite, with subangular chert Sand: medium, subangular to rounded quartz and lithic grains	1.7	(5.5)	6.7	(22.0)
		Clay, dark grey	1.0	(3.5)	7.7	(25.5)
Rhaetic		Mudstone, light greenish grey	1.3+	(4.5+)	9.0	(29.5)

		%	mm	%	Depth below surface (m)	Percentage Fines	Sand	Gravel
A.	Gravel	30	+16	8	0.6 - 1.1	15	65	20
			-16+4	22	1.1 - 1.3	41	51	8
					1.3 - 2.3	7	58	35
	Sand	60	- 4+1	13	2.3 - 3.3	10	52	38
			- 1+$\frac{1}{4}$	37	3.3 - 4.3	7	67	26
			- $\frac{1}{4}$+1/16	10	4.3 - 4.8	6	64	30
	Fines	10	- 1/16	10				
B.	Gravel	49	+16	23	5.0 - 6.0	1	50	49
			-16+4	26	6.0 - 6.7	3	47	50
	Sand	49	- 4+1	9				
			- 1+$\frac{1}{4}$	36				
			- $\frac{1}{4}$+1/16	4				
	Fines	2	- 1/16	2				

SK 85 NW 56 8180 5635 — Winthorpe — Block C

Surface level (+18.3 m) +60 ft
Water level +16.8 m (+55 ft)
Shell and auger 6 in
October 1972

Overburden 0.4 m (1.5 ft)
Mineral 8.4 m (27.5 ft)
Bedrock 1.7 m+ (5.5 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.4	(1.5)	0.4	(1.5)
Older River Gravel (Beeston Terrace)	Gravel and sandy gravel Gravel: fine to coarse, subrounded to well rounded, quartz, quartzite and sandstone, with subangular chert Sand: medium, angular to rounded quartz, quartzite and other lithic grains	8.4	(27.5)	8.8	(29.0)
Keuper	Mudstone, red	1.7+	(5.5+)	10.5	(34.5)

	%	mm	%
Gravel	49	+16	31
		-16+4	18
Sand	46	- 4+1	8
		- 1+¼	31
		- ¼+1/16	7
Fines	5	- 1/16	5

Depth below surface (m)	Percentage Fines	Sand	Gravel
0.4 - 1.4	9	79	13
1.4 - 2.4	16	20	64
2.4 - 3.4	trace	38	62
3.4 - 4.4	1	53	46
4.4 - 5.4	4	34	62
5.4 - 6.4	6	49	45
6.4 - 7.4	1	52	47
7.4 - 8.4	1	38	61
8.4 - 8.8	2	60	38

SK 85 NW 57 8367 5612

Langford Moor Block C

Surface level (+20.4 m) +67 ft
Water level not recorded
Shell and auger 6 in
October 1972

Overburden 0.3 m (1.0 ft)
Mineral 2.5 m (8.0 ft)
Waste 0.8 m (2.5 ft)
Mineral 1.5 m (5.0 ft)
Bedrock 1.4 m+ (4.5 ft+)

			Thickness m	(ft)	Depth m	(ft)
		Soil	0.3	(1.0)	0.3	(1.0)
Older River Gravel (Beeston Terrace)	A.	'Clayey' sandy gravel and gravel Gravel: fine to coarse, well rounded quartz and quartzite, with angular to subrounded chert Sand: medium, subangular to rounded chert and lithic grains Fines: brown	2.5	(8.0)	2.8	(9.0)
		Sandy silt, dark grey	0.8	(2.5)	3.6	(12.0)
	B.	Sandy gravel Gravel: fine to coarse, subrounded to well rounded quartz and quartzite, with subangular chert Sand: medium, subangular to rounded quartz, quartzite and others lithic grains	1.5	(5.0)	5.1	(16.5)
Lower Lias		Mudstone, greenish grey	1.4+	(4.5+)	6.5	(21.5)

		%	mm	%	Depth below surface (m)	Fines	Percentage Sand	Gravel
A.	Gravel	38	+16	16	0.3 - 1.3	13	51	36
			-16+4	22	1.3 - 2.3	11	59	30
					2.3 - 2.8	trace	42	58
	Sand	52	- 4+1	10				
			- 1+¼	31				
			- ¼+1/16	11				
	Fines	10	-1/16	10				
B.	Gravel	43	+16	17	3.6 - 4.6	2	62	36
			-16+4	26	4.6 - 5.1	1	43	56
	Sand	55	-4+1	3				
			-1+¼	43				
			-¼+1/16	9				
	Fines	2	-1/16	2				

SK 85 NW 58 8476 5537 — Langford Moor — Block C

Surface level (+18.0 m) +59 ft
Water level not recorded
April 1972

Overburden 0.5 m (1.5 ft)
Mineral 2.0 m (6.5 ft)
Waste 0.5 m (1.5 ft)
Mineral 3.8 m (12.5 ft)
Bedrock 1.7 m+ (5.5 ft+)

			Thickness m	(ft)	Depth m	(ft)
		Soil	0.5	(1.5)	0.5	(1.5)
Older River Gravel (Beeston Terrace)	A.	Sandy gravel Gravel: fine, subangular to well rounded quartz and quartzite, with subangular chert Sand: medium, subangular to sub-rounded quartz, quartzite, chert and other lithic grains	2.0	(6.5)	2.5	(8.0)
		Clay, light brown	0.5	(1.5)	3.0	(10.0)
	B.	Gravel Gravel: fine to coarse, subrounded to well rounded quartz and quartzite, with angular to subrounded chert Sand: medium, subangular to rounded quartz and lithic grains	3.8	(12.5)	6.8	(22.5)
Lower Lias		Mudstone, grey, fossiliferous	1.7+	(5.5+)	8.5	(28.0)

		%	mm	%	Depth below surface (m)	Percentage Fines	Sand	Gravel
A.	Gravel	46	+16	13	0.5 - 1.5	4	49	47
			-16+4	33	1.5 - 2.5	4	51	45
	Sand	50	-4+1	10				
			-1+¼	36				
			-¼+1/16	4				
	Fines	4	-1/16	4				
B.	Gravel	72	+16	36	3.0 - 4.0	2	29	69
			-16+4	36	4.0 - 5.0	3	15	82
					5.0 - 6.0	3	40	57
	Sand	26	- 4+1	6	6.0 - 6.8	1	17	82
			- 1+¼	17				
			- ¼+1/16	3				
	Fines	2	-1/16	2				

SK 85 NW 59 8308 5557 — Winthorpe Airfield — Block C

Surface level (+18.3 m) +60 ft
Water level +16.3 m (+54 ft)
March 1972

Overburden 1.9 m (6.0 ft)
Mineral 8.0 m (26.0 ft)
Bedrock 1.1 m+ (3.5 ft+)

		Thickness m	Thickness (ft)	Depth m	Depth (ft)
	Made ground	0.5	(1.5)	0.5	(1.5)
Alluvium	Pebbly sandy silt, **brown** with fine well rounded quartz and quartzite pebbles and medium subangular quartz sand	1.4	(4.5)	1.9	(6.0)
Older River Gravel (Beeston Terrace)	Gravel Gravel: fine to coarse, subangular to well rounded quartz, quartzite and sandstone, with subangular chert Sand: medium, rounded quartz and lithic grains	8.0	(26.0)	9.9	(32.5)
Rhaetic	Mudstone, greyish brown	1.1+	(3.5+)	11.0	(36.0)

	%	mm	%	Depth below surface (m)	Percentage Fines	Sand	Gravel
Gravel	69	+16	36	1.9 - 2.9	trace	38	62
		-16+4	33	2.9 - 3.9	trace	55	45
				3.9 - 4.9	trace	26	74
Sand	31	- 4+1	9	4.9 - 5.9	trace	34	66
		- 1+$\frac{1}{4}$	20	5.9 - 6.9	trace	29	71
		- $\frac{1}{4}$+1/16	2	6.9 - 7.9	trace	18	82
				7.9 - 8.9	trace	27	73
Fines	trace	- 1/16	trace	8.9 - 9.9	trace	18	82

SK 85 NW 60 8340 5506 — Coddington — Block C

Surface level (+20.7 m) +68 ft
Water level +17.7 m (+58 ft)
April 1972

Overburden 0.6 m (2.0 ft)
Mineral 12.1 m (39.5 ft)
Bedrock 1.3 m+ (4.5 ft+)

		Thickness m	Thickness (ft)	Depth m	Depth (ft)
	Soil	0.6	(2.0)	0.6	(2.0)
Older River Gravel (Beeston Terrace)	Pebbly sand and sandy gravel, 'clayey' at top Gravel: fine to coarse, well rounded quartz, sandstone and igneous pebbles, with subangular flint and rounded siltstone Sand: medium well rounded quartz and rock fragments	12.1	(39.5)	12.7	(41.5)
Lower Lias	Mudstone, grey	1.3+	(4.5+)	14.0	(46.0)

	%	mm	%
Gravel	24	+16	7
		-16+4	17
Sand	71	- 4+1	9
		- 1+¼	54
		- ¼+1/16	8
Fines	5	- 1/16	5

Depth below surface (m)	Percentage Fines	Sand	Gravel
0.6 - 1.6	19	33	48
1.6 - 2.6	14	42	44
2.6 - 3.6	6	86	8
3.6 - 4.6	4	77	19
4.6 - 5.6	1	79	20
5.6 - 6.6	7	88	5
6.6 - 7.6	1	90	9
7.6 - 8.6	1	73	26
8.6 - 9.6	trace	64	36
9.6 -10.6	3	73	24
10.6 -11.6	4	88	8
11.6 -12.7	trace	58	42

SK 85 NW 61 8397 5743

Danethorpe Hill Block E

Surface level (+34.4 m) +113 ft
Water level not recorded
March 1972

Overburden 0.2 m (0.5 ft)
Mineral 5.5 m (18.0 ft)
Bedrock 1.3 m+ (4.5 ft+)

		Thickness m	Thickness (ft)	Depth m	Depth (ft)
	Soil	0.2	(0.5)	0.2	(0.5)
Glacial Sand and Gravel (Hilton Terrace)	Gravel and sandy gravel, 'clayey' at top Gravel: fine to coarse, sub-angular to well rounded quartz and quartzite, with subangular chert Sand: medium, subangular to subrounded quartz and rock fragments	5.5	(18.0)	5.7	(18.5)
Lower Lias	Mudstone, dark grey, fossiliferous	1.3+	(4.5+)	7.0	(23.0)

	%	mm	%	Depth below surface (m)	Percentage Fines	Sand	Gravel
Gravel	43	+16	19	0.2 - 1.2	10	78	12
		-16+4	24	1.2 - 2.2	9	67	24
				2.2 - 3.2	7	53	40
Sand	51	- 4+1	10	3.2 - 4.3	2	48	50
		- 1+$\frac{1}{4}$	36	4.3 - 5.4	2	19	79
		- $\frac{1}{4}$+1/16	5	5.4 - 5.7	2	29	69
Fines	6	- 1/16	6				

SK 85 NW 62 8468 5979

South Collingham Block B

Surface level (+12.2 m) +40 ft
Water not encountered
March 1972

Waste 1.5 m (5.0 ft)
Bedrock 1.5 m+ (5.0 ft+)

		Thickness m	Thickness (ft)	Depth m	Depth (ft)
	Soil	0.3	(1.0)	0.3	(1.0)
Older River Gravel	Clay, pale grey mottled yellowish brown	1.2	(4.0)	1.5	(5.0)
Lower Lias	Mudstone, dark grey and purple	1.5+	(5.0+)	3.0	(10.0)

SK 85 NE 1 8637 5879

Norton Bottoms,
Norton Disney Block B

Surface level (+18.3 m) +60 ft
Water level +16.9 m (+56 ft)
March 1972

Overburden 0.5 m (1.5 ft)
Mineral 5.7 m (18.5 ft)
Bedrock 1.8 m + (6.0 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.5	(1.5)	0.5	(1.5)
Older River Gravel (Beeston Terrace)	Gravel Gravel: fine, subangular to well rounded quartz and quartzite, with angular to subrounded chert Sand: medium, angular to subrounded quartz, quartzite, chert and other lithic grains	5.7	(18.5)	6.2	(20.5)
Lower Lias	Mudstone, dark grey	1.8+	(6.0+)	8.0	(26.0)

	%	mm	%
Gravel	64	+16	25
		-16+4	39
		-4+1	8
Sand	34	-1+$\frac{1}{4}$	20
		-$\frac{1}{4}$+1/16	6
Fines	2	-1/16	2

Depth below surface (m)	Percentage Fines	Sand	Gravel
0.5 - 1.5	5	47	48
1.5 - 2.5	trace	36	64
2.5 - 3.5	4	35	61
3.5 - 4.5	1	36	63
4.5 - 5.3	trace	27	73
5.3 - 6.2	1	24	75

SK 85 NE 2 8724 5904

Norton Bottoms,
Norton Disney Block B

Surface Level (+17.4 m) +57 ft
Water level +16.1 m (+53 ft)
March 1972

Overburden 0.5 m (1.5 ft)
Mineral 7.6 m (25.0 ft)
Waste 0.4 m (1.5 ft)
Bedrock 1.5 m + (5.0 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.5	(1.5)	0.5	(1.5)
Older River Gravel (Beeston Terrace)	Gravel, sandy at top Gravel: fine, subangular to well rounded quartz and quartzite, with angular to subrounded chert Sand: medium, subangular to subrounded quartz and quartzite, with subangular chert and lithic grains	7.6	(25.0)	8.1	(26.5)
	Clay, light brown	0.4	(1.5)	8.5	(28.0)
Lower Lias	Mudstone, grey, calcareous	1.5+	(5.0+)	10.0	(33.0)

	%	mm	%
Gravel	42	+16	15
		-16+4	27
		-4+1	9
Sand	37	-1+$\frac{1}{4}$	40
		-$\frac{1}{4}$+1/16	8
Fines	1	-1/16	1

Depth below surface (m)	Percentage Fines	Sand	Gravel
0.5 - 1.5	1	80	19
1.5 - 1.9	2	74	24
1.9 - 2.9	1	41	58
2.9 - 3.9	trace	54	46
3.9 - 4.9	trace	37	63
4.9 - 5.9	2	47	51
5.9 - 6.9	2	97	1
6.9 - 7.9	trace	46	54
7.9 - 8.1	trace	10	90

SK 85 NE 3 8831 5970 Norton Disney Block B

Surface level (+16.2 m) +53 ft
Water level not recorded
March 1972

Overburden 0.3 m (1.0 ft)
Mineral 9.8 m (32.0 ft)
Bedrock 1.4 m + (4.5 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.3	(1.0)	0.3	(1.0)
Older River Gravel (Beeston Terrace)	Gravel, sandy and 'clayey' at top Gravel: fine to coarse, subangular to well rounded quartz and quartzite, with subangular chert and fossil fragments Sand: medium, angular to subrounded quartz, quartzite and chert	9.8	(32.0)	10.1	(33.0)
Lower Lias	Limestone, dark grey, fossiliferous	1.4+	(4.5+)	11.5	(37.5)

	%	mm	%
Gravel	49	+16	22
		-16+4	27
		-4+1	12
Sand	49	-1+$\frac{1}{4}$	33
		-$\frac{1}{4}$+1/16	4
Fines	2	-1/16	2

Depth below surface (m)	Percentage Fines	Sand	Gravel
0.3 - 0.7	11	56	33
0.7 - 1.3	13	61	26
1.3 - 2.3	2	35	63
2.3 - 3.3	trace	49	51
3.3 - 4.3	trace	54	46
4.3 - 5.3	trace	80	20
5.3 - 6.3	trace	39	61
6.3 - 7.3	trace	58	42
7.3 - 8.3	trace	33	67
8.3 - 9.3	trace	45	55
9.3 -10.1	trace	37	63

SK 85 NE 4 8740 5814 Stapleford Block B

Surface level (+14. 9 m) +49 ft
Water level +12.9 m (+42 ft)
Shell and auger 6 in
October 1972

Overburden 0.4 m (1.5 ft)
Mineral 3.6 m (12.0 ft)
Waste 0.2 m (0.5 ft)
Mineral 3.0 m (10.0 ft)
Bedrock 1.8 m + (6.0 ft+)

			Thickness m	(ft)	Depth m	(ft)
		Soil	0.4	(1.5)	0.4	(1.5)
Older River Gravel (Beeston Terrace)	A.	Gravel, 'very clayey' in places Gravel: fine to coarse, subrounded to well rounded quartz, quartzite and sandstone with igneous pebbles, and angular to rounded chert and flint Sand: medium, angular to subrounded quartz and lithic grains	3.6	(12.0)	4.0	(13.0)
		Silt, dark grey and brown	0.2	(0.5)	4.2	(14.0)
	B.	Gravel, sandy at top Gravel: fine to coarse, subrounded to well rounded quartz, quartzite, and sandstone, with subangular flint and chert Sand: medium, subangular to rounded quartz and lithic grains	3.0	(10.0)	7.2	(23.5)
Lower Lias		Mudstone, grey	1.8+	(6.0+)	9.0	(29.5)

		%	mm	%	Depth below surface (m)	Percentage Fines	Sand	Gravel
			+16	25	0.4 - 1.4	1	50	49
A.	Gravel	59	-16+4	34	1.4 - 2.4	22	15	63
			-4+1	10	2.4 - 3.4	1	32	67
	Sand	31	-1+$\frac{1}{4}$	21	3.4 - 4.0	21	22	57
			-$\frac{1}{4}$+1/16	0				
	Fines	10	-1/16	10				
			+16	19	4.2 - 5.2	6	59	35
B.	Gravel	56	-16+4	37	5.2 - 6.2	1	35	64
			-4+1	10	6.2 - 7.2	trace	32	68
	Sand	42	-1+$\frac{1}{4}$	27				
			-$\frac{1}{4}$+1/16	5				
	Fines	2	-1/16	2				

SK 85 NE 5 8636 5761

Moor Farm,
Stapleford Block B

Surface level (+17.4 m) +57 ft
Water level +13.8 m (+45 ft)
April 1972

Overburden 0.5 m (1.5 ft)
Mineral 7.2 m (23.5 ft)
Bedrock 1.3 m + (4.5 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.5	(1.5)	0.5	(1.5)
Older River Gravel (Beeston Terrace)	Gravel, with some sand Gravel: fine to coarse, subangular to well rounded quartz, quartzite with subangular chert, some mudstone Sand: medium angular to subrounded quartz and quartzite with chert	7.2	(23.5)	7.7	(25.5)
Lower Lias	Mudstone, light grey	1.3+	(4.5+)	9.0	(29.5)

	%	mm	%
		+16	22
Gravel	44	-16+4	22
		-4+1	7
Sand	54	-1+$\frac{1}{4}$	35
		-$\frac{1}{4}$+1/16	12
Fines	2	-1/16	2

Depth below surface (m)	Percentage Fines	Sand	Gravel
0.5 - 1.5	2	37	61
1.5 - 2.5	2	29	69
2.5 - 3.5	3	97	trace
3.5 - 4.5	2	48	50
4.5 - 5.5	1	60	39
5.5 - 6.3	trace	49	51
6.3 - 6.7	trace	94	6
6.7 - 7.7	1	46	53

SK 85 NE 6 8550 5828

Stapleford Lane,
South Collingham Block B

Surface level (+16.5 m) +54 ft
Water level +14.7 m (+48 ft)
February 1972

Overburden 0.6 m (2.0 ft)
Mineral 8.3 m (27.0 ft)
Bedrock 1.6 m + (5.0 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.6	(2.0)	0.6	(2.0)
Older River Gravel (Beeston Terrace)	Gravel, sandy at top Gravel: fine to coarse, subangular to well rounded quartz and quartzite with rare chalk and serpentinite, and angular to subrounded chert Sand: medium, subangular to rounded quartz and lithic grains	8.3	(27.0)	8.9	(29.0)
Lower Lias	Mudstone, light grey	1.6+	(5.0)	10.5	(34.5)

	%	mm	%
		+16	25
Gravel	58	-16+4	33
		-4+1	8
Sand	39	-1+$\frac{1}{4}$	25
		-$\frac{1}{4}$+1/16	6
Fines	3	-1/16	3

Depth below surface (m)	Percentage Fines	Sand	Gravel
0.6 - 0.8	3	97	trace
0.8 - 1.3	23	72	5
1.3 - 2.3	2	26	72
2.3 - 3.3	2	30	68
3.3 - 4.1	5	78	17
4.1 - 5.1	2	31	67
5.1 - 6.1	2	27	71
6.1 - 7.1	trace	40	60
7.1 - 8.1	trace	27	73
8.1 - 8.9	trace	37	63

SK 85 NE 7 8570 5710

Stapleford Wood, Stapleford Block C

Surface level (+16.8 m) +55 ft
Water level +15.2 m (+50 ft)
April 1972

Overburden 0.5 m (1.5 ft)
Mineral 6.9 m (22.5 ft)
Bedrock 1.6 m + (5.5 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.5	(1.5)	0.5	(1.5)
Older River Gravel (Beeston Terrace)	Gravel, sandy and 'clayey' at top Gravel: fine to coarse, subrounded to well rounded quartz and quartzite, with angular to subrounded chert Sand: medium, subangular to rounded quartz, quartzite and lithic grains Fines: light grey and yellowish brown silt	6.9	(22.5)	7.4	(24.5)
Lower Lias	Mudstone, dark grey	1.6+	(5.5+)	9.0	(29.5)

	%	mm	%
		+16	22
Gravel	47	-16+4	25
		-4+1	10
Sand	47	-1+$\frac{1}{4}$	30
		-$\frac{1}{4}$+1/16	7
Fines	6	-1/16	6

Depth below surface (m)	Percentage Fines	Sand	Gravel
0.5 - 1.3	34	61	5
1.3 - 1.8	17	66	17
1.8 - 2.8	2	53	45
2.8 - 3.8	trace	45	55
3.8 - 4.8	2	47	51
4.8 - 5.8	trace	40	60
5.8 - 6.8	trace	35	65
6.8 - 7.4	trace	37	63

SK 85 NE 8 8668 5641 — Stapleford Grange — Block C

Surface level (+16.2 m) +53 ft
Water level +14.5 m (+48 ft)
April 1972

Overburden 1.2 m (4.0 ft)
Mineral 1.1 m (3.5 ft)
Bedrock 0.5 m + (1.5 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.4	(1.5)	0.4	(1.5)
Older River Gravel (Beeston Terrace)	Pebbly clay; brown, grey and blue clay with occasional sandstone, chalk and limestone pebbles	0.8	(2.5)	1.2	(4.0)
	'Very clayey' sandy gravel Gravel: fine, well rounded quartz, sandstone and flint Sand: medium, rounded quartz and rock fragments	1.1	(3.5)	2.3	(7.5)
Lower Lias	Limestone, grey, fossiliferous	0.5+	(1.5+)	2.8	(9.0)

	%	mm	%
		+16	11
Gravel	32	-16+4	21
		-4+1	9
Sand	44	-1+$\frac{1}{4}$	26
		-$\frac{1}{4}$+1/16	9
Fines	24	-1/16	24

Depth below surface (m)	Percentage Fines	Sand	Gravel
1.2 - 2.3	24	44	32

SK 85 NE 9 8557 5578 — Stapleford Wood Block C

Surface level (+16.8 m) +55 ft
Water level +14.3 m (+47 ft)
April 1972

Overburden 0.1 m (0.5 ft)
Mineral 7.4 m (24.5 ft)
Bedrock 1.5 m + (5.0 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.1	(0.5)	0.1	(0.5)
Older River Gravel (Beeston Terrace)	Gravel and sandy gravel Gravel: fine to coarse, subrounded to well rounded quartz and quartzite, with subangular chert Sand: medium, angular to rounded quartz and lithic grains	7.4	(24.5)	7.5	(24.5)
Lower Lias	Mudstone, dark grey, fossiliferous	1.5+	(5.0+)	9.0	(29.5)

	%	mm	%
		+16	29
Gravel	58	-16+4	29
		-4+1	9
Sand	41	$-1+\frac{1}{4}$	28
		$-\frac{1}{4}+1/16$	4
Fines	1	-1/16	1

Depth below surface (m)	Percentage Fines	Sand	Gravel
0.1 - 0.5	2	62	36
0.5 - 1.5	2	34	64
1.5 - 2.5	1	46	53
2.5 - 3.5	4	63	33
3.5 - 4.5	trace	53	47
4.5 - 5.5	trace	24	76
5.5 - 6.5	trace	33	67
6.5 - 7.5	trace	20	80

SK 85 NE 10 8639 5537 — Stapleford Moor Block C

Surface level (+15.8 m) +52 ft
Water not encountered
April 1972

Overburden 0.3 m (1.0 ft)
Mineral 2.8 m (9.0 ft)
Bedrock 1.4 m + (4.5 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.3	(1.0)	0.3	(1.0)
Older River Gravel (Beeston Terrace)	Gravel and sandy gravel 'clayey' in part Gravel: fine, subrounded to well rounded quartz and quartzite, with subangular chert Sand: medium, angular to subrounded quartz and rock fragments	2.8	(9.0)	3.1	(10.0)
Lower Lias	Mudstone, dark grey	1.4+	(4.5+)	4.5	(15.0)

	%	mm	%
		+16	25
Gravel	48	-16+4	23
		-4+1	13
Sand	45	$-1+\frac{1}{4}$	25
		$-\frac{1}{4}+1/16$	7
Fines	7	-1/16	7

Depth below surface (m)	Percentage Fines	Sand	Gravel
0.3 - 1.1	1	25	74
1.1 - 2.1	16	43	41
2.1 - 3.1	4	61	35

SK 85 NE 11 8666 5944 — Norton Disney Block E

Surface level (+30.8 m) +101 ft
Water level +29.3 m (+96 ft)
April 1972

Waste 0.9 m (3.0 ft)
Bedrock 2.1 m + (7.0 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.5	(1.5)	0.5	(1.5)
Glacial Sand and Gravel (Hilton Terrace)	Pebbly sand Gravel: fine, well rounded sandstone, with subangular flint Sand: medium, quartz and rock fragments	0.4	(1.5)	0.9	(3.0)
Lower Lias	Mudstone, dark grey, fossiliferous	2.1+	(7.0+)	3.0	(10.0)

	%	mm	%	Depth below surface (m)	Percentage Fines	Sand	Gravel
		+16	2	0.5 - 0.9	1	87	12
Gravel	12	-16+4	10				
		-4+1	11				
Sand	87	-1+$\frac{1}{4}$	62				
		-$\frac{1}{4}$+1/16	14				
Fines	1	-1/16	1				

SK 85 NE 12 8854 5854 — Stapleford Block B

Surface level (+15.2 m) +50 ft
Water level not recorded
Shell and auger 6 in
October 1972

Overburden 0.5 m (1.5 ft)
Mineral 5.0 m (16.5 ft)
Bedrock 1.5 m + (5.0 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.5	(1.5)	0.5	(1.5)
Older River Gravel (Beeston Terrace)	Gravel and sandy gravel Gravel: fine, subangular to well rounded quartz, quartzite and sandstone, with angular to subrounded chert and flint Sand: medium, angular to rounded quartz, quartzite and other lithic grains	5.0	(16.5)	5.5	(18.0)
Lower Lias	Mudstone, grey	1.5+	(5.0+)	7.0	(23.0)

	%	mm	%	Depth below surface (m)	Percentage Fines	Sand	Gravel
		+16	13	0.5 - 1.5	4	48	48
Gravel	52	-16+4	39	1.5 - 2.5	3	56	41
		-4+1	12	2.5 - 3.5	2	51	47
Sand	46	-1+$\frac{1}{4}$	29	3.5 - 4.5	trace	33	67
		-$\frac{1}{4}$+1/16	5	4.5 - 5.5	1	42	57
Fines	2	-1/16	2				

SK 85 NE 13 8586 5944 Brills Farms, Norton Disney Block E

Surface level (c. +33.5 m) c. +110 ft
Water level c. +29.7 m (c. +98 ft)
November 1973

Overburden 0.7 m (2.5 ft)
Mineral 6.3 m (20.5 ft)
Bedrock 1.0 m+ (3.5 ft+)

			Thickness m	(ft)	Depth m	(ft)
		Soil	0.7	(2.5)	0.7	(2.5)
Glacial Sand and Gravel (Hilton Terrace)	A.	Pebbly sand, 'clayey' between 1.7 m and 3.7 m Gravel: fine, subrounded quartzite with angular chert and some rounded quartz. Sand: medium, subrounded to rounded quartz, chert, mudstone and other lithic fragments including coal.	5.0	(16.5)	5.7	(18.5)
	B.	Sandy gravel Gravel: fine, subrounded quartzite with some subangular chert and rare subrounded quartz. Sand: medium, subrounded to rounded quartz, chert, mudstone and lithic fragments	1.3	(4.5)	7.0	(23.0)
Lower Lias		Mudstone: greyish green	1.0+	(3.5+)	8.0	(26.0)

		%	mm	%	Depth below surface (m)	Percentage Fines	Sand	Gravel
A.	Gravel	7	+16	1	0.7 - 1.7	3	89	8
			-16+4	6	1.7 - 2.7	20	74	6
					2.7 - 3.7	10	83	7
	Sand	85	- 4+1	7	3.7 - 4.7	3	93	4
			- 1+¼	56	4.7 - 5.7	2	96	2
			- ¼+1/16	22				
	Fines	8	- 1/16	8				
B.	Gravel	46	+ 16	18	5.7 - 6.7	1	54	45
			- 16+4	28	6.7 - 7.0	1	49	50
	Sand	53	- 4+1	11				
			- 1+¼	37				
			- ¼+1/16	5				
	Fines	1	- 1/16	1				

SK 85 SW 22 8445 5475

Coddington Moor Block C

Surface level (+18.3 m) +60 ft
Water level not recorded
April 1972

Overburden 0.4 m (1.5 ft)
Mineral 7.8 m (25.5 ft)
Bedrock 0.8 m+ (2.5 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.4	(1.5)	0.4	(1.5)
Older River Gravel (Beeston Terrace)	Gravel and sandy gravel Gravel: fine, well rounded quartz, sandstone, quartzite and limestone, with subangular chert. Sand: medium, rounded quartz and rock fragments	7.8	(25.5)	8.2	(27.0)
Lower Lias	Mudstone, greenish grey and dark grey	0.8+	(2.5+)	9.0	(29.5)

	%	mm	%	Depth below surface (m)	Percentage Fines	Sand	Gravel
Gravel	47	+16	18	0.4 - 1.4	6	67	27
		-16+4	29	1.4 - 2.4	3	42	55
				2.4 - 3.4	trace	77	23
Sand	51	- 4+1	9	3.4 - 4.4	trace	60	40
		- 1+¼	38	4.4 - 5.4	trace	48	52
		- ¼+1/16	4	5.4 - 6.4	trace	36	64
				6.4 - 7.4	trace	26	74
Fines	2	-1/16	2	7.4 - 8.2	9	45	46

SK 85 SW 23 8449 5351 — Folly House, Coddington — Block D

Surface level (+22.6 m) +74 ft
Water level +21.9 m (+72 ft)
April 1972

Overburden 0.3 m (1.0 ft)
Mineral 6.1 m (20.0 ft)
Bedrock 1.6 m+ (5.0 ft+)

		Thickness m	Thickness (ft)	Depth m	Depth (ft)
	Soil	0.3	(1.0)	0.3	(1.0)
Older River Gravel (Beeston Terrace)	Sandy gravel and gravel, 'very clayey' at top Gravel: fine to coarse, subangular to well rounded quartz and quartzite, with subangular chert Sand: medium, angular to subrounded quartz and lithic grains	6.1	(20.0)	6.4	(21.0)
Lower Lias	Mudstone, dark grey	1.6+	(5.0+)	8.0	(26.0)

	%	mm	%
Gravel	39	+16	16
		-16+4	23
Sand	54	- 4+1	5
		- 1+$\frac{1}{4}$	36
		- $\frac{1}{4}$+1/16	13
Fines	7	-1/16	7

Depth below surface (m)	Percentage Fines	Sand	Gravel
0.3 - 1.3	19	68	13
1.3 - 1.7	25	69	6
1.7 - 2.7	trace	61	39
2.7 - 3.7	2	19	79
3.7 - 4.7	trace	54	46
4.7 - 5.7	9	88	3
5.7 - 6.4	2	50	48

SK 85 SW 24 8322 5275 Coddington Road, Balderton Block D

Surface level (+18.9 m) +62 ft
Water level +16.5 m (+54 ft)
April 1972

Overburden 0.6 m (2.0 ft)
Mineral 5.8 m (19.0 ft)
Bedrock 1.6 m+ (5.0 ft+)

			Thickness m	(ft)	Depth m	(ft)
		Soil	0.6	(2.0)	0.6	(2.0)
Older River Gravel (Beeston Terrace)	A.	'Very clayey' pebbly sand Gravel: fine to coarse, subrounded well rounded quartz and quartzite Sand: medium, subangular quartz and rock fragments	1.1	(3.5)	1.7	(5.5)
	B.	Sandy gravel and gravel Gravel: fine, angular to well rounded quartz and quartzite, with subangular chert Sand: medium, subangular to rounded quartz and lithic grains	4.7	(15.5)	6.4	(21.0)
Rhaetic		Mudstone, greenish grey	1.6+	(5.0+)	8.0	(26.0)

		%	mm	%	Depth below surface (m)	Percentage Fines	Sand	Gravel
A.	Gravel	14	+16	6	0.6 - 1.1	20	61	19
			-16+4	8	1.1 - 1.7	37	53	10
	Sand	57	- 4+1	3				
			- 1+¼	35				
			- ¼+1/16	19				
	Fines	29	- 1/16	29				
B.	Gravel	38	+16	13	1.7 - 2.7	2	36	62
			-16+4	25	2.7 - 3.7	2	50	48
					3.7 - 4.7	2	63	35
	Sand	60	- 4+1	10	4.7 - 5.7	1	82	17
			- 1+¼	43	5.7 - 6.4	1	75	24
			-¼+1/16	7				
	Fines	2	-1/16	2				

SK 85 SW 25 8236 5248

Ash Villa, Balderton Block D

Surface level (+17.1 m) +56 ft
Water level +15.5 m (+51 ft)
Shell and auger 6 in
September 1972

Overburden 0.3 m (1.0 ft)
Mineral 7.7 m (25.5 ft)
Bedrock 1.5 m+ (5.0 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.3	(1.0)	0.3	(1.0)
Older River Gravel (Beeston Terrace)	Gravel, 'clayey' at top Gravel: fine to coarse, subangular to well rounded quartz, quartzite and sandstone, with subangular chert Sand: medium, subangular to rounded quartz, quartzite and lithic grains	7.7	(25.5)	8.0	(26.0)
Keuper Marl	Mudstone, grey	1.5+	(5.0+)	9.5	(31.0)

	%	mm	%
Gravel	59	+16	23
		-16+4	36
Sand	36	- 4+1	8
		- 1+$\frac{1}{4}$	23
		- $\frac{1}{4}$+1/16	5
Fines	5	- 1/16	5

Depth below surface (m)	Percentage Fines	Sand	Gravel
0.3 - 0.8	17	68	15
0.8 - 1.8	15	34	51
1.8 - 2.8	trace	16	84
2.8 - 3.8	1	30	69
3.8 - 4.8	trace	44	56
4.8 - 5.8	1	37	62
5.8 - 6.8	11	43	46
6.8 - 7.8	trace	33	67
7.8 - 8.0	4	30	66

SK 85 SW 26 8148 5296

Newark upon Trent Block D

Surface level (+15.4 m) +51 ft
Water level +13.4 m (+44 ft)
April 1972

Overburden 1.2 m (4.0 ft)
Mineral 5.6 m (18.5 ft)
Bedrock 1.7 m+ (5.5 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.5	(1.5)	0.5	(1.5)
Older River Gravel (Beeston Terrace)	Pebbly sandy silt, grey and yellowish brown with fine well rounded, quartz and quartzite pebbles and medium subangular quartz sand	0.7	(2.5)	1.2	(4.0)
	Gravel Gravel: fine to coarse, sub-rounded to well rounded quartz and quartzite with subangular chert Sand: medium, subrounded quartz and lithic grains	5.6	(18.5)	6.8	(22.5)
Keuper	Mudstone, light bluish-grey	1.7+	(5.5+)	8.5	(28.0)

	%	mm	%
Gravel	62	+16	31
		-16+4	31
Sand	36	- 4+1	8
		- 1+$\frac{1}{4}$	24
		- $\frac{1}{4}$+1/16	4
Fines	2	- 1/16	2

Depth below surface (m)	Percentage Fines	Sand	Gravel
1.2 - 2.2	5	54	41
2.2 - 3.2	3	26	71
3.2 - 4.2	2	17	81
4.2 - 5.2	trace	35	65
5.2 - 6.2	trace	48	52
6.2 - 6.8	trace	36	64

SK 85 SW 27 8450 5255 Moor Farm, Barnby Block D

Surface level (+18.3 m) +60 ft
Water level +17.2 m (+56 ft)
Shell and auger 6 in
October 1972

Overburden 0.4 m (1.5 ft)
Mineral 7.1 m (23.5 ft)
Bedrock 1.5 m+ (5.0 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.4	(1.5)	0.4	(1.5)
Older River Gravel (Beeston Terrace)	Gravel and sandy gravel Gravel: fine to coarse, subangular to well rounded quartz and quartzite with occasional subangular chert Sand: medium, subangular to rounded quartz and lithic grains	7.1	(23.5)	7.5	(24.5)
Lower Lias	Mudstone, grey	1.5+	(5.0+)	9.0	(29.5)

	%	mm	%	Depth below surface (m)	Percentage Fines	Sand	Gravel
Gravel	47	+16	23	0.4 - 1.4	1	34	65
		-16+4	24	1.4 - 2.4	trace	26	74
				2.4 - 3.4	trace	29	71
Sand	52	- 4+1	9	3.4 - 4.4	trace	59	41
		- 1+$\frac{1}{4}$	39	4.4 - 5.4	trace	84	16
		- $\frac{1}{4}$+1/16	4	5.4 - 6.4	trace	95	5
				6.4 - 7.0	1	61	38
Fines	1	-1/16	1	7.0 - 7.5	trace	24	76

SK 85 SW 28 8333 5188 Bridge Farm, Balderton Block D

Surface level (+18.0 m) +59 ft
Water level +16.7 m (+55 ft)
April 1972

Overburden 0.4 m (1.5 ft)
Mineral 8.4 m (27.5 ft)
Bedrock 1.7 m+ (5.5 ft+)

			Thickness m	(ft)	Depth m	(ft)
		Soil	0.4	(1.5)	0.4	(1.5)
Older River Gravel (Beeston Terrace)	A.	'Very clayey' pebbly sand Gravel: fine, well rounded quartz and quartzite Sand: medium, subangular quartzite chert and lithic grains Fines: grey and yellowish brown silt	1.2	(4.0)	1.6	(5.5)
	B.	Gravel Gravel: fine to coarse, well rounded quartz and quartzite, with sub-angular chert Sand: medium, subangular to rounded quartz and lithic grains	7.2	(23.5)	8.8	(29.0)
Lower Lias		Mudstone, pale brown	1.7+	(5.5+)	10.5	(34.5)

		%	mm	%	Depth below surface (m)	Percentage Fines	Sand	Gravel
A.	Gravel	12	+16	4	0.4 - 1.0	36	59	5
			-16+4	8	1.0 - 1.6	14	67	19
	Sand	63	- 4+1	7				
			- 1+¼	41				
			- ¼+1/16	15				
	Fines	25	- 1/16	25				
B.	Gravel	72	+16	32	1.6 - 2.6	2	27	71
			-16+4	40	2.6 - 3.6	1	34	65
					3.6 - 4.6	trace	24	76
	Sand	27	- 4+1	10	4.6 - 5.6	1	33	66
			- 1+¼	15	5.6 - 6.6	1	19	80
			- ¼+1/16	2	6.6 - 7.6	trace	27	73
					7.6 - 8.6	1	11	88
	Fines	1	- 1/16	1	8.6 - 8.8	trace	45	55

SK 85 SW 29 8324 5359 Coddington Windmill Block E

Surface level (+35.7 m) +117 ft
Water not encountered
April 1972

Overburden 0.8 m (2.5 ft)
Mineral 3.1 m (10.0 ft)
Bedrock 1.6 m+ (5.0 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.8	(2.5)	0.8	(2.5)
Glacial Sand and Gravel (Hilton Terrace)	Gravel, sandy and 'very clayey' at top Gravel: fine to coarse, subrounded to well rounded quartz and quartzite Sand: medium, angular to subrounded quartz and rock fragments	3.1	(10.0)	3.9	(13.0)
Lower Lias	Mudstone, dark grey	1.6+	(5.0+)	5.5	(18.0)

	%	mm	%
Gravel	58	+16	34
		-16+4	24
Sand	30	- 4+1	6
		- 1+$\frac{1}{4}$	16
		- $\frac{1}{4}$+1/16	8
Fines	12	- 1/16	12

Depth below surface (m)	Percentage Fines	Sand	Gravel
0.8 - 1.9	31	40	29
1.9 - 2.9	3	37	61
2.9 - 3.9	1	12	87

SK 85 SW 30 8262 5467

Coddington Hall Block E

Surface Level (c. +30.5 m) c. +100 ft
Water level c. +28.5 m (c. +94 ft)
Dando 6 in
December 1973

Overburden 0.7 m (2.5 ft)
Mineral 4.1 m (13.5 ft)
Bedrock 1.2 m+ (4.0 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.7	(2.5)	0.7	(2.5)
Glacial Sand and Gravel (Hilton Terrace)	'Clayey' pebbly sand Gravel: fine to coarse, subangular to well rounded quartz and quartzite, with subangular chert and some rounded mudstone Sand: medium, subangular quartz and rock fragments	4.1	(13.5)	4.8	(15.5)
Lower Lias	Mudstone, pale bluish grey	1.2+	(4.0+)	6.0	(19.5)

	%	mm	%
Gravel	15	+16	6
		-16+4	9
Sand	66	- 4+1	8
		- 1+$\frac{1}{4}$	39
		- $\frac{1}{4}$+1/16	19
Fines	19	- 1/16	19

Depth below surface (m)	Percentage Fines	Sand	Gravel
0.7 - 1.7	14	73	13
1.7 - 2.7	13	79	8
2.7 - 3.5	13	64	23
3.5 - 4.8	35	50	15

SK 85 SE 9 8540 5481

Tinderbox, Coddington Block C

Surface level (+17.4 m) +57 ft
Water level +16.1 m (+53 ft)
April 1972

Overburden 0.3 m (1.0 ft)
Mineral 5.7 m (18.5 ft)
Bedrock 1.5 m+ (5.0 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.3	(1.0)	0.3	(1.0)
Older River Gravel (Beeston Terrace)	Gravel, 'very clayey' at top Gravel: fine to coarse, subrounded to well rounded quartz and quartzite, with subangular to rounded chert Sand: medium, angular to subrounded quartz and lithic grains Fines: light grey and brown	5.7	(18.5)	6.0	(19.5)
Lower Lias	Mudstone, grey	1.5+	(5.0+)	7.5	(24.5)

	%	mm	%
Gravel	64	+16	30
		-16+4	34
Sand	34	-4+1	12
		-1+$\frac{1}{4}$	19
		-$\frac{1}{4}$+1/16	3
Fines	2	-1/16	2

Depth below surface (m)	Percentage Fines	Sand	Gravel
0.3 - 0.6	25	47	28
0.6 - 1.6	2	25	73
1.6 - 2.6	1	32	67
2.6 - 3.6	1	38	61
3.6 - 4.6	trace	39	61
4.6 - 5.6	trace	35	65
5.6 - 6.0	trace	18	82

SK 85 SE 10 8535 5394 Kelwick Farm, Barnby Block D

Surface level (+17.7 m) +58 ft
Water level +16.5 m (+54 ft)
April 1972

Overburden 0.4 m (1.5 ft)
Mineral 6.0 m (19.5 ft)
Bedrock 1.6 m+ (5.0 ft+)

	Soil	Thickness m	(ft)	Depth m	(ft)
	Soil	0.4	(1.5)	0.4	(1.5)
Older River Gravel (Beeston Terrace)	Gravel Gravel: fine to coarse, angular to well rounded quartz and quartzite, with angular to subrounded chert Sand: medium, angular to subrounded quartz and lithic grains	6.0	(19.5)	6.4	(21.0)
Lower Lias	Mudstone, dark grey	1.6+	(5.0+)	8.0	(26.0)

	%	mm	%	Depth below surface (m)	Fines	Sand	Gravel
Gravel	63	+16	31	0.4 - 1.4	5	25	70
		-16+4	32	1.4 - 2.4	2	31	67
				2.4 - 3.0	5	37	58
Sand	34	-4+1	9	3.0 - 3.2	4	63	33
		-1+$\frac{1}{4}$	21	3.2 - 4.2	1	19	80
		-$\frac{1}{4}$+1/16	4	4.2 - 5.2	1	39	60
				5.2 - 6.2	2	49	49
Fines	3	-1/16	3	6.2 - 6.4	trace	37	63

SK 85 SE 11 8541 5280

Plots Farms, Barnby Block D

Surface level (+17.4 m) +57 ft
Water not encountered
April 1972

Overburden 0.4 m (1.5 ft)
Mineral 4.4 m (14.5 ft)
Bedrock 1.7 m+ (5.5 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.4	(1.5)	0.4	(1.5)
Older River Gravel (Beeston Terrace)	A. 'Very clayey' pebbly sand Gravel: fine, subrounded to well rounded quartz and quartzite Sand: medium, angular to subrounded quartz and lithic grains Fines: light grey silt	1.4	(4.5)	1.8	(6.0)
	B. Gravel Gravel: fine to coarse rounded quartz and quartzite with subangular chert Sand: medium, subangular to rounded quartz and lithic grains	3.0	(10.0)	4.8	(16.0)
Lower Lias	Mudstone, light bluish grey	1.7+	(5.5+)	6.5	(21.5)

		%	mm	%	Depth below surface (m)	Percentage Fines	Sand	Gravel
A.	Gravel	8	+16	2	0.4 - 0.8	23	63	14
			-16+4	6	0.8 - 1.8	32	63	5
	Sand	63	- 4+1	3				
			- 1+¼	32				
			- ¼+1/16	28				
	Fines	29	-1/16	29				
B.	Gravel	48	+16	24	1.8 - 2.8	4	39	57
			-16+4	24	2.8 - 3.8	trace	47	53
					3.8 - 4.8	trace	65	35
	Sand	50	- 4+1	9				
			- 1+¼	35				
			- ¼+1/16	6				
	Fines	2	- 1/16	2				

SK 85 SE 12 8999 5333

Beckingham Field

Surface level (+14.9 m) +49 ft
Water not encountered
April 1972

Waste 1.0 m (3.5 ft)
Bedrock 2.0 m+ (6.5 ft+)

	Soil	Thickness m	Thickness (ft)	Depth m	Depth (ft)
		0.2	(0.5)	0.2	(0.5)
Older River Gravel	Pebbly sand Gravel: fine, subrounded quartz and quartzite Sand: medium subrounded quartz, quartzite, chert and other rock fragments Fines: brown silt	0.8	(2.5)	1.0	(3.5)
Lower Lias	Mudstone, dark grey, purple and brown	2.0+	(6.5+)	3.0	(10.0)

	%	mm	%	Depth below surface (m)	Percentage Fines	Sand	Gravel
Gravel	12	+16	6	0.2 - 1.0	2	86	12
		-16+4	6				
Sand	86	- 4+1	7				
		- 1+$\frac{1}{4}$	53				
		- $\frac{1}{4}$+1/16	26				
Fines	2	- 1/16	2				

SK 85 SE 13 8948 5229

Stragglethorpe Grange

Surface level (+16.5 m) +54 ft
Water not encountered
April 1972

Waste 0.9 m (3.0 ft)
Bedrock 2.1 m+ (7.0 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.2	(0.5)	0.2	(0.5)
Older River Gravel	'Very clayey' sand Sand: medium, angular to subrounded quartz and rock fragments Fines: brown silt	0.7	(2.5)	0.9	(3.0)
Lower Lias	Mudstone, dark grey, purple and brown	2.1+	(7.0+)	3.0	(10.0)

	%	mm	%	Depth below surface (m)
Gravel	3	+16	0	0.2 - 0.9
		-16+4	3	
Sand	60	- 4+1	3	
		- 1+¼	37	
		- ¼+1/16	20	
Fines	37	-1/16	37	

Percentage		
Fines	Sand	Gravel
37	60	3

SK 85 SE 14 8971 5142

Fenton

Surface level (+15.2 m) +50 ft
Water not encountered
April 1972

Bedrock 2.5 m+ (8.0 ft+)

		Thickness m	(ft)	Depth m	(ft)
Lower Lias	Mudstone; grey, mottled purple and brown	2.5+	(8.0+)	2.5	(8.0)

SK 85 SE 15 8916 5080

Fenton

Surface level (+17.1 m) +56 ft
Water not encountered
April 1972

Waste 1.2 m (4.0 ft)
Bedrock 1.3 m+ (4.5 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.2	(0.5)	0.2	(0.5)
Older River Gravel	Sandy silt, brown silt with scattered patches of fine, subangular quartz and rock fragments	1.0	(3.5)	1.2	(4.0)
Lower Lias	Mudstone, purple and brown	1.3+	(4.5+)	2.5	(8.0)

SK 85 SE 16 8987 5007

Fenton

Surface level (+16.8 m) +55 ft
Water not encountered
April 1972

Waste 1.4 m (4.5 ft)
Bedrock 1.1 m+ (3.5 ft+)

		Thickness m	(ft)	Depth m	(ft)
	Soil	0.1	(0.5)	0.1	(0.5)
Older River Gravel	Clay, brown, slightly sandy	0.4	(1.5)	0.5	(1.5)
	Pebbly sand Gravel: fine, well rounded quartz and oolitic limestone Sand: medium, well rounded quartz and limestone	0.9	(3.0)	1.4	(4.5)
Lower Lias	Mudstone, dark grey, calcareous	1.1+	(3.5+)	2.5	(8.0)

	%	mm	%	Depth below surface (m)
Gravel	22	+16	2	0.5 - 1.5
		-16+4	20	
Sand	70	- 4+1	6	
		- 1+$\frac{1}{4}$	56	
		- $\frac{1}{4}$+1/16	8	
Fines	8	- 1/16	8	

Percentage		
Fines	Sand	Gravel
8	70	22

Appendix G: 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

References

ALLEN, V.T. 1936. Terminology of medium grained sediments. Rep. Natl. Res. Coun. Washington 1935-36, App. 1, Rep. Comm. Sedimentation, pp. 18-47.

ARCHER, A.A. 1969. Background and problems of an assessment of sand and gravel resources in the United Kingdom. Proc. 9th Commonw. Min. Metall. Congr., 1969, Vol. 2. Mining and Petroleum Geology, pp. 495-508.

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

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

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

BRITISH STANDARD 1377. 1967. Methods of testing soils for civil engineering purposes. (London: British Standards Institution). 233 pp.

BUREAU OF MINES AND GEOLOGICAL SURVEY. 1948. Mineral Resources of the United States (Washington D.C.: Public Affairs Press) pp. 14-17.

CLAYTON, K.M. 1953. The glacial chronology of part of the Middle Trent Basin. Proc. Geol. Assoc., Vol. 64, No. 3, pp. 198-207.

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

KING, C.A.M. 1966. Pp. 41-59 in Nottingham and its Region. Ed. by K.C. Edwards (Nottingham: British Association for the Advancement of Science).

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

PETTIJOHN, F.J. 1957. Sedimentary Rocks. 2nd Ed. (London: Harper and Row).

POCOCK, T.L. 1929. The Trent Valley in the glacial period. Z. Gletscherkd., Vol. 17, pp. 302-318.

POSNANSKY, M. 1960. The Pleistocene succession in the Middle Trent Basin. Proc. Geol. Assoc., Vol. 71, pp. 285-311.

STEVENSON, I.P. and MITCHELL, G.H. 1955. The geology of the country between Burton upon Trent, Rugeley and Uttoxeter. Mem. Geol. Surv. G.B. (London: Her Majesty's Stationery Office).

STRAW, A. 1963. The Quaternary Evolution of the Lower and Middle Trent. East Midland Geogr., No. 20, pp. 171-189.

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

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

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

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

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

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

The following reports of the Institute relate particularly to sand and gravel resources:

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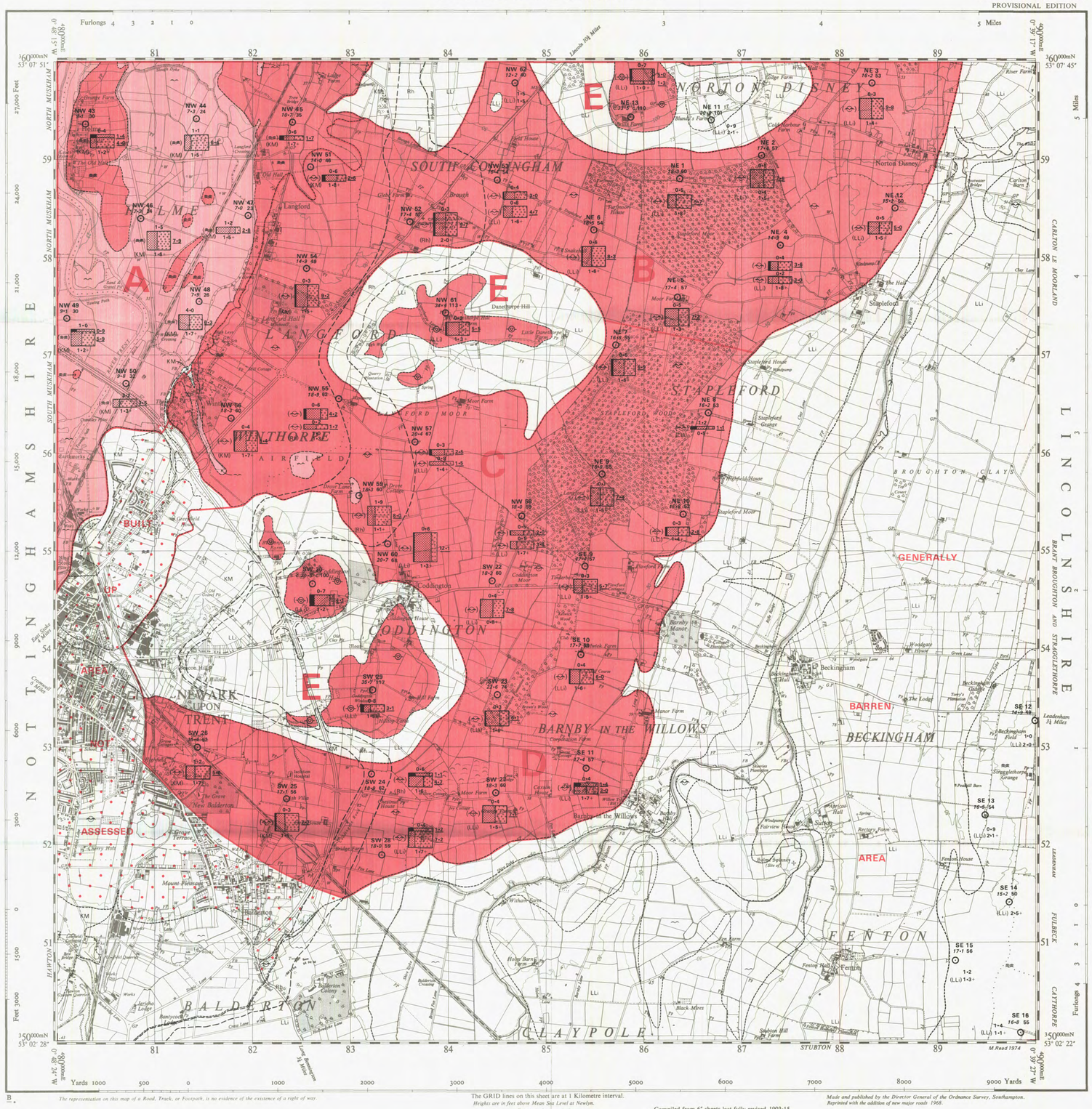
INSTITUTE OF GEOLOGICAL SCIENCES

MINERAL ASSESSMENT UNIT

THE SAND & GRAVEL RESOURCES of SHEET SK85 (EAST OF NEWARK UPON TRENT, NOTTS)

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

ORDNANCE SURVEY
SHEET SK 85
PROVISIONAL EDITION



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

The GRID lines on this sheet are at 1 Kilometre interval.
Heights are in feet above Mean Sea Level at Newlyn.
Contour value(s) are in feet
1 square inch on this map represents 99·639 acres on the ground.

Made and published by the Director General of the Ordnance Survey, Southampton.
Reprinted with the addition of new major roads 1968.

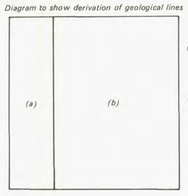
Compiled from 6" sheets last fully revised 1903-15.
Other partial systematic revision 1938-53 has been incorporated.
Major roads revised 1967.

Sand and Gravel Survey by J.R.Gozzard and J.H.Lovell in 1972 under the supervision of D.Price, R.G.Thurrell, Head, Mineral Assessment Unit.

1:25 000 Sand and Gravel Resources Sheet published 1976.
Austin W. Woodland, C.B.E., Director, Institute of Geological Sciences. Incorporating the Geological Survey of Great Britain, the Museum of Practical Geology and Overseas Geological Surveys.
1550/76

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

Diagram to show derivation of geological lines



(a) *Geological survey on six-inch scale by B.Smith and R.L.Sherlock in 1905-08. G.W.Lamplugh, District Geologist. (With minor revisions).*

(b) *Original geological survey on one-inch scale published in 1886. (With minor revisions).*

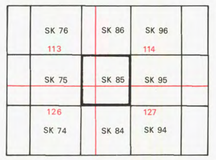


Diagram showing the relation of the National Grid 1:25 000 sheets with the New Series One-Inch and 1:50 000 Geological Sheets 113,114,126 and 127.

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

20

EXPLANATION OF SYMBOLS AND ABBREVIATIONS

DRIFT — RECENT AND PLEISTOCENE

- **Alluvium** – clays, silts and peat. A-8
- **River Gravel** – sands and gravels. RG-1
- **Older River Gravel** – sands and gravels. OR-9
- **Glacial Sand and Gravel** – sands and gravels, part 'clayey' GS-6

SOLID — JURASSIC AND PERMO-TRIASSIC

- LLi **Lower Lias** – dark impure limestones and mudstones.
- Rh **Rhaetic** – grey and green mudstones.
- KM **Keuper Marl** – red and green mudstones with gypsum in places.

BOUNDARY LINES

- Geological boundary, Drift.
- Geological boundary, Solid. Broken lines denote uncertainty.
- Inferred boundary between recognised categories of deposits.
- Resource Block boundary.

BOREHOLE DATA

- Mineral Assessment Unit (M.A.U.) Boreholes

Borehole Registration Number. NW 58 / 18·0 59 — Surface level in metres and feet above O.D. (Newlyn).
Borehole Site.
Geological Classification. 0·5+ Overburden, thickness in metres. 2·0+ Mineral (sand and gravel), thickness in metres. 0·5+ Waste, thickness in metres. 3·8+ Mineral (sand and gravel), thickness in metres. (LLi) 1·7+ Bedrock.
Grading diagram.

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 measurements recorded in feet.
(iv) The Geological Classification is given only for mineral and bedrock.

Borehole Registration Number

Each M.A.U. borehole is identified by a registration number e.g. NW 58. The letters refer to the relevant standard quarter sheet and the figures to the I.G.S. serial numbers for that quarter. The unique designation for borehole NW 58 is SK 85 NW 58.

Grading Diagrams

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

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

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

CATEGORIES OF DEPOSITS

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

Where appropriate on other sheets a fifth category, 'Discontinuous spreads of sand and gravel beneath overburden' is recognised.

RESOURCE BLOCKS

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

Detailed records may be consulted, on application to the Director at the appropriate offices of the Institute of Geological Sciences.

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