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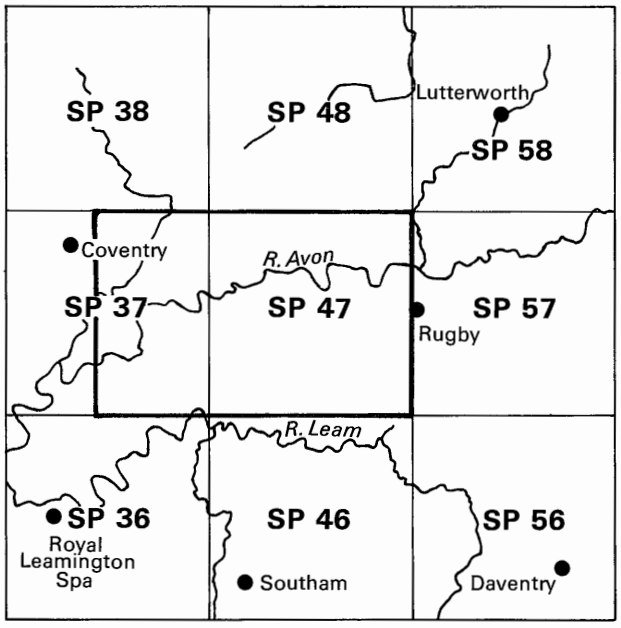

The sand and gravel resources of the country between Coventry and Rugby, Warwickshire

Description of 1:25 000 sheet SP47 and part of 37

R. G. Crofts

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

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

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The asterisk on the front cover indicates that part of a sheet adjacent to that quoted is described in the report.

PREFACE

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

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

This report describes the sand and gravel resources of sand and gravel of 160 km^2 of country between Coventry and Rugby, Warwickshire, shown on the accompanying 1:25 000 resource map SP 47 and part of SP 37. The survey was conducted by R. G. Crofts and B. Cannell in 1980. The work is based on the 1:10 000 scale geological survey carried out in 1976 to 1980, which is to be published in part at 1:50 000 on New Series Sheet 184 (Warwick).

J. D. Burnell ISO, and W.N. Pierce (Land Agents) were responsible for negotiating access to land for drilling. The ready cooperation of landowners and tenants in this work is gratefully acknowledged.

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SUMMARY

The geological maps of the Institute of Geological Sciences, pre-existing borehole information, and 70 boreholes drilled for the Industrial Minerals Assessment Unit form the basis of the assessment of the sand and gravel resources in the area between Coventry and Rugby, Warwickshire.

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

The assessed area is divided into six resource blocks, containing between 10.5 and 19.9 km^2 of sand and gravel. For each block the geology of the deposits is described, and the mineral-bearing area, the mean thickness of overburden and mineral and the mean gradings are stated. Detailed borehole data are also given. The geology, the position of the boreholes and the outlines of the resource blocks are shown on the accompanying map.

Notes

Each borehole registered with the Institute is identified by a four-element code (e.g. SP 47 NE 64). The first two elements define the 10-km square (of the National Grid) in which the borehole is situated; the third element defines a quadrant of that square, and the fourth is the accession number of the borehole. In the text of the report the borehole is normally referred to by the last three elements alone (e.g. 47 NE 64).

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

Bibliographical reference

CROFTS, R. G. 1982. The sand and gravel resources of the country between Coventry and Rugby, Warwickshire: description of 1:25 000 sheets SP 47 and part of SP 37. **Miner. Assess. Rep. Inst. Geol. Sci.**, No.125.

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INTRODUCTION

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

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

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

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

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

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

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

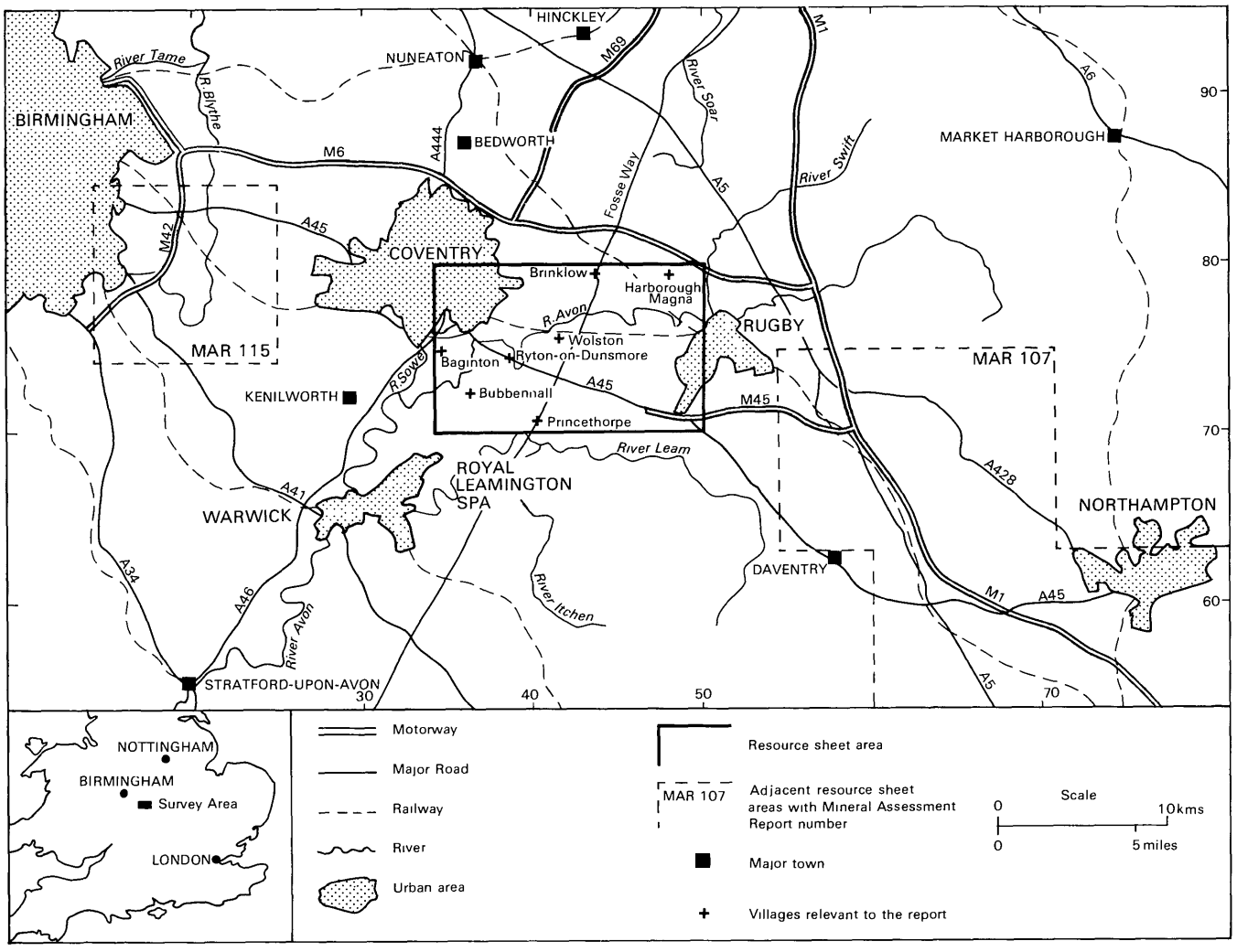


Figure 1 Map showing the location of the resource sheet.

The volume and other characteristics are assessed within resource blocks, each of which, ideally, contains approximately 10 km^2 of sand and gravel. No account is taken of any factors, for example roads, villages or land of high agricultural or landscape value, which might stand in the way of sand and gravel being exploited, although towns are excluded. The estimated total volume therefore bears no simple relationship to the amount that could be extracted in practice.

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

DESCRIPTION OF THE DISTRICT

General

The district extends over 160 km^2 between the urban areas of Coventry [340 793] and Rugby [500 753]. There are a number of major east-west road and rail routes which link these urban areas with other commercial and industrial centres of the West Midlands (Figure 1). The main north-south route is provided by the Fosse Way, an old Roman road, which traverses the district from Brinklow [431 794] to Princethorpe [402 702].

The industrial towns of Coventry and Rugby are both noted as centres of engineering, and are separated by rural areas which support both dairy and arable farming.

Sand and gravel deposits of the district fall into two main categories, glacial deposits and fluvial deposits. Glacial Sand and Gravel is found in resource blocks A, B, D, E and F, where it covers an area of 60.4 km^2 and contains an estimated 233 million m^3 of mineral resources. Fluvial deposits associated with the River Avon (Block C) cover an area of 15.4 km^2 and contain an estimated 32 million m^3 of mineral. Glacial Sand and Gravel is at present worked around Ryton-on-Dunsmore [385 742] and Bubbenhall [360 720] whilst extensive areas of abandoned pits can also be found around these villages and at Wolston [413 755], Brandon [408 765] and Baginton [346 741].

Topography

The River Avon drains westwards across the district and falls from 82 m above Ordnance Datum on the edge of Rugby to about 56 m OD west of Bubbenhall. Two smaller rivers, the Sowe and Sherbourne, drain southwards off the Warwickshire coalfield; they join to the north of Baginton [345 745] and are confluent with the River Avon beyond the western margin of the district.

South of the River Avon, the land surface is plateau-like, at an average height of 100 m above OD, and falls away gently westwards. To the north of the Avon, no such plateau surface exists; the ground is more undulating, rising to 122 m above OD near Harborough Magna [480 792] but to only about 91 m above OD in the centre of Coventry.

Geology

The geological sequence is summarised in Table 1. A more detailed description of the deposits can be found in

Table 1 Geological sequence.

DRIFT		
Recent and Pleistocene		Alluvium
		River Terrace Deposits (first to fourth terraces)
		Alluvial Fan Deposits
		Fluvioglacial Deposits (Dunsmore Gravel)
		Till (Oadby Till)
		Glacial Lake Deposits (Upper Wolston Clay)
		Glacial Sand and Gravel, undivided (including Wolston Sand and Gravel)
		Glacial Lake Deposits (Lower Wolston Clay)
		Till (Thrussington Till)
		Glacial Sand and Gravel (Baginton Sand and Gravel)
SOLID		
Jurassic	Lower Lias	Lower Lias, Including Blue Lias
Triassic	Penarth Group	Langport Member (White Lias)
		Cotham Member
		Westbury Formation
	Mercia Mudstone Group	Blue Anchor Formation (Tea Green Marl)
		Mercia Mudstone
	Sherwood Sandstone Group	Bromsgrove Sandstone Formation
Permian	Enville Group	Kenilworth Sandstone Formation
Upper Carboniferous		Tile Hill Mudstone Formation
		Coventry Sandstone Formation

the Regional Guide (Hains and Horton, 1969) and in the Warwick (Ambrose, Old and Sumbler, *in preparation*) and Coventry (Eastwood, Gibson and Cantril, 1923) memoirs. Open file reports (Sumbler, *in press*, b, c, and d) describe the details of recent mapping while additional details of the glacial drift are given by Sumbler (*in press*, a).

SOLID

Solid rocks are seen at outcrop in the west of the district around Coventry, where the drift cover is thin and patchy, and in the valleys of the River Avon and its tributaries. Elsewhere, there is widespread drift cover (Figure 2).

Upper Carboniferous and Permian

Enville Group The Coventry Sandstone Formation of Upper Carboniferous age comprises reddish brown sandstone with conglomeratic bands and impersistent beds of red mudstone. Sporadically exposed in the centre of Coventry, this sequence is known from boreholes to be about 300-350 m thick but in this district only about 75 m is seen at the surface. The Tile Hill Mudstone consists mainly of reddish brown mudstone with impersistent brown sandstone. The total thickness of the formation is about 280 m, of which 90 m are represented at the surface. The Kenilworth Sandstone Formation, thought to be of Permian age, comprises massive red and brown sandstone with impersistent mudstone beds. The lowest 50 m or so of this formation crops out in the southwestern part of this district.

Triassic

Sherwood Sandstone Group This group is represented by the Bromsgrove Sandstone, which is unconformable on the older beds. It consists of pale greyish buff micaceous sandstones with subordinate red mudstone beds, and totals between 25 and 40 m in thickness.

Mercia Mudstone Group Widespread and well exposed over the district, the Mercia Mudstone Group comprises 170 to 200 m of reddish brown mudstone with thin but persistent greenish grey sandstone and siltstone bands (skerries), overlain by the Blue Anchor Formation (Tea Green Marl) - a pale green silty mudstone, about 6 m in thickness.

Penarth Group This transgressive deposit consists of the Westbury Formation, a dark grey fissile mudstone, the Cotham Member, pale greenish grey and brown blocky mudstones and the Langport Member, a porcellanous limestone, which in this district total about 20 m in thickness.

Jurassic

Lower Lias The Lower Lias has a total thickness of about 220 m and consists principally of dark grey mudstone. The Blue Lias, a sequence of alternating mudstones and limestones up to 40 m in thickness, occurs near the base, and is quarried at New Bilton for cement manufacture.

DRIFT

The drift deposits of the district were first studied in detail by Shotton (1953) and were selected as the type sequence of the penultimate British glaciation, the Wolstonian (Mitchell and others, 1973). More recent work on these deposits is summarised by Sumbler (*in press*, a). The oldest deposits are the Baginton Sand and Gravel, which infill the north-east trending valley of the Proto-Soar (see Figure 2). Ice advancing from the north-west deposited a till (Thurssington Till) and on its retreat an ice-dammed lake or lakes, (the Lake Harrison of Shotton, 1953) remained, in which a sequence of clays, silts and sands were laid down. Subsequently, ice advanced from the north-east depositing a further till (Oadby Till)

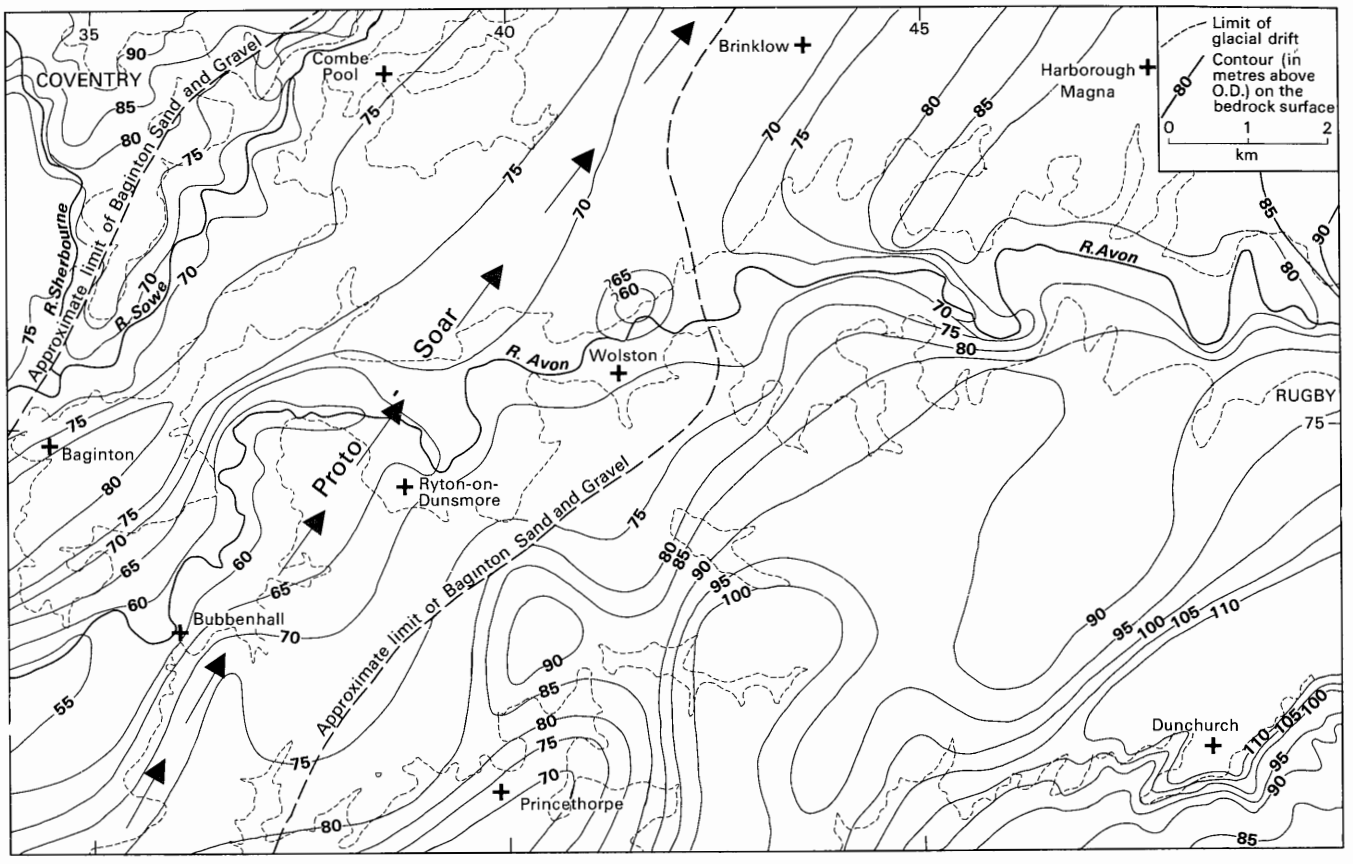


Figure 2 Contours on the bedrock surface, the courses of the Proto-Soar and present day rivers Avon, Sowe and Sherbourne and the limits of the Baginton Sand and Gravel.

and upon its retreat, meltwaters formed an outwash plain, comprising the Dunsmore Gravel.

The River Avon and its main tributaries have since dissected these older drift deposits. Four terraces are preserved along the rivers Avon and Sowe, and two in the valley of the River Sherbourne.

Glacial Sand and Gravel: Baginton Sand and Gravel These sands and gravels are found on the western side of the resource sheet area, occupying the deeper parts of a pre-Wolstonian river valley. This sequence was laid down in the valley of the Proto-Soar (Figure 2) at the onset of glacial conditions. The gravels, which are well sorted and current bedded, floor the buried valley and consist almost entirely of 'Bunter' pebbles derived from the Sherwood Sandstone Group. They are overlain and overlapped by well-sorted fine to medium cross-bedded sands, although the top metre or so is flat-bedded and commonly clayey (see borehole 37 SE 317). The sands and gravels have been equated with the Thurmaston Sand and Gravel of the Leicester area (Rice, 1968). Shotton (1953, p 237) considers that the Baginton Sand and Gravel is also similar to the "bedded gravelly drifts" found in the upper Tame Valley, which have been described by Cannell (1982).

Till In this district there are two lithologically distinct tills. A reddish brown till (Thrussington Till) with many Triassic and Carboniferous erratics, and a greyish brown till (Oadby Till) with dominantly Cretaceous, Jurassic and Triassic erratics. The former overlies the Baginton Sand and Gravel and is confined to an area similar to that of the underlying sand and gravel. The till contains erratics of red and green mudstones, quartzite, quartz and pale brown and buff sandstone from the Mercia Mudstone and Sherwood Sandstone groups, together with traces of coal and sandstone from Carboniferous outcrops, all bound in a reddish brown clay matrix. These Triassic and Carboniferous lithologies in the till indicate that the ice moved across the district from the north or north-west. The planar contact with the underlying sand is notable: it typically leaves the sand undistrubed. Generally, the till is 3 to 4 m thick but greater thicknesses have been proved in some assessment boreholes, (for example 8.8 m in borehole 47 NW 60).

The other till found in the area is preserved in the high ground around Harborough Magna and possibly also in an outlier at Princethorpe. It is a greyish brown clay with pebbles of quartzite, quartz, Triassic mudstones and sandstones, Jurassic limestones and mudstones, flint and chalk. This till has been thought to represent the deposits of ice which advanced from a north-easterly direction and covered an area extending to Moreton-in-Marsh in the south (Tomlinson, 1929).

Glacial Lake Deposits and Glacial Sand and Gravel, undivided (including Wolston Sand and Gravel These deposits are widespread and crop out over much of the district. The lake deposits (Wolston Clay) are variable in colour from reddish brown and brown in the west and north, around Stretton-on-Dunsmore [411 726] and Brinklow, to greyish brown and grey in the south-east around Dunchurch [475 718]. These clays and silts are typically stone-free and commonly well laminated, but clays contianing many small pebbles of quartzite, quartz and chalk are common in the east of the district where bodies of till also occur. These deposits vary greatly in thickness but have a tendency to thin to the south-east against bedrock (see horizontal section on map).

The silts and clays are commonly divided by a 'clayey' fine quartz sand, which appears to occur as a series of contemporaneous lobes. On the northern edge of the resource sheet, the sand occurs at various levels within the lake deposits, and around Harborough Magna it

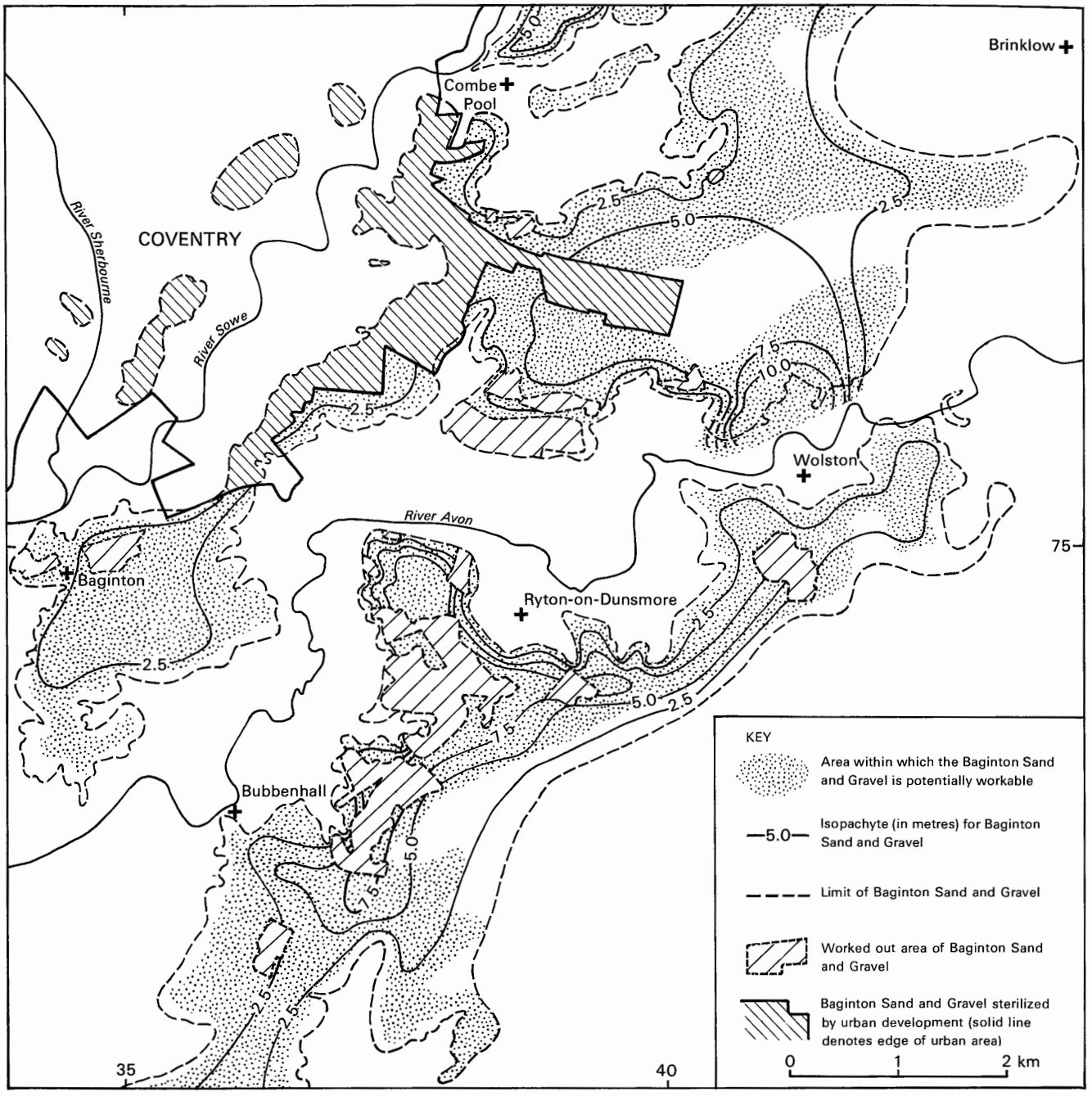


Figure 3 Isopachyte map of the Baginton Sand and Gravel.

attains an exceptional thickness of 13.5 m (including 1.5 m of laminated clay). It is, however, more usually about 2 m thick.

According to Shotton (1953) all these deposits were laid down in a large ice-dammed lake (Lake Harrison), which covered most of present-day Warwickshire and south Leicestershire. Shotton (1976) attempted to estimate the minimum period of sedimentation in Lake Harrison by counting varves, and obtained an approximate figure of 9600 years.

Fluvioglacial Deposits (Dunsmore Gravel) This deposit is widely developed on the high ground south of the River Avon and occurs as smaller outliers on Brinklow Heath [413 778], west of Brinklow and north of King's Newham [454 773]. It is usually a 'clayey' to 'very clayey' pebbly sand although where the deposit is thicker, as proved in borehole 47 SE 26, a basal 'clayey' sandy gravel may be present. The deposit contains much flint and ironstone in addition to 'Bunter' material derived from the Sherwood Sandstone Group. The high ironstone content gives these sands and gravels a distinctive ochreous colour and may in part explain the ironpans which are commonly found within a metre of the surface. The base of the Dunsmore Gravel is irregular, perhaps as a result of channeling into the underlying soft lake clays. This sand and gravel deposit is believed to have been laid down in an outwash plain by meltwaters issuing from the retreating ice sheet at the end of the Wolstonian period (Shotton, 1976).

Alluvial Fan Deposits Alluvial fans are mapped around Stretton-on-Dunsmore and Combe Pool [389 790]. They are derived from local older drift and are gravelly in nature. They may correspond in age with the oldest river deposits of the area.

River Terrace Deposits Although four terraces have been mapped in the Avon Valley, all are lithologically similar, and the correlations implied by the numbering of these deposits is based only on their relative height above the river. The third terrace has a very limited outcrop in this district, being mapped only near

Willenhall [360 770] in the valley of the River Sowe. The terrace deposits consist mainly of gravels containing quartzite, quartz, flint and ironstone; locally they may be overlain by a variable thickness of silt and clay, as proved, for example, in borehole 47 NE 64. Although the terrace deposits have a mean thickness of 2.9 m, they thicken locally around Wolston; in places they may overlie Baginton Sand and Gravel.

Alluvium Alluvium is found in the valleys of the rivers Avon, Sowe and Sherbourne and other smaller streams throughout the district. It consists of silts, clays and fine sands which, in parts of the Avon floodplain, conceal up to 2 m of sand and gravel as proved, for example, in borehole 47 NE 65.

Composition of the Sand and Gravel Deposits

Within the resource sheet area, glacial sand and gravel, and fluvioglacial, river terrace and alluvial fan deposits constitute potentially workable sand and gravel.

Glacial Sand and Gravel: Baginton Sand and Gravel (see Figure 3) This deposit comprises a basal gravelly unit generally overlain by 'clayey' sands and pebbly sands (see Figure 4b) and has an overall mean grading of 10 per cent fines, 73 per cent sand and 17 per cent gravel. The fines content of the gravelly unit ranges from 3 per cent in boreholes 37 NE 399 and 47 NW 60 to 8 per cent in borehole 47 SE 313, whilst the gravel content ranges from 29 per cent to 55 per cent, in boreholes 47 NW 60 and 37 NE 399 respectively. In the 'clayey' sand unit, the fines content ranges from 5 per cent to 21 per cent, in boreholes 37 NE 401 and 47 NW 64 respectively, but the maximum gravel content is only 15 per cent (proved in borehole 47 NW 68).

The pebbles are dominantly subrounded to well rounded quartzite and quartz, with sandstone and minor amounts (totalling less than 5 per cent) of igneous rocks, ironstone, flint and mudstone.

The sand fraction of both units is comprised mainly of quartz; fine and medium grades are equally represented in the sand fraction of the upper unit, but coarse sand becomes more predominant in the basal gravels.

Glacial Sand and Gravel: undivided (including Wolston Sand and Gravel) Consisting mainly of sands, this deposit is widely distributed over the district and has a mean grading of 22 per cent fines, 76 per cent sand and 2 per cent gravel. It is 'clayey' or 'very clayey', with the fines content ranging between 11 per cent (borehole 47 SE 26) and 30 per cent (borehole 37 SE 317]. Fine quartz sand is dominant in the sand grade although some medium sand may be present, as in borehole 47 NW 59. Although the deposits are generally sandy, borehole 47 SW 86 was exceptional in proving a deposit with only 5 per cent fines, but 27 per cent gravel. This gravel consisted of rounded to well rounded sandstone, quartzite and tabular grey mudstone with quartz and limestone and minor amounts of flint, ironstone and igneous rocks.

Fluvioglacial Deposits (Dunsmore Gravel) These deposits, 'clayey' and 'very clayey' pebbly sands to 'very clayey' gravels, have a mean grading of 16 per cent fines, 57 per cent sand and 27 per cent gravel. The fines, which have a ochreous colour and are often silty, range from 10 per cent in borehole 47 SW 85 to 22 per cent in borehole 47 SE 25. The gravel content of the deposits ranges from 10 per cent in borehole 47 SE 27 to 53 per cent in borehole 47 SW 86. To the south of Lawford Heath [460 748] 'clayey' or 'very clayey' pebbly sands generally overlie the more gravelly deposits, as, for example in borehole 47 SE 24.

Subangular to subrounded flint dominates the gravel fraction, which also contains pebbles of quartzite, quartz, sandstone and ironstone and minor amounts of limestone and mudstone. Fine and medium sands are about equally represented in the sand fraction, but increasing amounts of coarse sand are found in the gravelly deposits. Quartz is dominant in all the sand grades but rock fragments representative of the gravel fraction are increasingly common in the medium and coarse sand fractions.

River Terrace Deposits These 'clayey' gravels are found beneath the alluvium of the rivers Avon, Sowe and Sherborne and in their associated terraces. The deposits have a mean grading of 18 per cent fines, 47 per cent sand and 35 per cent gravel, with the fines content ranging from 9 per cent to 33 per cent, in boreholes 47 NW 70 and 47 NW 69 respectively. The gravel content ranges from 2 per cent in borehole 47 NW 69 to 55 per cent in borehole 47 NW 66.

Subrounded to rounded flint and rounded to well rounded quartzite, with quartz, sandstone, ironstone and minor amounts of igneous rocks, mudstone and limestone make up the gravel fraction.

Fine, medium and coarse sands are found in roughly equal amounts in the sand fraction. Quartz dominates all the sand grades but the lithologies represented in the small pebbles of the gravel fraction are more common in the coarse sand.

Alluvial Fan Deposits To the south of Stretton-on-Dunsmore, borehole 47 SW 83 proved the mapped alluvial fan deposits to have a composition similar to that of the Dunsmore Gravel. In the gravel, subangular flint is the dominant pebble type with lesser amounts of quartzite, quartz, sandstone and ironstone. The sand fraction contains mainly fine and medium quartz although coarse sand is found in the more gravelly parts of the deposit.

The Map

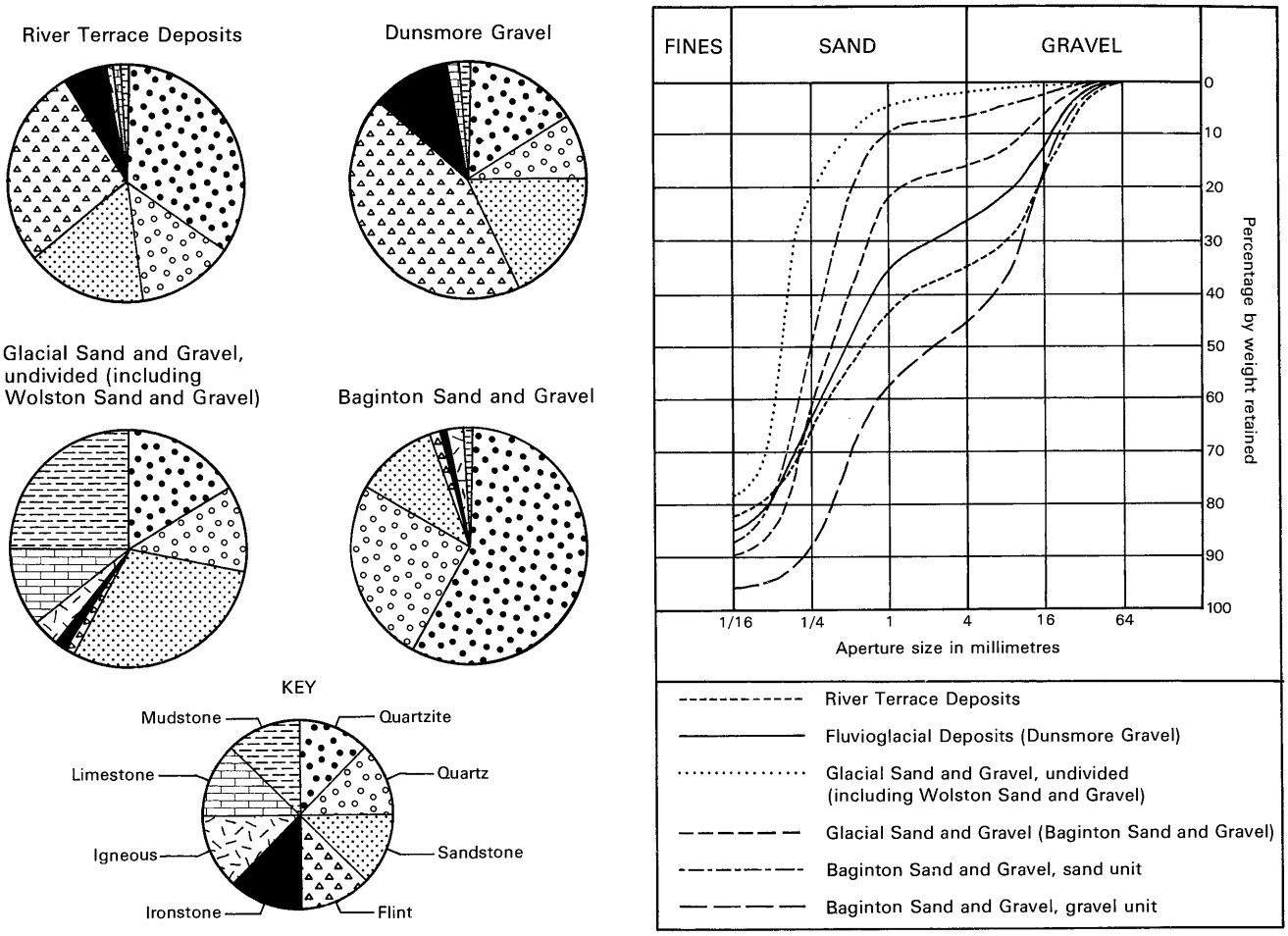
The sand and gravel resource map is folded into the pocket at the end of this report. The base map is the Ordnance Survey 1:25 000 Outline Edition in grey, on which the geological data are shown in black and the mineral resource information in shades of red.

Geological data The geological lines are mostly from a survey on the 1:10 000 scale by M. G. Sumbler and R. A. Old (western margin) in 1976-80 but for grid squares SP 37 NW 34 78 and 34 79 they are taken from the original survey on the six-inch scale by T. Eastwood in 1914. The geological boundaries represent the best interpretation of the information available at the time of the survey. However, it is inevitable, particularly with drift deposits, that local irregularities and discrepancies will be revealed as new evidence from boreholes and excavations becomes available.

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

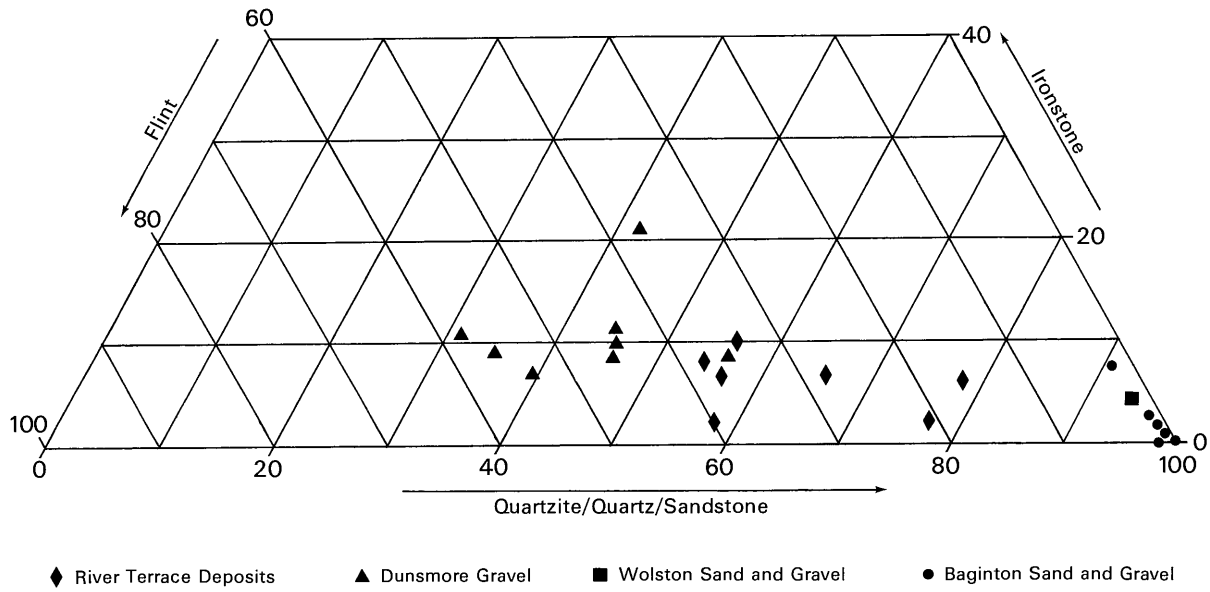
Mineral resource information The mineral-bearing ground is divided into resource blocks (see Appendix A). Within a resource block the mineral is subdivided into areas where it is exposed, that is where the overburden averages less than 1 m in thickness, and areas where it is present in continuous, or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

Areas where bedrock crops out, where boreholes indicate absence of sand and gravel beneath cover and where sand and gravel beneath cover is interpreted to be



a. Mean lithological composition of +8 –16mm fraction of sand and gravel deposits (based on weighted means from selected boreholes)

b. Grading characteristics of the sand and gravel deposits



c. Lithology of +8–16mm fraction from individual IMAU samples, expressed as percentages of flint, ironstone and of quartzite, quartz and sandstone combined.

Figure 4 Composition of the sand and gravel.

Table 2 The sand and gravel resources of the district: statistical assessment.

Resource block	No. of sample points	Area (km^2)			Mean thickness (m)		Volume of mineral			Mean grading (based on IMAU data)		
		Block	Mineral	Worked out area	Over-burden	Mineral	Limit at the 95 % probability			Fines $-\frac{1}{16}$	Sand $+\frac{1}{16}-4$	Gravel +4 mm
		km^2	km^2	km^2	m	m	$m^3 x 10^6$	± %	$\pm m^3 x 10^6$			
A	48	21.4	12.2	1.7	3.0	4.2	51	46	24	9	73	18
B	170	17.0	10.5	1.9	1.8	4.5	47	25	12	10	73	17
C	136	20.8	15.4	0.1	0.7	2.2	32	16	5	18	47	35
D	49	21.2	17.8	0.1	2.6	2.0	37	35	13	18	66	16
E	13	31.0	19.9	0.0	2.9	3.1	63	30	19	16	61	23
F	11	23.2	10.9	0.0	2.0	4.7	52	77	39	24	72	4
A to F	427	134.6	86.7	3.8	2.9	3.3	286	14	40			
Separate assessment of Dunsmore Gravel and Alluvial Fan Deposits												
D	40		8.0	-	0.7	1.9	15	40	6	15	59	26
E	13		14.7	-	0.5	3.4	50	25	13	17	55	28
F*	9		1.7	-	0.5	1.6	3	-	-	17	55	28
D to F	62		24.4	-	0.6	2.8	68	20	14	16	57	27
Separate assessment of Wolston Sand and Gravel												
D	16		9.8	-	7.3	2.2	22	45	10	19	79	2
E	6		5.2	-	8.1	2.5	13	66	9	12	81	7
F	6		9.2	-	4.2	5.3	49	84	41	25	74	1
D to F	28		24.2	-	6.3	3.4	84	42	34	22	76	2

* inferred assessment

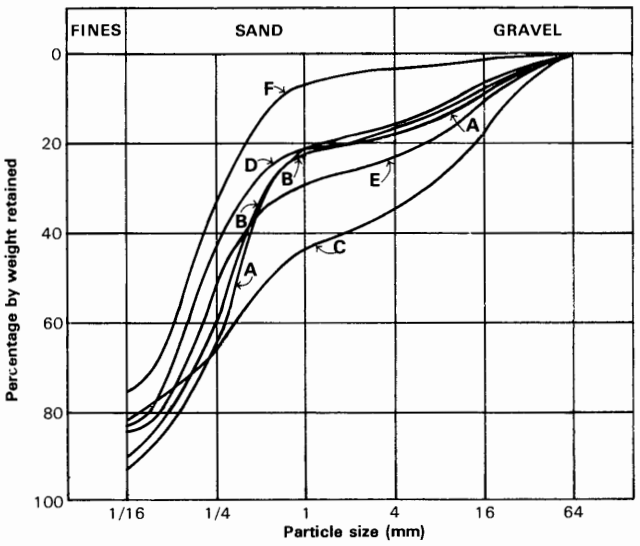
not potentially workable, are uncoloured on the map; where appropriate, the relevant criterion is noted. In such cases it has been assumed that mineral is absent except in infrequent and relatively minor patches that can neither be outlined nor assessed quantitatively in the context of this survey. Areas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

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

Results

The statistical results are summarised in Table 2. Fuller grading particulars are shown in Figures 5 and 7 and Tables 3 to 8.

Accuracy of results For the six blocks, the accuracy of the results at the 95 per cent probability level (that is, on average nineteen out of every twenty sets of limits constructed in this way contain the true value for the volume of mineral) varies between 16 per cent and 77 per cent (Appendix B). However, the true volumes are more likely to be nearer the figure estimated than either of the limits. Moreover, it is probable that roughly the same percentage limits would apply for the statistical estimate of mineral volume within a very much smaller parcel of ground (say 100 hectares) containing similar



Block	Percentage by weight retained					
	$\frac{1}{16}$ mm	$\frac{1}{4}$ mm	1 mm	4 mm	16 mm	64 mm
A	91	64	21	18	8	0
B	90	60	22	17	7	0
C	82	65	44	35	18	0
D	82	41	21	16	6	0
E	84	51	29	23	11	0
F	76	31	6	4	2	0

Figure 5 Mean particle-size distribution for the mineral in resource blocks A to F, based on data from IMAU boreholes.

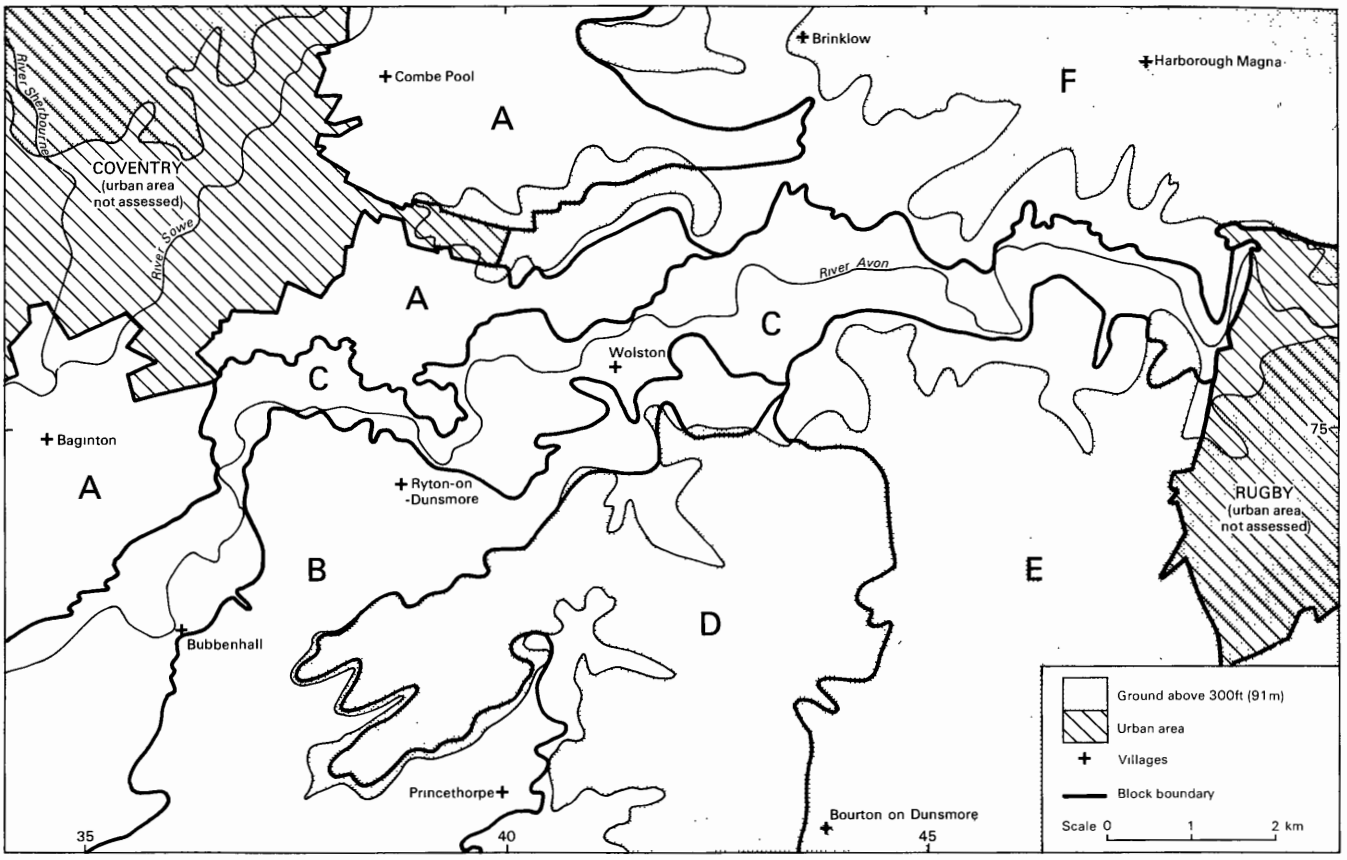


Figure 6 Block boundaries with reference to topography.

sand and gravel deposits, if the results from the same number of sample points (as provided by, say, ten boreholes) were used in the calculation. Thus, if closer limits are needed for quotation of reserves, data from more sample points would be required, even if the area were quite small. This point can be illustrated by considering the whole of the potentially workable sand and gravel in Blocks A to F. The total volume (286 million m^3) can be estimated to limits of $\pm$ 14 per cent at the 95 per cent probability level by a calculation based on the data from the 427 sample points spread across the six resource blocks. However, it must be emphasised that the quoted volume of mineral has no simple relationship with the amount that could be extracted in practice, as no allowance has been made in the calculations for any restraints (such as existing buildings and roads) on the use of the land for mineral working.

Notes on the Resource Blocks

The district has been divided into the six resource blocks shown in Figure 6. Blocks A and B contain mainly glacial sand and gravel (Baginton Sand and Gravel) and small areas of river terrace deposits of the rivers Avon, Sowe and Sherbourne. In Block C, the remaining river terrace deposits of the River Avon are assesed. In Blocks D and E fluvioglacial deposits (Dunsmore Gravel) overlie glacial sand and gravel, (including Wolston Sand and Gravel) while Block F contains mainly Wolston Sand and Gravel. For Block D, E and F separate statistical assessments have been prepared for the Dunsmore Gravel and Wolston Sand and Gravel because the two mineral deposits have very different compositional characteristics (Table 2). Confidence limit are given at the 95 per cent probability level.

Block A Block A contains all the deposits of Baginton Sand and Gravel which occur to the north of the River Avon. In addition, small areas of river terrace deposits of the rivers Avon, Sowe and Sherbourne are also included in this block. The assesment uses data from eight IMAU boreholes and 40 other boreholes.

Around Baginton [350 742] the mineral is mostly exposed, whilst to the east of Combe Pool [390 790] it is concealed by progressively thicker clayey drift. Around Brinklow Heath and East Lodge [418 795], in block F, this overburden thickens until the ratio of overburden to sand and gravel exceeds 3:1 (see Figure 3) and the limits of the potentially workable sand and gravel are defined by an inferred boundary, which is the limit of the block. To the north of Cottage Farm [429 784] assessment boreholes (for example 47 NW 61) failed to prove mineral and an inferred boundary has been drawn to divide barren ground in block F from potentially workable sand and gravel of this block.

Proved thicknessess of mineral (Table 3) range from 0.5 m in borehole 37 SW 112 to an exceptional 14.1 m in borehole 47 NW 68; the mineral has a mean thickness of 4.2 m. The full thickness of mineral was not penetrated in three boreholes (37 NE 401, 47 NW 60 and 47 NW 64). Sands and pebbly sands, mainly 'clayey' or 'very clayey' were found in all IMAU boreholes except 37 SW 112 and 47 NW 60, which encountered gravel and sandy gravel only. The full Baginton Sand and Gravel sequence of sand overlying sandy gravel was seen in only two boreholes (37 NE 399 and 47 NW 56). The mean grading for the mineral in this block is 9 per cent fines, 73 per cent sand and 18 per cent gravel (Figure 7).

Where mineral is shown on the resource map as 'exposed' there is only a thin cover of sandy soil, as for example in borehole 37 NE 399. Elsewhere, the mineral has been proved to be overlain by till or lake clays or both, up to 9.8 m in thickness (in borehole 47 NW 60), and with a mean thickness of 6.2 m. For the block as a whole, the mean thickness of overburden is 3.0 m. Sand and gravel has been worked around Brandon and Baginton; the estimated volume remaining is 51 million m^3 $\pm$ 46 per cent.

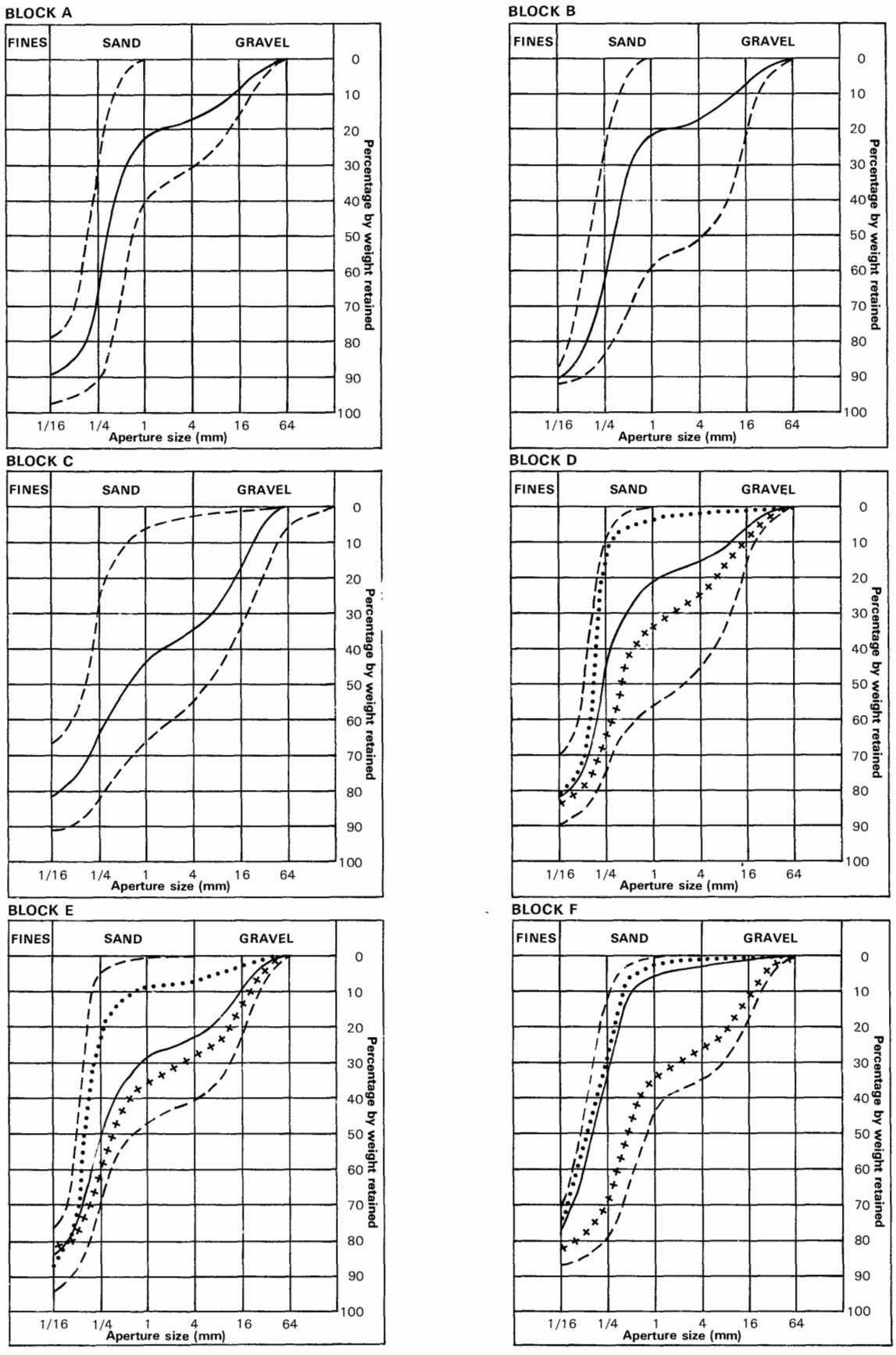


Figure 7 Particle-size distribution for the mineral in Blocks A, B, C, D, E and F. The continuous curve represents the weighted mean grading of the block; the broken lines delimit the envelope within which the mean grading curves for the individual boreholes fall; the lines depicted by crosses and dots are the weighted mean grading curves for the Dunsmore Gravel combined with Alluvial Fan Deposits and the Wolston Sand and Gravel, respectively.

Table 3 Block A: data from IMAU boreholes

Borehole	Recorded thickness (m)		Mean grading percentage					
	Mineral	Over-burden	Fines $-\frac{1}{16}$ mm	Fine sand $+\frac{1}{16}-\frac{1}{4}$ mm	Medium sand $+\frac{1}{4}$ -1 mm	Coarse sand +1 -4 mm	Fine gravel +4 -16 mm	Coarse gravel +16 mm
37 NE 399	5.3	0.6	10	25	29	5	16	15
37 NE 400	3.0	3.5	10	20	56	4	7	3
37 NE 401	2.1+	6.7	5	28	65	1	1	0
37 SW 112	0.5	0.4	No grading data available					
47 NW 56	3.9	1.2	7	22	35	7	17	12
47 NW 60	2.5+	9.8	3	6	50	12	23	6
47 NW 64	4.1+	9.6	21	47	32	0	0	0
47 NW 68	14.1	0.7	10	20	52	3	7	8

Table 4 Block B: data from IMAU boreholes

Borehole	Recorded thickness (m)		Mean grading percentage					
	Mineral	Over-burden	Fines $-\frac{1}{16}$ mm	Fine sand $+\frac{1}{16}-\frac{1}{4}$ mm	Medium sand $+\frac{1}{4}$ -1 mm	Coarse sand +1 -4 mm	Fine gravel +4 -16 mm	Coarse gravel +16 mm
37 SE 313	3.0	0.5	8	7	25	9	31	20
37 SE 317	8.7	2.6	9	30	34	6	14	7
37 SE 320	3.2	2.8	9	65	26	0	0	0
37 SE 322	2.2	0.6	13	44	31	6	5	1

Table 5 Block C: data from IMAU boreholes

Borehole	Recorded thickness (m)		Mean grading percentage					
	Mineral	Over-burden	Fines $-\frac{1}{16}$ mm	Fine sand $+\frac{1}{16}-\frac{1}{4}$ mm	Medium sand $+\frac{1}{4}$ -1 mm	Coarse sand +1 -4 mm	Fine gravel +4 -16 mm	Coarse gravel +16 mm
37 NE 402	1.2+	0.4	18	7	19	13	27	16
37 SW 113	0.6	0.9	19	22	29	7	13	10
37 SE 311	1.9	1.4	21	19	21	5	16	18
37 SE 312	1.4	0.3	15	9	17	8	18	33†
47 NW 66	1.7	1.0	10	8	17	10	27	28
47 NW 67	1.7	0.5	29	33	23	3	7	5
47 NW 69	3.5	0.7	33	40	22	2	2	1
47 NW 70	0.5	0.9	9	20	25	8	18	20
47 NW 71	3.4	0.3	17	24	35	6	13	5
47 NW 72	3.8*	0.6	18	9	19	11	24	19
47 NW 73	3.8**	0.4	16	16	20	12	24	12
47 NE 64	1.8	1.8	13	6	17	11	28	25
47 NE 65	2.0	0.4	13	4	17	12	22	32
47 NE 66	3.9	0.3	15	12	19	6	12	36††

* excluding 0.2 m waste parting
** excluding 1.6 m waste parting
† includes 3% cobble gravel
†† includes 11% cobble gravel

Block B The Baginton Sand and Gravel found to the south of the River Avon, (and partially overlain by river terrace deposits near Ryton-on-Dunsmore and Wolston) is assessed in this block. Smaller areas of terrace deposits around Princethorpe have not been assessed because they are too thin and of limited area. Thickness and grading data have been obtained from four IMAU boreholes, while thickness data only was obtained from 166 other boreholes.

The southern edge of the sand and gravel is mostly hidden by thick clayey drift which forms the high ground between Ryton Wood [381 725] and Lammas Hill [418 752]. Beneath the overburden around Weston Fields Farm [365 708] an inferred boundary has been placed to indicate the limit of the mineral. Another inferred boundary, skirting the northern edge of the high ground, delineates an area of excessive overburden (see Figure 3 and borehole 37 SE 314, Block D).

Recorded mineral thicknesses range from 1.8 m in borehole 37 SE 26 (a non-IMAU borehole) to 8.7 m in borehole 37 SE 317 (Table 4); the mean thickness is 4.5 m. Where the complete Baginton Sand and Gravel sequence is developed, as for example in borehole 37 SE 317, 'clayey' sands overlie sandy gravel. However, towards the margins of the deposit, frequently only sand is found, (for example in borehole 37 SE 320). The mean grading for the deposit is 10 per cent fines, 73 per cent sand and 17 per cent gravel (see Figure 7).

Overburden generally comprises thin sandy soil where the mineral is exposed (as in borehole 37 SE 313) but where till or lake deposits or both conceal the mineral, overburden thicknesses of up to 17.4 m have been recorded. This clayey overburden has a mean thickness, for the block as a whole, of 1.8 m.

Sand and gravel has been worked from about 1.9 km^2 of ground near Ryton-on-Dunsmore and Bubbenhall, where extraction is continuing. The estimated volume remaining is 47 million m^3 $\pm$ 25 per cent.

Block C Mineral in Block C consists of a relatively simple sequence of terrace deposits of the River Avon which extend between the western outskirts of Rugby and the western limits of Bubbenhall. The sand and gravel in this block has been assessed using data from 136 boreholes, 14 of which were drilled by IMAU.

'Clayey' sandy gravel or gravel was found in most of the IMAU boreholes, although boreholes 47 NW 67 and 47 NW 69, sited on the fourth terrace, found only 'very clayey' sand and pebbly sand. The mean grading, based on IMAU data, is 18 per cent fines, 47 per cent sand and 35 per cent gravel (figure 7). Recorded mineral thickness (Table 5) range from 0.5 m in borehole 47 NW 70 to 3.8 m in boreholes 47 NW 72 and 73, with a mean thickness of 2.2 m. The volume of sand and gravel present is estimated at 32 million m^3 $\pm$16 per cent.

Overburden has a mean thickness of 0.7 m and recorded thicknesses range between 0.3 m and 1.8 m, in boreholes 37 SE 312 and 47 NE 64 respectively. It generally consists of sandy clays and silts. Waste partings of 0.2 m and 1.6 m were recorded in boreholes 47 NW 72 and 73 respectively.

Block D This block extends over 21.2 km^2 of ground around Stretton-on-Dunsmore. Seventeen IMAU boreholes and 32 other boreholes have been used to assess the mineral resources, which comprise 9.8 km^2 of Wolston Sand and Gravel, 7.1 km^2 of Dunsmore Gravel and 0.9 km^2 of alluvial fan deposits. Baginton Sand and

Table 6 Block D: data from IMAU boreholes

Borehole	Recorded thickness (m)		Mean grading percentage					
	Mineral	Overburden	Fines $-\frac{1}{16}$ mm	Fine sand $+\frac{1}{16}-\frac{1}{4}$ mm	Medium sand $+\frac{1}{4}$ -1 mm	Coarse sand +1 -4 mm	Fine gravel +4 -16 mm	Coarse gravel +16 mm
Dunsmore Gravel and Alluvial Fan Deposits								
37 SE 315	0.4	0.4	No grading available					
37 SE 318	2.5	0.5	14	10	34	15	22	5
37 SE 319	1.5	0.4	12	29	28	6	14	11
47 SW 73	1.4	0.7	15	12	15	11	34	13
47 SW 74	Nil							
47 SW 75	2.0	0.4	13	20	26	4	13	24
47 SW 77	2.1	0.6	18	24	31	7	12	8
47 SW 78	Nil							
47 SW 80	2.4	0.1	18	18	27	8	17	12
47 SW 81	2.4	0.4	13	15	31	11	21	9
47 SW 83	3.6	4.0	18	27	21	6	12	16
47 SW 84	2.3	0.4	21	33	28	5	9	4
47 SW 87	0.7	0.5	20	31	35	3	6	5
Wolston Sand and Gravel								
37 SE 314	1.2	0.2	25	64	6	1	4	
37 SE 315	2.9	7.5	21	69	10	0	0	
37 SE 316	2.5*	8.0	25	47	22	5	1	
37 SE 318	1.0*	8.3	No grading available					
37 SE 319	1.0	4.6	30	44	18	3	1	4
37 SE 323	2.7	7.9	19	66	14	0	1	
47 SW 73	5.9	8.4	16	70	11	1	2	
47 SW 74	0.6	3.4	No grading available					
47 SW 77	3.2*	12.6	23	62	12	1	1	1
47 SW 78	1.7*	8.0	No grading available					
47 SW 83	0.8	15.5	No grading available					

* ratio of overburden to sand and gravel >3:1

Table 7 Block E: data from IMAU boreholes

Borehole	Recorded thickness (m)		Mean grading percentage					
	Mineral	Depth of burial	Fines $-\frac{1}{16}$ mm	Fine sand $+\frac{1}{16}-\frac{1}{4}$ mm	Medium sand $+\frac{1}{4}-1$ mm	Coarse sand +1 -4 mm	Fine gravel +4 -16 mm	Coarse gravel +16 mm
Dunsmore Gravel								
47 SW 79	3.9	1.3	15	31	29	5	11	9
47 SW 82	3.3*	0.4	18	20	26	7	14	15
47 SW 85	4.0	0.4	10	22	36	8	14	10
47 SW 86	4.0	0.5	15	19	28	6	15	17
47 SE 24	3.9	0.8	21	21	26	6	13	13
47 SE 25	1.9†	0.3	22	18	20	8	14	18
47 SE 26	5.6	0.6	16	15	29	11	18	11
47 SE 27	1.9	0.5	20	31	35	4	7	3
47 SE 28	1.7	0.5	16	13	35	14	16	6
47 SE 29	2.8	0.2	17	17	18	7	23	18
47 SE 30	2.0	0.3	13	28	37	4	9	9
Wolston Sand and Gravel								
47 SW 82	1.0+	10.5	No grading available					
47 SW 86	2.1	9.0	5	36	23	9	19	8
47 SE 26	1.6	8.9	11	82	6	1	0	0
47 SE 28	3.3	5.6	18	74	7	0	1	0
47 SE 30	5.0	4.0	12	68	13	1	3	3

Wolston Sand and Gravel proved in borehole 47 SE 27 is not potentially workable.

* excluding 0.8 m waste parting
† excluding 0.2 m waste parting

Gravel is considered to be not potentially workable in this block because the overburden to sand and gravel ratio is greater than 3:1, as shown for example in borehole 37 SE 314.

Wolston Sand and Gravel was found in 11 assessment boreholes but is only considered to be potentially workable in five of them. In four of the remaining six boreholes, the ratio of overburden to sand and gravel exceeds 3:1 (see Table 6) while in the other two boreholes, 47 SW 74 and 47 SW 83, the thicknesses of sand and gravel recorded were only 0.6 m and 0.7 m respectively. Consequently, the Wolston Sand and Gravel beneath the higher ground from Wappenbury Wood [379 709] to south of Wolston is classified as 'discontinuous beneath overburden'. Where the edge of the sand and gravel could not be delineated by mapping, as for example northeast of Church Farm [405 725], an inferred boundary has been drawn. Thicknesses of the Wolston Sand and Gravel (Table 6) range from 1.0 m in borehole 37 SE 319 to 5.9 m in borehole 47 SW 73, giving a mean thickness of 2.2 m. An inferred boundary has also been placed around borehole 37 SE 323, south of Princethorpe, since the extent of the mineral encountered in this borehole could not be delineated by mapping. Elsewhere in the block, the Wolston Sand and Gravel is considered to be absent. The deposit consists of 'clayey' fine quartz sands which give a mean grading of 19 per cent fines, 79 per cent sand and 2 per cent gravel (Figure 7). The estimated volume of Wolston Sand and Gravel is 22 million $m^3 \pm 45$ per cent.

Much of the mineral mapped at the surface in this block consists of Dunsmore Gravel and alluvial fan deposits. They are here assessed together because of their broad compositional similarities. These deposits were encountered in 13 IMAU boreholes (see Table 6). Thicknesses of only 0.4 m and 0.7 m (less than the arbitrary limit for mineral, see p.1) were encountered in boreholes 37 SE 315 and 47 SW 87 respectively, while boreholes 47 SW 74 and 47 SW 78 proved only clays and sandy clays. However, since the areas of barren ground are difficult to delineate these nil values have been taken into account when assessing the resource. The proved maximum thickness of mineral is 3.6 m (in borehole 47 SW 83), while the mean thickness is 1.9 m. The mineral usually comprises 'clayey' sandy gravel but, locally, 'clayey' sands have been observed, as in borehole 37 SE 315, while in borehole 47 SW 83 'very clayey' sand (alluvial fan deposits) overlies gravel. The Dunsmore Gravel and Alluvial Fan Deposits have a mean grading of 15 per cent fines, 59 per cent sand and 26 per cent gravel and an extimated volume of 15 million m^3 + 40 per cent.

Overburden covering the Dunsmore Gravel and alluvial fan deposit is generally a thin sandy soil, with a mean thickness of 0.7 m, but locally it may thicken to 4.0 m, as in borehole 47 SW 83. The Wolston Sand and Gravel is covered by Glacial Lake Deposits which are locally capped by Dunsmore Gravel. Deposits (including Dunsmore Gravel) covering the Wolston Sand and Gravel range from 0.2 m in borehole 37 SE 314 to 12.6 m in borehole 47 SW 77 and have a mean thickness of 7.3 m.

Block E Block E covers an area of 31.0 km^2 to the west of Rugby, in which Dunsmore Gravel extends over 14.7 km^2 and Wolston Sand and Gravel over 5.2 km^2. The latter deposit is almost entirely concealed beneath thick overburden.

The area underlain by the Wolston Sand and Gravel lies to the north-east of Bourton on Dunsmore [433 705] where this deposit has been proved by five IMAU boreholes and one other borehole, 47 SE 15. Around Bourton on Dunsmore and north-east of Lawford Heath Farm [453 733], an inferred boundary has been used to delimit this deposit. Where the mineral is hidden beneath Dunsmore Gravel and glacial lake deposits, a dot and dash red line represents the buried limits of this mineral. Wolston Sand and Gravel was also recorded in borehole 47 SE 27 [4730 7331] at Cawston Grange Farm but because the ratio of overburden to sand and gravel exceeds 3:1, the deposit is considered not to be potentially workable.

Mineral thicknesses for the Wolston Sand and Gravel range from 1.0 m in borehole 47 SE 82 to 5.0 m in borehole 47 SE 30, and the mineral has a mean thickness

Table 8 Block F: data from IMAU boreholes

Borehole	Recorded thickness (m)		Mean grading percentage					
	Mineral	Depth of burial	Fines $-\frac{1}{16}$ mm	Fine sand $+\frac{1}{16}-\frac{1}{4}$ mm	Medium sand $+\frac{1}{4}$ -1 mm	Coarse sand +1 -4 mm	Fine gravel +4 -16 mm	Coarse gravel +16 mm
Dunsmore Gravel								
47 NW 57	1.3	0.5	24	20	30	8	12	6
47 NW 63	2.0	0.8	12	9	37	7	17	18
47 NW 65	Nil							
Wolston Sand and Gravel								
47 NW 57	3.8*	14.5	29	66	4	1	0	0
47 NW 59	7.1	2.0	17	22	60	1	0	0
47 NE 59	Nil							
47 NE 61	12.0†	1.8	27	56	16	0	0	1
47 NE 63	7.8‡	0.2	29	55	15	1	0	0

* ratio of overburden to sand and gravel >3:1
† excludes 1.5 m waste parting
‡ excludes 1.2 m waste parting

of 2.5 m (Table 7). Generally the deposit is a 'clayey' fine quartz sand, but exceptionally, as in borehole 47 SW 86, up to 27 per cent of +4 mm material may be present. The overall mean grading for the deposit is 12 per cent fines, 81 per cent sand and 7 per cent gravel (Figure 7) and the estimated volume is 13.0 million m^3 ± 66 per cent.

Dunsmore Gravel caps the higher ground of this block and has been proved in 11 IMAU boreholes and two other boreholes (47 SE 14 and 15). Proved thicknesses of mineral range from 1.7 m in borehole 47 SE 28 to 6.1 m in (non-IMAU) borehole 47 SE 14, giving a mean thickness of 3.4 m. It generally comprises an upper 'clayey' pebbly sand up to 3.0 m thick, overlying a 'clayey' sandy gravel usually at least 1.0 m in thickness. In borehole 47 SE 29 the upper unit was absent, while in boreholes 47 SE 27, 28 and 30 only 'clayey' pebbly sand was present. The mean grading for the deposit is 17 per cent fines, 55 per cent sand and 28 per cent gravel. The volume of mineral present is estimated to be 50 million m^3 ± 25 per cent.

As with Block D, the overburden covering the Dunsmore Gravel is a thin sandy soil of mean thickness 0.5 m. Waste partings of 0.8 m and 0.2 m were encountered within the Dunsmore Gravel in boreholes 47 SW 82 and 47 SE 25 respectively. Glacial lake deposits and Dunsmore Gravel generally cover the Wolston Sand and Gravel; together they range in thickness from 4.0 m to 10.5 m, in boreholes 47 SE 30 and 47 SW 82 respectively, and they have a mean thickness of 8.1 m.

Block F This block lies to the north of the River Avon, between Brinklow [435 795] and Cosford [495 785], and covers an area of 23.2 km^2. The main mineral deposit is Wolston Sand and Gravel which is for the most part concealed by glacial lake deposits and till. In addition, Dunsmore Gravel caps the higher ground of Brinklow Heath, around East Lodge and north of King's Newham.

Wolston Sand and Gravel covers 9.2 km^2 and potentially workable mineral was encountered in three IMAU boreholes (Table 8) and two other boreholes, 47 NE 35 and 47 NE 58. Borehole 47 NW 57 proved 3.8 m of 'very clayey' sand but the overburden to sand and gravel ratio was greater than 3:1, while borehole 47 NE 59 proved to be barren. For the purpose of this report, mineral around Easenhall [464 797] and Harborough Magna is considered to be continuous beneath overburden. Elsewhere, all glacial sands and gravels are considered to be discontinuous beneath overburden. Inferred boundaries have been inserted where mapping has been unable to define the mineral at outcrop and where the overburden is exessively thick, as to the north of Newbold on Avon [490 774]. 'Clayey' and 'very clayey' fine quartz sands characterise the Wolston Sand and Gravel, which varies greatly in thickness, ranging from zero in borehole 47 NE 59 to 12.0 m in borehole 47 NE 61. The mean thickness for the deposit is 5.3 m; it has a mean grading of 25 per cent fines, 74 per cent sand and 1 per cent gravel. An estimate of the volume of mineral present is 49 million m^3 ± 84 per cent.

The Dunsmore Gravel covers only 1.7 km^2 and mineral was proved in only two IMAU boreholes (47 NW 57 and 47 NW 63) and six other boreholes (Table 8). Borehole 47 NW 65 found only sandy clay but is included in the assessment as a nil value since the area of non-mineral cannot be delineated. Proved mineral thicknesses range from nil in boreholes 47 NW 65, to 3.3 m in borehole 47 NE 25 (a non-IMAU borehole) and have a mean of 1.6 m. The IMAU boreholes proved either 'very clayey' pebbly sand (47 NW 57) or 'clayey' sandy gravel (47 NW 63), which gives the deposit a mean grading of 17 per cent fines, 55 per cent sand and 28 per cent gravel (Figure 7). Because of the paucity of information available for this deposit, the volume is estimated, at the inferred level, to be 3 million m^3.

Sandy soil, of mean thickness 0.5 m, covers the Dunsmore Gravel. In contrast, the Wolston Sand and Gravel is covered by thick clayey drift, consisting of glacial lake deposits and till, which has a mean thickness of 4.2 m. However, where this Wolston Sand and Gravel is exposed, as at borehole 47 NE 63, south of Harborough Magna, only a thin sandy soil overlies it. Waste partings of 1.5 m and 1.2 m were encountered in boreholes 47 NE 61 and 47 NE 63 respectively.

List of Workings

Active and abandoned pits in the district are listed below. All worked Glacial Sand and Gravel (Baginton Sand and Gravel) except the last two, which exploited Alluvial Fan Deposits.

Location	Grid Reference
Active Pits	
The Bogs	382 769
West of Brandon Wood	387 765
North of Ryton-on-Dunsmore	381 750
North of Ryton-on-Dunsmore	387 757
Ryton Lodge	378 738
West of Jubilee Farm	390 736
West of Ryton Wood	374 725
Waverly Wood Farm	362 714

Abandoned Pits

North of Binley Common Farm	380 788
South of The Bogs	382 766
Long Spinney	382 762
West of Brandon Wood Farm	391 763
Brandon	412 764
East of Brandon Wood Farm	398 765
Northwest of Brandon Hall	402 765
Baginton	341 749
Baginton	349 749
South of Wolston	410 749
South of Wolston	413 746
Manor Farm	375 744
Warren Farm	382 740
North of Frog Hall	414 738
Stretton-on-Dunsmore	413 727

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APPENDIX A

FIELD AND LABORATORY PROCEDURES

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

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

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

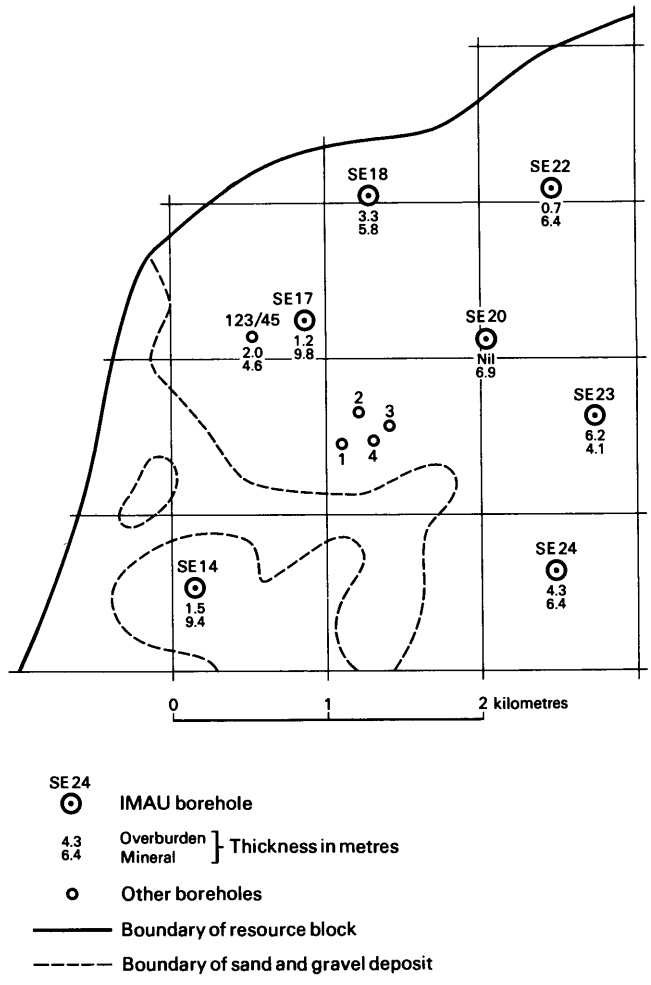
The drilling machine employed should be capable of providing a continuous sample representative of all unconsolidated deposits, so that the in-situ grading can be determined, if necessary, to a depth of 30 m (100 ft) at a diameter of about 200 mm (8 in), beneath different types of overburden. It should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

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

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

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

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



Example of resource block assessment: map of a fictitious block

APPENDIX B

STATISTICAL PROCEDURE

Statistical assessment

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

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

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

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

4 The above relationship may be transposed such that

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

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

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

5 Given that the number of approximately evenly spaced sample points in the sampled area is n with mineral thickness measurements $l_{m_1}, l_{m_2}, \ldots l_{m_n}$, then the best estimate of mean thickness, $\bar{l}_m$, is given by

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

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

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

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

6 The sampled area in each resource block is coloured pink on the map. Wherever possible, calculations relate to the mineral within mapped geological boundaries (which may not necessarily correspond to the limits of a deposit). Where the area is not defined by a mapped boundary, that is, where the boundary is inferred, a distinctive symbol is used. Experience suggests that the errors in determining area are small relative to those in thickness. The relationship $S_A / S_{\bar{l}_m} \leqq 0.\dot{3}$ is assumed in all cases. It follows from Equation [2] that

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

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

$\pm (t/\sqrt{n}) \times S_{\bar{l}_m}$ or as a percentage

$\pm (t/\sqrt{n}) \times S_{\bar{l}_m} \times (100/\bar{l}_m)$ per cent, where t is Student's t at the 95 per cent probability level for $(n-1)$ degrees of freedom, evaluated by reference to statistical tables. (In applying Student's t it is assumed that the measurements are distributed normally).

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

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

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

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

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

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

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

per cent,

and when n is greater than 20, as

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

per cent.

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

Inferred assessment

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

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

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

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

Block calculation

Scale: 1:25 000
Block: Fictitious

Area
Block: 11.08 km²
Mineral: 8.32 km²

Mean thickness
Overburden: 2.5 m
Mineral: 6.5 m

Volume
Overburden: 21 million m³
Mineral: 54 million m³

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

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

Sample point	Weighting w	Overburden l_o	Overburden wl_o	Mineral l_m	Mineral wl_m	Remarks
SE 14	1	1.5	1.5	9.4	9.4	IMAU boreholes
SE 18	1	3.3	3.3	5.8	5.8	
SE 20	1	nil	-	6.9	6.9	
SE 22	1	0.7	0.7	6.4	6.4	
SE 23	1	6.2	6.2	4.1	4.1	
SE 24	1	4.3	4.3	6.4	6.4	
SE 17	½	1.2	1.6	9.8	7.2	Hydrogeology Unit record
123/45	½	2.0		4.6		
1	¼	2.7	2.6	7.3	5.8	Close group of four boreholes (commercial)
2	¼	4.5		3.2		
3	¼	0.4		6.8		
4	¼	2.8		5.9		
Totals	$\Sigma w = 8$	$\Sigma wl_o = 20.2$		$\Sigma wl_m = 52.0$		
Means		$\overline{wl}_o = 2.5$		$\overline{wl}_m = 6.5$		

Calculation of confidence limits

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

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

$n = 8$

$t = 2.365$

L_Y is calculated as

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

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

$= 20.3$

$\simeq 20$ per cent.

APPENDIX C

CLASSIFICATION AND DESCRIPTION OF SAND AND GRAVEL

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

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

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

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

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

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

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

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

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

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

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

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

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

The terms used in the field to describe the degree of rounding of particles, which is concerned with the sharpness of the edges and corners of a clastic fragment and not the shape (after Pettijohn, 1975), are as follows.

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

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

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

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

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

Classification of gravel, sand and fines

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

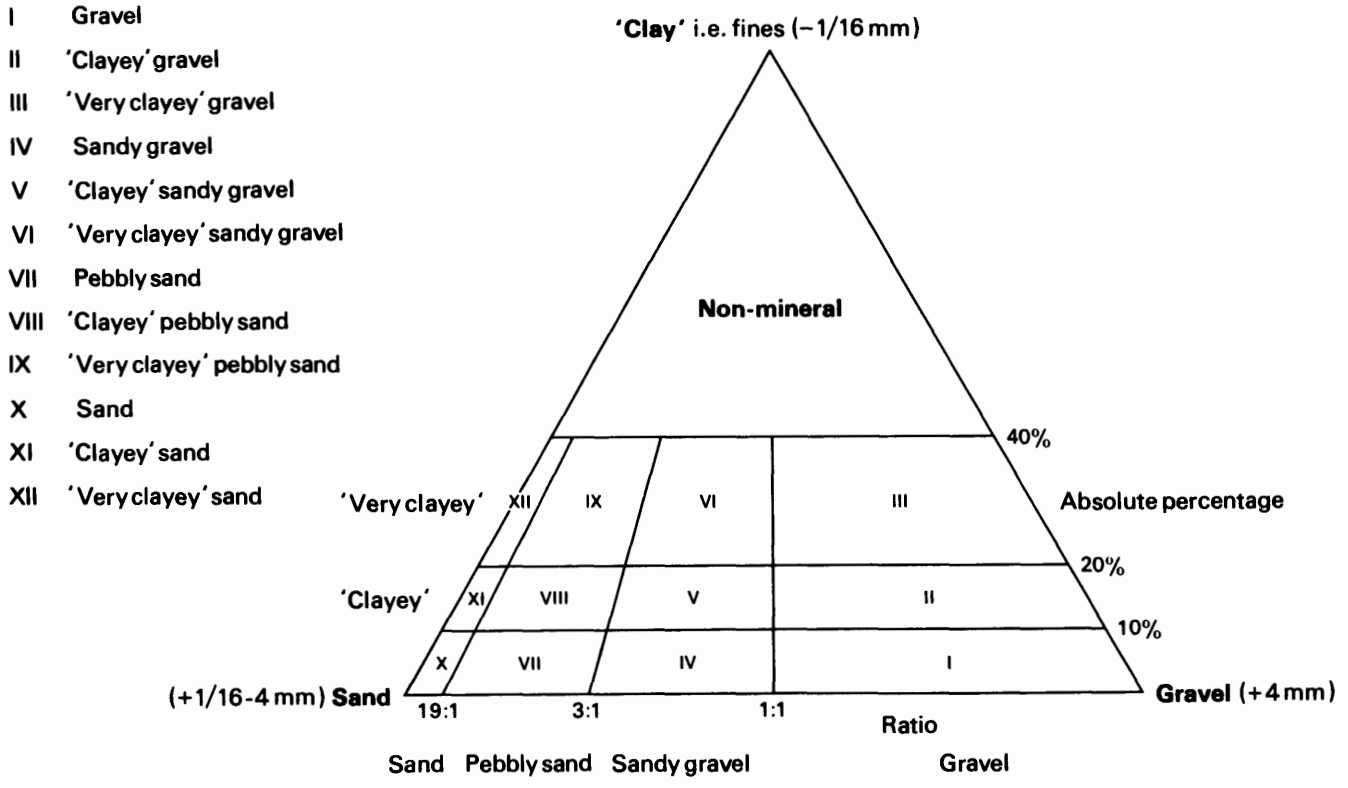


Diagram showing the descriptive categories used in the classification of sand and gravel

APPENDIX D

EXPLANATION OF THE BOREHOLE RECORDS

Annotated fictitious example

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

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

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

LOG

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

GRADING[10]

	Mean for deposit percentages			Depth below surface (m)	percentages						
	Fines	Sand	Gravel		Fines	Sand			Gravel		
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 -64	+64 mm
a	5	46	49	2.8-3.9	20	14	62	2	2	0	0
				3.8-4.8	2	2	12	18	42	24	0
				4.8-5.8	1	3	24	13	35	24	0
				5.8-6.8	0	4	21	20	26	29	0
				6.8-8.2	4	3	23	10	23	30	7
				Mean	**5**	**5**	**28**	**13**	**25**	**22**	**2**
b	5	95	0	9.3-10.3	3	73	23	1	0	0	0
				10.3-10.7	9	85	5	1	0	0	0
				Mean	**5**	**77**	**17**	**1**	**0**	**0**	**0**
a+b	**5**	**56**	**39**	**Mean**	**5**	**20**	**26**	**10**	**20**	**17**	**2**

COMPOSITION[11]

Depth below surface (m)	percentages by weight in the +4-64 mm fraction				
	Flint	Quartz	Limestone	Chalk	Ironstone
3.8-4.8	41	5	50	1	3
4.8-5.8	39	3	45	5	8
5.8-6.8	45	2	42	5	6
6.8-8.2	19	6	61	3	11
Mean	**35**	**4**	**51**	**3**	**7**

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

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

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

Thus the full Registration Number is CK 66 NW 5.

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

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

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

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

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

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

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

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

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

For each bulk sample the percentages of fines ($-\frac{1}{16}$ mm), fine sand ($+\frac{1}{16}$-$\frac{1}{4}$ mm), medium sand ($+\frac{1}{4}$-1 mm), coarse sand (+1-4 mm), fine gravel (+4-16 mm), coarse and (+16-64 mm) and cobble gravel (+64 mm) are stated.

The mean grading of groups of samples making up an identified bed of mineral are also given in detail and in summary. Where more than one bed is recognised the mean grading for the whole of the mineral in the borehole may be given. Where necessary, in calculating mean gradings, data for individual samples are weighted by the thickness represented. If,exceptionally, grading results are not available for a sample, an attempt may be made to estimate the grading by comparing the grading and field descriptions of adjacent samples with the sample in question. Such estimates are shown in square brackets. Alternatively, in calculating means, the sample may be allotted the mean grading of other samples in the deposit.

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

11 Composition
Details of the composition of selected samples or groups of samples may be given.

APPENDIX E

INDUSTRIAL MINERALS ASSESSMENT UNIT BOREHOLE RECORDS

SP 37 NE 399 **3915 7972** **North of Combe Pool** **Block A**

Surface level +81 m (+266 ft)
Water struck at +75.5 m
September 1980

Overburden 0.6 m
Mineral 5.3 m
Bedrock 0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Baginton Sand and Gravel	**a** 'Clayey' pebbly sand Gravel: fine, rounded to well rounded; quartzite and quartz Sand: medium and fine; quartz	2.5	3.1
	b Gravel Gravel: fine and coarse, rounded to well rounded; quartzite with quartz and sandstone Sand: medium; quartz	2.8	5.9
Mercia Mudstone	Clay, red with green 'fish-eyes'	0.6+	6.5

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
a	17	78	5	0.6-1.6	18	44	32	1	3	2
				1.6-3.1	17	40	37	1	1	4
				Mean	**17**	**42**	**35**	**1**	**2**	**3**
b	3	42	55	3.1-4.1	3	9	22	7	34	25
				4.1-5.1	3	7	18	10	31	31
				5.1-5.9	4	15	29	10	22	20
				Mean	**3**	**10**	**23**	**9**	**29**	**26**
a+b	**10**	**59**	**31**	**Mean**	**10**	**25**	**29**	**5**	**16**	**15**

COMPOSITION

Depth below surface (m)	Percentages by weight in +4-64 mm fraction								
	Quartzite	Quartz	Sandstone	Flint	Limestone	Ironstone	Mudstone	Igneous	Others
3.1-4.1	68	26	6	0	0	trace	0	trace	0
4.1-5.1	63	25	12	0	0	trace	trace	trace	0
5.1-5.9	54	32	14	0	0	trace	trace	-	0
Mean	**62**	**27**	**11**	**0**	**0**	**trace**	**trace**	**trace**	**0**

SP 37 NE 400 **3949 7820** **Old Lodge Farm** **Block A**

Surface level +83 m (+292 ft)
Water struck at +79.5 m
October 1980

Overburden 3.5 m
Mineral 3.0 m
Bedrock 0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Till	Clay, red-brown, with pebbles of quartzite, quartz and red and green mudstone	3.1	3.5
Baginton Sand and Gravel	'Clayey' pebbly sand Gravel: fine with coarse, rounded to well well rounded; quartzite with quartz and sandstone Sand: medium and fine; quartz	3.0	6.5
Mercia Mudstone	Clay, red with green spots	0.5+	7.0

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
10	80	10	3.5-5.0	10	22	61	4	2	1
			5.0-6.5	10	19	49	5	11	6
			Mean	**10**	**20**	**56**	**4**	**7**	**3**

SP 37 NE 401 **3931 7704** **Binley Woods** **Block A**

Surface level +89 m (+292 ft)
Water not struck

Overburden 6.7 m
Mineral 2.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Glacial Lake Deposits	Clay, red-brown, pebbly to 2.5 m, laminated from 2.5 m to 4.0 m	3.7	4.0
Till	Clay, red-brown, with pebbles of quartzite, quartite, red and green mudstone and sandstone and coal	2.7	6.7
Baginton Sand and Gravel	Sand: medium and fine; quartz	2.1+	8.8
	Borehole abandoned		

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
5	94	1	6.7-8.8	5	28	65	1	1	0

SP 37 NE 402 **3970 7566** **East of Golf Course** **Block C**

Surface level +70 m (+230 ft)
Water struck at +65.5 m
October 1980

Overburden 0.4 m
Mineral 1.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Alluvium	Soil	0.4	0.4
River Terrace Deposits	'Clayey' gravel Gravel: fine and coarse; rounded to well round quartzite and subangular flint with rounded quartz, sandstone and ironstone and trace of green mudstone Sand: fine to coarse; quartz	1.2+	1.6
	Borehole abandoned		

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
18	39	43	0.4-1.6	18	7	19	13	27	16

SP 37 SW 112 **3446 7357** **Gospel Oak** **Block A**

Surface level +83 m (+272 ft)
Water struck at +82.6 m
November 1980

Overburden 0.4 m
Mineral 0.5 m
Bedrock 1.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Baginton Sand and Gravel	Gravel Gravel: fine and coarse, rounded to well rounded; quartzite and quartz with some sandstone Sand: medium; quartz	0.5	0.9
	Mudstone, red, sandy in parts	1.6+	2.5

SP 37 SW 113 **3453 7218** **Tantara Lodge** **Block C**

Surface level +54 m (+177 ft)
Water struck at +53.1 m
September 1980

Overburden 0.9 m
Mineral 0.6 m
Bedrock 1.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.9	0.9
River Terrace Deposits	'Clayey' sandy gravel Gravel: fine and coarse, subangular flint and rounded to well rounded quartzite with quartz sandstone and ironstone and trace of mudstone and igneous rock	0.6	1.5
Kenilworth Sandstone Formation	Mudstone, red-brown with grey-green lenses	1.8+	3.3

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
19	58	23	0.9-1.5	19	22	29	7	13	10

COMPOSITION

Depth below surface (m)	Percentages by weight in +4-64 mm fraction								
	Quartzite	Quartz	Sandstone	Flint	Limestone	Ironstone	Mudstone	Igneous	Others
0.9-1.5	33	12	8	37	0	8	1	1	0

SP 37 SE 311 **3725 7392** **South of Coney Grey Farm** **Block C**

Surface level +64 m (+210 ft)
Water struck at +61.6 m
September 1980

Overburden 1.4 m
Mineral 1.9 m
Bedrock 0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
River Terrace Deposits	Silt, grey-green, with plant debris and sandy lenses	0.8	1.4
	'Very clayey' pebbly sand Gravel: fine and coarse; subangular flint and rounded to well rounded quartzite with quartz and ironstone Sand: fine and medium; quartz	1.0	2.4
	'Clayey' gravel Gravel: as above Sand: fine to coarse; quartz	0.9	3.3
Mercia Mudstone	Mudstone, red with green 'fish-eyes'	0.5+	3.8

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
21	45	34	1.4-2.4	27	26	27	3	11	6
			2.4-3.3	13	10	15	7	22	33
			Mean	**21**	**19**	**21**	**5**	**16**	**18**

SP 37 SE 312 **3569 7279** **East of Bubbenhall Bridge** **Block C**

Surface level +60 m (+197 ft)
Water struck at +58.5 m
November 1980

Overburden	0.3 m
Mineral	1.4 m
Bedrock	1.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
River Terrace Deposits	'Clayey' gravel Gravel: coarse and fine; subangular flint and rounded to well rounded quartzite with quartz and some ironstone Sand: fine to coarse; quartz	1.4	1.7
Bromsgrove Sandstone Formation	Sandstone, yellow - to grey - green, micaceous	1.7+	3.4

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
15	34	51	0.3-1.7	15	9	17	8	18	33*

*Including 3 per cent cobbles (+64 mm)

SP 37 SE 313 **3659 7223** **Bubbenhall** **Block B**

Surface level +79 m (+259 ft)
Water struck at +76.2 m
September 1980

Overburden 0.5 m
Mineral 3.0 m
Bedrock 1.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Baginton Sand and Gravel	Gravel, clayey to 1.5 m Gravel: fine and coarse, rounded to well rounded; quartzite with quartz and sandstone Sand: medium; quartz	3.0	3.5
Mercia Mudstone	Mudstone, red with green 'fish-eyes'	1.2+	4.7

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
8	41	51	0.5-1.5	13	10	22	10	31	14
			1.5-2.5	7	9	22	10	31	21
			2.5-3.5	3	3	31	7	30	26
			Mean	**8**	**7**	**25**	**9**	**31**	**20**

SP 37 SE 314 **3824 7235** **Ryton Wood** **Block D**

Surface level +90 m (+294 ft)
Not encountered
September 1980

Overburden 0.2 m
Mineral 1.2 m
Waste 15.0 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Wolston Sand and Gravel	'Very clayey' pebbly sand Gravel: fine, rounded; quartzite and quartz Sand: fine; quartz	1.2	1.4
Glacial Lake Deposits	Clay, brown, stoneless, laminated from 5.8 m to 6.7 m	5.3	6.7
Till	Clay, red-brown, sandy, pebbly; pebbles of quartzite, quartz, red mudstone, red and green sandstone and coal	6.4	13.1
Baginton Sand and Gravel	'Clayey' sand: fine and medium; quartz	2.4	15.5
	'Clayey' sandy gravel Gravel: fine and coarse, rounded to well rounded; quartzite with quartz and sandstone Sand: fine and medium; quartz	0.9	16.4
Mercia Mudstone	Mudstone, red with green 'fish-eyes'	0.3+	16.7

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
25	71	4	0.2-1.4	25	64	6	1	4	0
13	87	0	13.1-14.1	14	40	45	0	1	0
			14.1-15.5	12	47	41	0	0	0
			Mean	**13**	**44**	**43**	**0**	**0**	**0**
10	48	42	15.5-16.4	10	11	30	7	25	17

SP 37 SE 315 **3911 7287** **Ryton Heath Farm** **Block D**

Surface level +98 m (+322 ft)
Water struck at +89 m
November 1980

Overburden 7.5 m
Mineral 2.9 m
Waste 11.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Dunsmore Gravel	Sand, medium, with pebbles of flint, quartzite and quartz	0.4	0.8
Glacial Lake Deposits	Clay, brown, silty, laminated from 4.0 m to 4.7 m	3.9	4.7
	Clay, brown, with sand-sized fragments of quartz, quartzite, red and green mudstone and coal	2.5	7.2
	Clay, brown, laminated	0.3	7.5
Wolston Sand and Gravel	'Very clayey', sand: fine quartz	2.9	10.4
Glacial Lake Deposits	Clay, brown, silty, laminated from 15.7 m to 16.6 m	6.2	16.6
Till	Clay, red-brown, with pebbles of quartzite, quartz, red and green mudstone and sandstone; silty from 17.2 m to 17.9 m	4.9+	21.5

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
21	79	0	7.5-10.4	21	69	10	0		

SP 37 SE 316 **3999 7224** **Stretton House** **Block D**

Surface level +104 m (+342 ft)
Water not encountered
November 1980

Waste 10.5 m
Bedrock 0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Dunsmore Gravel	'Very clayey' pebbly sand Gravel: fine; subangular flint with well rounded quartzite, quartz and sandstone Sand: fine to coarse; quartz	0.3	0.6
Glacial Lake Deposits	Clay, brown; pebbles of quartzite and sandstone	2.7	3.3
	'Clayey' sandy gravel Gravel: fine and coarse, subrounded to well rounded; quartzite and sandstone Sand: fine to coarse; quartz	0.3	3.6
	Clay, brown, sandy, poorly laminated	4.4	8.0
Wolston Sand and Gravel	'Very clayey' sand: fine and medium; quartz	2.5	10.5
Westbury Formation	Clay, grey-black, with limestone bands	0.5+	11.0

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
25	74	1	8.0-9.5	27	68	5	0	0	0
			9.5-10.5	22	13	48	13	3	1
			Mean	**25**	**47**	**22**	**5**	**1**	**trace**

SP 37 SE 317 **3731 7165** **Bubbenhall House** **Block B**

Surface level +84 m (+276 ft)
Water struck at +77 m
November 1980

Overburden 2.6 m
Mineral 8.7 m
Bedrock 1.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Till	Clay, reddish brown, with pebbles of quartzite, quartz and green and red mudstone	2.3	2.6
Baginton Sand and Gravel	**a** 'Clayey' sand: fine and medium; quartz	4.9	7.5

	b Sandy Gravel Gravel: fine and coarse, rounded to well rounded; quartzite with quartz and sandstone, some ironstone and mudstone and traces of limestone and flint Sand: medium; quartz	3.8	11.3
Mercia Mudstone	Clay, red with green 'fish-eyes'	1.2+	12.5

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
a	13	87	0	2.6-4.5	23	50	27	0		
				4.5-6.5	7	44	49	0		
				6.5-7.5	7	64	29	0		
				Mean	**13**	**51**	**36**	**0**		
b	4	50	46	7.5-8.6	3	7	39	22	29	0
				8.6-9.6	1	3	35	5	28	28
				9.6-10.6	5	4	35	11	28	17
				10.6-11.3	10	3	13	10	46	18
				Mean	**4**	**4**	**33**	**13**	**31**	**15**
a+b	9	70	21	**Mean**	**9**	**30**	**34**	**6**	**14**	**7**

COMPOSITION

Depth below surface (m)	Percentages by weight in +4-64 mm fraction								
	Quartzite	Quartz	Sandstone	Flint	Limestone	Ironstone	Mudstone	Igneous	Others
7.5-8.6	50	24	8	2	2	6	7	1	0
8.6-9.6	66	23	10	1	0	trace	trace	trace	0
9.6-10.6	71	19	7	1	0	1	trace	1	0
10.6-11.3	64	25	8	trace	trace	trace	3	trace	0
Mean	**63**	**23**	**8**	**1**	**trace**	**2**	**3**	**trace**	**0**

SP 37 SE 318 **3838 7113** **Burnthurst Bungalow** **Block D**

Surface level +103 m (+338 ft)
Water struck at +101.3 m
November 1980

Overburden 0.5 m
Mineral 2.5 m
Waste 16.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Dunsmore Gravel	'Clayey' sandy gravel Gravel: fine with coarse; subrounded flint with rounded to well rounded quartzite, quartz, ironstone, sandstone and trace mudstone Sand: fine to coarse; quartz	2.5	3.0
Glacial Lake Deposits	Clay, brown, with small pebbles of quartzite, quartz, sandstone and green mudstone; chalk below 7.0 m	5.3	8.3
Wolston Sand and Gravel	'Clayey' sand with silt at base	1.0	9.3
Glacial Lake Deposits	Clay, dark brown, sandy, laminated	10.2+	19.5

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
14	59	27	0.5-1.7	21	13	36	14	13	3
			1.7-3.0	7	7	30	17	32	7
			Mean	**14**	**10**	**34**	**15**	**22**	**5**

COMPOSITION

Depth below surface (m)	Percentages by weight in +4-64 mm fraction								
	Quartzite	Quartz	Sandstone	Flint	Limestone	Ironstone	Mudstone	Igneous	Others
0.5-1.7	15	8	22	44	0	11	0	0	0
1.7-3.0	19	3	13	55	0	9	1	trace	0
Mean	**17**	**5**	**17**	**50**	**0**	**10**	**1**	**trace**	**0**

SP 37 SE 319 **3922 7199** **Stretton Lodge Farm** **Block D**

Surface level +100 m (+328 ft)
Water not encountered
November 1980

Overburden	0.4 m
Mineral	1.5 m
Waste	2.7 m
Mineral	1.0 m
Waste	13.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Dunsmore Gravel	**a** 'Clayey' sandy gravel Gravel: fine and coarse, subrounded; flint with quartzite, quartz, sandstone and ironstone Sand: fine and medium; quartz	1.5	1.9
Glacial Lake Deposits	Clay, brown, silty, with small pebbles of quartzite, quartz and sandstone	2.7	4.6
Wolston Sand and Gravel	**b** 'Very clayey' pebbly sand Gravel: fine and coarse, rounded to well rounded; quartzite and quartz Sand: fine and medium; quartz	1.0	5.6
Glacial Lake Deposits	Clay, brown and reddish-brown, silty, laminated to 10.5 m	11.1	16.7
Till	Clay, reddish brown, with pebbles of quartzite, quartz, sandstone and green mudstone	2.3+	19.0

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
a	12	63	25	0.4-1.2	4	30	31	7	16	12
				1.2-1.9	21	28	25	5	12	9
				Mean	**12**	**39**	**28**	**6**	**14**	**11**
b	30	65	5	4.6-5.6	30	44	18	3	1	4
a+b	**19**	**64**	**17**	**Mean**	**19**	**35**	**24**	**5**	**9**	**8**

SP 37 SE 320 **3613 7005** **East of Weston Wood** **Block B**

Surface level +86 m (+282 ft)
Water struck at +82 m
November 1980

Overburden 2.8 m
Mineral 3.2 m
Bedrock 0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Till	Clay, red-brown, with pebbles of red and green sandstone and mudstone, quartzite, quartz and coal	2.5	2.8
Baginton Sand and Gravel	Sand, 'clayey' to 4.8 m: fine with medium, quartz	3.2	6.0
Mercia Mudstone	Mudstone, red with green 'fish-eyes'	0.5+	6.5

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
9	91	0	2.8-3.8	13	68	19	0		
			3.8-4.8	11	71	18	0		
			4.8-6.0	4	57	39	0		
			Mean	**9**	**65**	**26**	**0**		

SP 37 SE 321 **3794 7093** **Wappenbury Wood** **Block D**

Surface level +97 m (+318 ft)
Water not encountered
November 1980

Waste 17.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
Glacial Lake Deposits	Clay, brown and red-brown, silty, laminated from 8.7 m to 10.4 m; pebbles of quartzite, sandstone and green mudstone, 6.5 m to 8.7 m	10.4	10.4
Till	Clay, reddish brown, with pebbles of quartzite, quartz, sandstone and green mudstone	7.1+	17.5
	Borehole abandoned: casing jammed, no recovery		

SP 37 SE 322 **3647 7068** **Weston Fields Farm** **Block B**

Surface level +81 m (+266 ft)
Water struck at +79 m
November 1980

Overburden 0.6 m
Mineral 2.2 m
Bedrock 0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Baginton Sand and Gravel	'Clayey' pebbly sand on sand Gravel: fine, rounded to well rounded; quartzite with quartz and sandstone Sand: fine and medium; quartz	2.2	2.8
Mercia Mudstone	Mudstone, red with green 'fish-eyes'	0.2+	3.0

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
13	81	6	0.6-1.6	23	19	33	11	12	2
			1.6-2.8	4	65	30	1	0	0
			Mean	**13**	**44**	**31**	**6**	**5**	**1**

SP 37 SE 323 **3988 7026** **Foss Way, Princethorpe** **Block D**

Surface level +89 m (+296 ft)
Water not encountered
September 1980

Overburden 7.9 m
Mineral 2.7 m
Waste 14.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	1.0	1.0
Till	Clay, red-brown, with pebbles of quartzite, quartz, green sandstone and coal	3.1	4.1
Glacial Lake Deposits	Clay, brown, silty, well laminated from 7.5 m to 7.9 m	3.8	7.9
Wolston Sand and Gravel	'Clayey' sand: fine; quartz	2.7	10.6
Glacial Lake Deposits	Clay, brown, silty, well laminated from 15.0 m to 16.9 m	6.3	16.9
Till	Clay, red-brown, sandy, with pebbles of green sandstone, red mudstone, quartzite, quartz and coal	8.1+	25.0

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
19	80	1	7.9-8.9	24	73	3	0	0	
			8.9-9.9	18	71	10	0	1	
			9.9-10.6	14	48	35	1	2	
			Mean	**19**	**66**	**14**	**trace**	**1**	

SP 47 NW 56 **4051 7911** **South of Combe Abbey** **Block A**

Surface level +81 m (+266 ft)
Water struck at +77 m
October 1980

Overburden 1.2 m
Mineral 3.9 m
Bedrock 0.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
?Till/Wash	Clay, red, with pebbles of red and green mudstone and sandstone and quartz	0.8	1.2
Baginton Sand and Gravel	**a** 'Clayey' sand: fine and medium; quartz	1.6	2.8
	b Sandy gravel Gravel: fine and coarse, rounded to well rounded; quartzite, quartz and sandstone Sand: fine to coarse; quartz	2.3	5.1
Mercia Mudstone	Mudstone, red	0.4+	5.5

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
a	12	85	3	1.2-2.2	14	36	45	2	1	2
				2.2-2.8	9	35	52	2	2	0
				Mean	**12**	**36**	**47**	**2**	**2**	**1**
b	3	49	48	2.8-3.8	4	15	30	12	30	9
				3.8-5.1	3	11	23	10	26	27
				Mean	**3**	**12**	**26**	**11**	**29**	**19**
a+b	**7**	**64**	**29**	**Mean**	**7**	**22**	**35**	**7**	**17**	**12**

SP 47 NW 57 **4168 7942** **East Lodge** **Block F**

Surface level +107 m (+352 ft)
Water struck at +96 m
September 1980

Overburden 0.5 m
Mineral 1.3 m
Waste 21.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Dunsmore Gravel	'Very clayey' pebbly sand Gravel: fine with coarse; subangular to rounded flint and rounded to well rounded quartzite, quartz, sandstone and ironstone Sand: fine and medium; quartz	1.3	1.8
Glacial Lake Deposits	Clay, brown and grey-brown, silty, pebbly from 5.0 m to 8.5 m	9.2	11.0
	'Very clayey' sand; fine quartz	0.7	11.7
	Clay, brown, with grey silt	2.8	14.5
Wolston Sand and Gravel	'Very clayey', sand Sand: fine; quartz Fines: grey-brown silt	3.8	18.3
Glacial Lake Deposits	Silty clay, brown and grey brown; fine quartz sand 19.2 m to 19.7 m	5.1+	23.4

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	$+1-4$	$+4-16$	$+16$ mm
24	58	18	0.5-1.8	24	20	30	8	12	6
29	71	0	14.5-18.3	29	66	4	1	0	0

SP 47 NW 58 **4301 7984** **West of Brinklow** **Block F**

Surface level +85 m (+280 ft)
Water struck at +74 m
October 1980

Waste 18.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Glacial Lake Deposits	Clay, brown and red brown, with small pebbles of red mudstone, quartzite, quartz and coal	8.4	8.8
	Silt, red-brown, with sporadic brown stony layers	9.2+	18.0

SP 47 NW 59 **4405 7901** **Brinklow** **Block F**

Surface level +94 m (+308 ft)
Water struck at +87 m
October 1980

Overburden 2.0 m
Mineral 7.1 m
Waste 4.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Glacial Lake Deposits	Clay, brown, silty, with small pebbles of quartz, quartzite, sandstone and coal	1.7	2.0
Wolston Sand and Gravel	'Clayey' sand: medium and fine; quartz	7.1	9.1
Glacial Lake Deposits	Clay, brown, silty, laminated	2.4	11.5
Till	Clay, brown, with pebbles of quartz, quartzite, sandstone and mudstone	1.9	13.4
Baginton Sand and Gravel	'Clayey' sand: medium; quartz	0.6+	14.0
	Borehole abandoned: unable to penetrate casing		

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
				Fines	Sand			Gravel	
Fines	Sand	Gravel		$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
17	83	0	2.0-3.5	29	44	27	0	0	
			3.5-6.0	16	15	67	1	1	
			6.0-9.1	12	18	70	0	0	
			Mean	**17**	**22**	**60**	**1**	**trace**	
19	79	2	13.4-14.0	19	12	66	1	2	

SP 47 NW 60 **4137 7842** **Birchley Farm** **Block A**

Surface level +84 m (+276 ft)
Water struck at +72 m
October 1980

Overburden 9.8 m
Mineral 2.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Glacial Lake Deposits	Clay, brown, sandy, with layers of fine quartz sand	0.8	1.0
Till	Clay, red brown, with pebbles of red and green marl, sandstone, quartz and quartzite	8.8	9.8
Baginton Sand and Gravel	Sandy gravel Gravel: fine with coarse, rounded to well rounded; quartzite and quartz with sandstone and some ironstone Sand: medium; quartz	2.5+	12.3
	Borehole abandoned: unable to penetrate casing		

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}$ -1	+1 -4	+4 -16	+16 mm
3	68	29	9.8-10.8	5	7	42	11	28	7
			10.8-12.3	2	5	56	13	19	5
			Mean	**3**	**6**	**50**	**12**	**23**	**6**

COMPOSITION

Depth below surface (m)	Percentages by weight in +4-64 mm fraction								
	Quartzite	Quartz	Sandstone	Flint	Limestone	Ironstone	Mudstone	Igneous	Others
9.8-10.8	56	30	13	0	trace	1	trace	trace	trace
10.8-12.3	46	38	15	0	trace	1	trace	trace	trace
Mean	**50**	**35**	**14**	**0**	**trace**	**1**	**trace**	**trace**	**trace**

SP 47 NW 61 **4282 7875** **North of Cottage Farm** **Block F**

Surface level +88 m (+288 ft)
Water not encountered
October 1980

Waste 18.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Glacial Lake Deposits	Clay, brown and grey, with red-brown and grey silt; pebbly below 11.0 m	17.7+	18.0

SP 47 NW 62 **4373 7835** **Abbey Hall Farm** **Block F**

Surface level +86 m (+282 ft)
Water struck at +82.1 m
October 1980

Waste 10.9 m
Bedrock 1.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.7	0.7
Glacial Lake Deposits	Clay, reddish brown, with pebbles of quartzite, quartz, sandstone and mudstone	8.2	8.9
Baginton Sand and Gravel	Sand; medium; quartz	2.0	10.9
Mercia Mudstone	Mudstone, reddish brown, with green sandstone	1.1+	12.0

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				-1/16	+1/16 -1/4	+1/4 -1	+1 -4	+4 -16	+16 mm
8	91	1	8.9-9.9	8	13	76	1	1	1
			9.9-10.9	7	12	79	1	1	0
			Mean	**8**	**13**	**77**	**1**	**1**	**trace**

SP 47 NW 63 **4043 7725** **Woodside** **Block F**

Surface level +95 m (+312 ft)
Water struck at +94 m
October 1980

Overburden 0.8 m
Mineral 2.0 m
Waste 16.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.8	0.8
Dunsmore Gravel	'Clayey' sandy gravel Gravel: fine and coarse; subrounded flint and rounded to well rounded quartzite with quartz, sandstone, ironstone and some mudstone Sand: medium; quartz	2.0	2.8
Glacial Lake Deposits	Clay, grey-brown, silty; pebbles of quartzite, quartz and red mudstone and sandstone below 9.4 m; becoming red below 15.0 m	13.0	15.8
	Clay, brown, well laminated	2.9	18.7
	Clay, red, with pebbles of quartzite, quartz and red mudstone	0.8+	19.5

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				-1/16	+1/16 -1/4	+1/4 -1	+1 -4	+4 -16	+16 mm
12	53	35	0.8-2.8	12	9	37	7	17	18

COMPOSITION

Depth below surface (m)	Percentages by weight in +4-64 mm fraction								
	Quartzite	Quartz	Sandstone	Flint	Limestone	Ironstone	Mudstone	Igneous	Others
0.8-2.8	28	11	16	35	0	7	3	trace	trace

SP 47 NW 64 **4143 7726** **Privet Covert** **Block A**

Surface level +91 m (+300 ft)
Water struck at +79.5 m
October 1980

Overburden 9.6 m
Mineral 4.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Glacial Lake Deposits	Clay, yellow-brown and brown; grey silt 4.7 m to 6.0 m and sporadic stony bands	9.2	9.6
Baginton Sand and Gravel	'Very clayey' sand Sand: fine and medium quartz Fines: brown, silty, laminated	4.1+	13.7
	Borehole abandoned		

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
21	79	0	9.6-10.6	17	51	32	0		
			10.6-11.6	20	51	29	0		
			11.6-12.6	30	43	27	0		
			12.6-13.7	17	45	38	0		
			Mean	**21**	**47**	**32**	**0**		

SP 47 NW 65 **4270 7760** **Hill Farm** **Block F**

Surface level +92 m (+302 ft)
Water struck at +78 m
October 1980

Waste 16.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Dunsmore Gravel	Clay, yellow-brown sandy, with thin layers of 'clayey' quartz sand and sporadic pebbles of flint and quartzite	1.3	1.7
Glacial Lake Deposits	Clay, brown with silt bands; pebbly below 10 m	10.0	11.7
Wolston Sand and Gravel	'Very clayey' sand: fine; quartz	3.5	15.2
Glacial Lake Deposits	Clay, red-brown and brown, stony in parts, well laminated 15.6 m to 16.0 m	0.8	16.0
	Clay, red-brown, sandy, with coal fragments	0.5+	16.5
	Borehole abandoned		

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
25	75	0	11.7-15.2	25	59	16	0		

SP 47 NW 66 **4382 7716** **Newham Grounds** **Block C**

Surface level +77 m (+254 ft)
Water not encountered
October 1980

Overburden 1.0 m
Mineral 1.7 m
Bedrock 5.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	1.0	1.0
River Terrace Deposits	'Clayey' gravel Gravel: fine and coarse; subangular flint and rounded quartzite with quartz, sandstone and ironstone and some mudstone Sand: fine to coarse; quartz	1.7	2.7
Mercia Mudstone	Mudstone, reddish-brown, with green sandstone fragments	5.3+	8.0

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
10	35	55	1.0-2.7	10	8	17	10	27	28

COMPOSITION

Depth below surface (m)	Percentages by weight in +4-64 mm fraction								
	Quartzite	Quartz	Sandstone	Flint	Limestone	Ironstone	Mudstone	Igneous	Others
1.0-2.7	31	10	15	36	0	7	1	0	trace

SP 47 NW 67 **4485 7746** **Chapel Wood** **Block C**

Surface level +93 m (+306 ft)
Water not encountered
October 1980

Overburden	0.5 m
Mineral	1.7 m
Waste	3.6 m
Bedrock	0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
River Terrace Deposits	'Very clayey' pebbly sand Gravel: fine and coarse; subangular flint with rounded quartzite, quartz, sandstone and ironstone Sand: fine and medium; quartz Fines: yellow-brown, silty, lamianted	1.7	2.2
	Clay, yellow brown, with pebbles of flint, quartzite, quartz and sandstone	0.6	2.8
Glacial Lake Deposits	Clay, red-brown and brown, silty, pebbly and sandy in parts	3.0	5.8
Cotham Member	Clay, grey-green	0.3+	6.1

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
29	59	12	0.5-2.2	29	33	23	3	7	5

SP 47 NW 68 **4153 7646** **Sidenhill Spinney** **Block A**

Surface level +76 m (+250 ft)
Water struck at +68 m
February 1981

Overburden	0.7 m
Mineral	0.9 m
Waste	2.4 m
Mineral	13.2 m
Waste	5.2 m
Bedrock	1.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.7	0.7
River Terrace Deposits	**a** 'Very clayey' sand: fine and medium; quartz	0.9	1.6
	Clay, red-brown, with medium quartz sand	0.5	2.1
Till	Clay, red-brown, with pebbles of quartzite, quartz and coal	1.9	4.0
Baginton Sand and Gravel	**b** 'Clayey' pebbly sand Gravel: fine and coarse, rounded to well rounded; quartzite, quartz and sandstone Sand: medium with fine; quartz	13.2	17.2

Till	Clay, brown, with pebbles of quartzite, quartz, red and green mudstone and coal; very sandy below 18.7 m	5.2	22.4
Mercia Mudstone	Mudstone, red with green 'fish-eyes'	1.1+	23.5

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
a	20	78	2	0.7-1.6	20	23	53	2	2	0
b	10	75	15	4.0-5.0	11	26	37	5	13	8
				5.0-6.0	18	17	56	3	5	1
				6.0-7.8	15	20	58	2	5	0
				7.8-8.8	5	7	52	6	14	16
				8.8-9.8	6	18	57	4	5	10
				9.8-10.8	16	15	63	3	3	0
				10.8-11.8	11	22	49	3	10	5
				11.8-12.8	9	19	66	3	2	1
				12.8-15.8	5	24	48	3	5	15
				15.8-17.2	6	21	45	3	10	15
				Mean	**10**	**20**	**52**	**3**	**7**	**8**
a+b	**10**	**75**	**15**	**Mean**	**10**	**20**	**52**	**3**	**7**	**8**

SP 47 NW 69 **4277 7626** **East of Marston Mill** **Block C**

Surface level +78 m (+256 ft)
Water not encountered
October 1980

Overburden 0.7 m
Mineral 3.5 m
Bedrock 0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
River Terrace Deposits	Clay, red, with pebbles of flint, quartz and quartzite	0.4	0.7
	'Very clayey' sand: fine and medium; quartz	3.5	4.2
Mercia Mudstone	Mudstone, red with green 'fish-eyes'	0.8+	5.0

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
33	64	3	0.7-2.7	35	29	29	3	2	2
			2.7-4.2	28	57	11	1	2	1
			Mean	**33**	**40**	**22**	**2**	**2**	**1**

SP 47 NW 70 **4389 7639** **The Grange** **Block C**

Surface level +79 m (+260 ft)
Water not encountered
October 1980

Overburden	0.9 m
Mineral	0.5 m
Waste	0.5 m
Bedrock	0.6 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.9	0.9
River Terrace Deposits	Sandy gravel Gravel: fine and coarse; subangular flint with rounded quartzite, quartz, sandstone and ironstone Sand: fine and medium; quartz	0.5	1.4
	Clay, reddish brown, with pebbles of flint, quartzite, quartz, sandstone and coal	0.5	1.9
Tea Green Marl	Clay, blue-grey	0.6+	2.5

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	$+1-4$	$+4-16$	$+16$ mm
9	53	38	0.9-1.4	9	20	25	8	18	20

SP 47 NW 71 **4041 7512** **South-west of The Plantation** **Block C**

Surface level +76 m (+250 ft)
Water not encountered
October 1980

Overburden	0.3 m
Mineral	3.4 m
Waste	0.5 m
Bedrock	0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
River Terrace Deposits	'Clayey' pebbly sand Gravel: fine with coarse; subrounded flint and rounded quartzite with quartz, sandstone, ironstone and some mudstone Sand: fine and medium; quartz	3.4	3.7
?Till	Clay, red with green layers and quartzite pebbles	0.5	4.2
Mercia Mudstone	Mudstone, red with green marbling	0.3+	4.5

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
17	65	18	0.3-1.6	24	21	26	8	17	4
			1.6-3.0	11	32	42	5	6	4
			3.0-3.7	16	16	32	7	20	9
			Mean	**17**	**24**	**35**	**6**	**13**	**5**

SP 47 NW 72 **4189 7567** **Wolston Priory** **Block C**

Surface level +77 m (+254 ft)
Water struck at +75.5 m
October 1980

Overburden	0.6 m
Mineral	1.0 m
Waste	0.2 m
Mineral	2.8 m
Bedrock	0.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
River Terrace Deposits	**a** 'Clayey' sandy gravel Gravel: fine with coarse; subangular flint and rounded to well rounded quartzite with quartz, sandstone and ironstone Sand: fine to coarse; quartz and flint	1.0	1.6
	Clay, yellow, with pebbles of flint	0.2	1.8
	b 'Very clayey' gravel Gravel: fine and coarse; well rounded quartzite with subangular flint, rounded quartz, sandstone ironstone and some mudstone and igneous rocks Sand: fine to coarse; quartz	2.8	4.6
Mercia Mudstone	Mudstone red with green lenses	0.4+	5.0

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
a	14	47	39	0.6-1.6	14	17	18	12	26	13
b	20	36	44	1.8-3.4	21	6	13	12	30	18
				3.4-4.6	18	8	26	8	15	25
				Mean	**20**	**7**	**19**	**10**	**23**	**21**
a+b	**18**	**39**	**43**	**Mean**	**18**	**9**	**19**	**11**	**24**	**19**

COMPOSITION

Depth below surface (m)	Percentages by weight in +4-64 mm fraction								
	Quartzite	Quartz	Sandstone	Flint	Limestone	Ironstone	Mudstone	Igneous	Others
0.6-1.6	37	21	18	20	0	2	0	trace	2
1.8-3.4	33	17	15	27	0	6	1	1	0
3.4-4.6	36	10	28	15	0	5	4	2	0
Mean	**35**	**16**	**20**	**21**	**0**	**4**	**2**	**1**	**1**

SP 47 NW 73 **4300 7580** **North-east of New Farm** **Block C**

Surface level +75 m (+246 ft)
Water struck at +74.2 m
October 1980

Overburden	0.4 m
Mineral	3.0 m
Waste	1.6 m
Mineral	0.8 m
Bedrock	0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
River Terrace Deposits	**a** 'Clayey' sandy gravel Gravel: fine with coarse; subangular flint and rounded quartzite with quartz, sandstone and ironstone Sand: fine to coarse; quartz and flint	3.0	3.4
	Clay, yellow-brown, sandy, with flint and quartz pebbles	0.3	3.7
	Silt, black; quartz pebbles at base	1.3	5.0
	b Gravel Gravel: fine and coarse, as above Sand: as above	0.8	5.8
Mercia Mudstone	Mudstone, red with green 'fish-eyes'	0.5+	6.3

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
a	19	50	31	0.4-1.9	19	17	17	10	26	11
				1.9-3.4	18	21	24	10	19	8
				Mean	**19**	**19**	**21**	**10**	**22**	**9**
b	5	42	53	5.0-5.8	5	6	18	18	30	23
a+b	**16**	**48**	**36**	**Mean**	**16**	**16**	**20**	**12**	**24**	**12**

SP 47 NW 74 **4451 7572** **Limestone Hall Farm** **Block E**

Surface level +94 m (+308 ft)
Water not encountered
October 1980

Waste	4.5 m
Bedrock	0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Glacial Lake Deposits	Clay, brown, silty, with pebbles of quartzite, quartz, sandstone and Keuper sandstone	4.2	4.5
Lower Lias	Clay, black	0.5+	5.0

SP 47 NE 59 **4532 7947** **The Hill, Town Thorns** **Block F**

Surface level +103 m (+338 ft)
Water not encountered
October 1980

Waste	19.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Glacial Lake Deposits	Clay, brown, with sporadic pebbles of quartzite	6.0	6.2
	Sandy silt, brown, laminated in parts and with concentration of coal fragments at 12.5 m	13.1+	19.3

SP 47 NE 60 **4655 7934** **Easenhall** **Block F**

Surface level +100 m (+328 ft)
Water struck at +5.2 m
September 1980

Waste	13.9 m
Bedrock	0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Glacial Lake Deposits	Clay, brown, silty and sandy in parts; pebbles of sandstone, quartzite and coal at base	5.0	5.2
	Silt, reddish brown, sandy, laminated	1.2	6.4
	Clay, brown, with pebbles as above; grey 13.3 m to 13.9 m with many limestone pebbles	7.5	13.9
White Lias	Limestone, white	0.1+	14.0

SP 47 NE 61 **4777 7968** **North of Harborough Magna** **Block F**

Surface level +120 m (+394 ft)
Water struck at +115.5 m
November 1980

Overburden	1.8 m
Mineral	4.0 m
Waste	1.5 m
Mineral	8.0 m
Waste	6.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Till	Clay, yellow-brown, with pebbles of limestone, quartz, quartzite, coal, sandstone, red and green mudstone and flint	1.4	1.8
Glacial Sand and Gravel, undivided	**a** 'Very clayey' pebbly sand Gravel: fine and coarse, rounded; quartzite, quartz, sandstone and some ironstone Sand: fine and medium; quartz	4.0	5.8
	Silt, red-brown	1.5	7.3
	b 'Very clayey' sand: fine; quartz	8.0	15.3
Glacial Lake Deposits	Clay, brown, silty, with lenses of fine quartz sand	5.2	20.5
? Till	Clay, grey and brown; pebbles of quartz, quartzite, grey mudstone, red and green mudstone and sandstone and coal	1.5+	22.0

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
a	21	75	4	1.8-2.8	28	48	13	1	4	6
				2.8-3.8	26	36	31	1	1	5
				3.8-5.8	15	37	47	0	1	0
				Mean	**21**	**40**	**35**	**trace**	**1**	**3**
b	30	70	0	7.3-10.5	36	61	3	0		
				10.5-13.5	24	66	10	0		
				13.5-15.3	30	65	5	0		
				Mean	**30**	**64**	**6**	**0**		
a+b	**27**	**72**	**1**	**Mean**	**27**	**56**	**16**	**0**	**trace**	**1**

SP 47 NE 62 **4608 7816** **Southwest of Cathiron Bridge** **Block F**

Surface level +92 m (+302 ft)
Water not encountered
October 1980

Waste	8.7 m
Bedrock	0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Glacial Lake Deposits	Clay, red-brown, silty, laminated in parts	2.7	3.0
	Clay, brown and red-brown at top, grey and grey-brown from 3.5 m to base; pebbles of quartz, quartzite, blue and white limestone, red mudstone and sandstone and traces of chalk, coal and dark grey mudstone	4.5	7.5
	Clay, grey, laminated with thin bands of brown sandy clay	0.8	8.3
	Sand; medium quartz	0.4	8.7
White Lias	Limestone, white and pale brown, banded	0.3+	9.0

SP 47 NE 63 **4787 7873** **Harborough Parva** **Block F**

Surface level +108 m (+354 ft)
Water struck at +102.4 m
October 1980

Overburden	0.2 m
Mineral	4.2 m
Waste	1.2 m
Mineral	3.6 m
Waste	9.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Glacial Sand and Gravel	**a** 'Very clayey' sand: fine with medium; quartz	4.2	4.4
	Silt, red-brown, with orange clay bands, sandy in parts	1.2	5.6
	b 'Very clayey' sand: fine; quartz	3.6	9.2
Glacial Lake Deposits	Clay, brown and grey-brown, silty, with pebbles of quartzite, quartz, sandstone, dark mudstone, limestone, red mudstone and sandstone and chalk; pebble free and weakly laminated 11.8 m to 12.1 m	2.9	12.1
? Till	Clay, brown, with pebbles of quartz, quartzite, red mudstone and coal, and grey with pebbles of quartz, quartzite, limestone and chalk	6.4+	18.5
	Borehole abandoned; drilling tool lost down borehole		

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
a	31	69	0	0.2-1.2	23	46	30	1		
				1.2-2.2	25	50	24	1		
				2.2-3.2	27	52	20	1		
				3.2-4.4	47	48	5	0		
				Mean	**31**	**49**	**19**	**1**		
b	27	73	0	5.6-6.6	24	60	16	0		
				6.6-7.6	33	63	4	0		
				7.6-9.2	25	67	8	0		
				Mean	**27**	**64**	**9**	**0**		
a+b	**29**	**71**	**0**	**Mean**	**29**	**55**	**15**	**1**		

SP 47 NE 64 **4698 7735** **Little Lawford** **Block C**

Surface level +80 m (+262 ft)
Water struck at +78 m
November 1980

Overburden 1.8 m
Mineral 1.8 m
Bedrock 0.9 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
River Terrace Deposits	Clay, yellow-brown	1.4	1.8
	'Clayey' gravel Gravel: fine and coarse; subangular flint and rounded to well rounded quartzite with quartz, sandstone, ironstone and some mudstone and limestone Sand: fine to coarse; quartz	1.8	3.6
Lower Lias	Clay, dark grey	0.9+	4.5

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
13	34	53	1.8-2.8	21	5	14	10	24	26
			2.8-3.6	2	8	21	13	32	24
			Mean	**13**	**6**	**17**	**11**	**28**	**25**

COMPOSITION

Depth below surface (m)	Percentages by weight in +4-64 mm fraction								
	Quartzite	Quartz	Sandstone	Flint	Limestone	Ironstone	Mudstone	Igneous	Others
1.8-2.8	38	6	12	38	3	2	1	trace	0
2.8-3.6	34	12	9	34	0	10	1	trace	0
Mean	**37**	**8**	**10**	**36**	**2**	**6**	**1**	**trace**	**0**

SP 47 NE 65 **4565 7632** **King's Newham** **Block C**

Surface level +75 m (+246 ft)
Water not encountered
October 1980

Overburden	0.4 m
Mineral	2.0 m
Waste	2.4 m
Bedrock	0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
?Alluvium	Soil	0.4	0.4
River Terrace Deposits	'Clayey' gravel Gravel: fine and coarse; subangular flint and rounded quartzite with quartz, sandstone, ironstone and some limestone and mudstone Sand: medium and coarse; quartz and flint	2.0	2.4
	Clay, yellow-brown to 3.4 m, blue-grey below; pebbles as above	2.4	4.8
Cotham Member	Clay, greenish grey	0.2+	5.0

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
13	33	54	0.4-2.4	13	4	17	12	22	32

SP 47 NE 66 **4798 7613** **Home Farm** **Block C**

Surface level +92 m (+302 ft)
Water not encountered
October 1980

Overburden	0.3 m
Mineral	2.9 m
Waste	2.5 m
Bedrock	0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.3	0.3
River Terrace Deposits	'Clayey' gravel Gravel: fine, coarse and cobble; subangular flint and rounded quartzite with quartz, sandstone ironstone and some mudstone Sand: fine to coarse; quartz and flint	2.9	3.2
	Clay, reddish brown, with pebbles of quartzite, quartz, sandstone and limestone	2.5	5.7
Blue Lias	Limestone and clay, blue-grey	0.8+	6.5

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				-1/16	+1/16 -1/4	+1/4 -1	+1 -4	+4 -16	+16 mm
15	37	48	0.3-1.4	18	15	19	3	4	41*
			1.4-2.4	19	16	27	7	15	16
			2.4-3.2	5	5	10	10	21	49
			Mean	**15**	**12**	**19**	**6**	**12**	**36**

*Includes 26 per cent cobbles

SP 47 NE 67 **4595 7558** **Mount Pleasant** **Block E**

Surface level +107 m (+352 ft)
Water struck at +102 m
October 1980

Waste 12.7 m
Bedrock 0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	1.0	1.0
Glacial Lake Deposits	Clay, brown, sandy; pebbles of quartz, quartzite, sandstone and coal	0.9	1.9
	Clay, reddish brown and grey-brown, silty, laminated in parts	5.7	7.6
	Clay, red-brown, sandy, with pebbles of quartzite, quartz, sandstone, limestone and coal	5.1	12.7
Blue Lias	Clay, dark blue, fossiliferous	0.3+	13.0

SP 47 NE 68 **4661 7598** **Sunnyview Farm** **Block E**

Surface level +89 m (+292 ft)
Water not encountered
October 1980

Waste 4.8 m
Bedrock 1.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.8	0.8
Glacial Lake Deposits	Clay, reddish brown to 2.5 m grey below; pebbles of quartzite, quartz, sandstone and (below 2.5 m) limestone	3.1	3.9
	Clay, grey, silty, with limestone cobbles	0.9	4.8
Blue Lias	Clay, blue	1.8+	6.6

SP 47 NE 69 **4767 7524** **Lawford Fields Farm** **Block E**

Surface level +94 m (+308 ft)
Water not encountered
October 1980

Waste	4.7 m
Bedrock	1.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.3	0.3
Glacial Lake Deposits	Clay, reddish brown, sandy; pebbles of quartzite, quartz, sandstone and coal	3.4	3.7
	Clay, grey and brown, silty, laminated	1.0	4.7
Blue Lias	Limestone and clay, blue	1.8+	6.5

SP 47 SW 73 **4105 7396** **North of the Dun Cow** **Block D**

Surface level +101 m (+333 ft)
Water struck at +94 m
October 1980

Overburden	0.7 m
Mineral	1.4 m
Waste	6.3 m
Mineral	5.9 m
Waste	8.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.7	0.7
Dunsmore Gravel	**a** 'Clayey' gravel Gravel: fine with coarse; subangular flint with rounded to well rounded quartzite, sandstone, quartz, ironstone and some mudstone Sand: fine to coarse; quartz and flint	1.4	2.1
Glacial Lake Deposits	Clay, red-brown; pebbles of quartz and red mudstone and grey silt lenses	6.3	8.4
Wolston Sand and Gravel	**b** 'Clayey' sand: fine; quartz	5.9	14.3
Glacial Lake Deposits	Clay, brown, well laminated 16.0 m to 17.0 m	2.7	17.0
?Till	Clay, red, with pebbles of quartz, quartzite, red and green mudstone and coal; silty and stoneless in parts	6.0+	23.0

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
a	15	38	47	0.7-2.1	15	12	15	11	34	13
b	16	82	2	8.4-10.0	28	61	5	2	4	0
				10.0-12.0	12	81	4	1	2	0
				12.0-14.3	9	68	22	0	0	1
				Mean	**16**	**70**	**11**	**1**	**2**	**trace**
a+b	**16**	**73**	**11**	**Mean**	**16**	**58**	**12**	**3**	**8**	**3**

COMPOSITION

Depth below surface (m)	Percentages by weight in +4-64 mm fraction								
	Quartzite	Quartz	Sandstone	Flint	Limestone	Ironstone	Mudstone	Igneous	Others
0.7-2.1	16	5	18	53	trace	7	1	trace	0

SP 47 SW 74 **4193 7465** **Fosse Farm** **Block D**

Surface level +95 m (+312 ft)
Water level not recorded
October 1980

Waste 19.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Alluvial Fan Deposits	Sandy gravel Gravel: fine and coarse, subangular; flint with quartzite and sandstone Sand: fine to coarse; quartz	0.3	0.8
	Clay, red-brown, with pebbles as above	1.6	2.4
Glacial Lake Deposits	Clay, brown, silty	1.0	3.4
	'Clayey' sand: fine and medium; quartz	0.6	4.0
	Clay, brown, silty, laminated	6.0	10.0
	Clay, red-brown, stony, silty and laminated in parts	5.6	15.6
	Sandy silt, brown	3.4+	19.0

SP 47 SW 75 **4290 7431** **Heath Villa** **Block D**

Surface level +110 m (+360 ft)
Water level not recorded
October 1980

Overburden 0.4 m
Mineral 2.0 m
Waste 17.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Dunsmore Gravel	'Clayey' sandy gravel Gravel: fine and coarse; subangular flint with rounded to well rounded quartzite, quartz, sandstone and ironstone Sand: fine and medium; quartz and flint	2.0	2.4
Glacial Lake Deposits	Clay, brown and grey brown, silty, laminated in parts and with silt from 12.0 m to 14.3 m	12.6	15.0
	Clay, red-brown, with pebbles of quartzite, quartz, and pale green sandstone; grey from 18.5 m to base	4.5+	19.5

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
13	50	37	0.4-1.4	17	25	23	3	10	22
			1.4-2.4	9	14	28	6	17	26
			Mean	**13**	**20**	**26**	**4**	**13**	**24**

SP 47 SW 76 **4386 7495** **Limestone Hall Farm** **Block E**

Surface level +96 m (+314 ft)
Water not encountered
October 1980

Waste	9.0 m
Bedrock	0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Glacial Lake Deposits	Clay, brown, silty, with pebbles of quartzite, quartz and sandstone	6.6	6.8
	Clay, red-brown and grey, with pebbles of quartzite, quartz, sandstone and dark blue limestone; 0.2 m thick quartz sand bands at 8.4 m and 8.8 m	2.2	9.0
Lower Lias	Clay, black	0.5+	9.5

SP 47 SW 77 **4029 7323** **South of Knightlow Hill** **Block D**

Surface level +105 m (+346 ft)
Water level not recorded
September 1980

Overburden	0.6 m
Mineral	2.1 m
Waste	14.7 m
Bedrock	0.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Dunsmore Gravel	'Clayey' pebbly sand Gravel: fine and coarse; subangular flint with rounded quartzite, quartz, sandstone and ironstone Sand: fine and medium; quartz and flint	2.1	2.7
Glacial Lake Deposits	Clay, red-brown, silty, stony in parts	3.3	6.0
Wolston Sand and Gravel	Sandy silt: fine quartz sand with yellow-brown silt	4.3	10.3
	Clay, brown, silty	2.3	12.6
Wolston Sand and Gravel	'Very clayey' sand: fine; quartz	3.2	15.8

Till	Clay, red-brown, with small pebbles of quartzite, quartz, Keuper sandstone, red and green mudstone and coal	1.6	17.4
Mercia Mudstone	Mudstone, red-brown with green 'fish-eyes'	0.3+	17.7

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
18	62	20	0.6-1.6	19	26	26	5	11	13
			1.6-2.7	18	21	35	10	13	3
			Mean	**18**	**24**	**31**	**7**	**12**	**8**
23	75	2	12.6-13.6	32	52	16	0	0	0
			13.6-14.6	20	72	8	0	0	0
			14.6-15.8	19	62	12	3	2	2
			Mean	**23**	**62**	**12**	**1**	**1**	**1**

SP 47 SW 78 **4158 7302** **South of Frog Hall** **Block D**

Surface level +96 m (+314 ft)
Water level not recorded
October 1980

Waste 15.8 m
Bedrock 0.7 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Made ground	0.4	0.4
Alluvial Fan Deposits	Silt clay and sand, orange-brown, with pebbles of quartzite and sandstone	1.6	2.0
Glacial Lake Deposits	Clay, brown, silty	4.3	6.3
	Clay, reddish-brown, with pebbles of quartzite, sandstone and red and green mudstone	1.7	8.0
Wolston Sand and Gravel	'Clayey' sand: fine and medium quartz with red-brown silty clay, laminated	1.7	9.7
Glacial Lake Deposits	Clay, red-brown and grey, silty in parts, with pebbles of quartzite, quartz and sandstone	5.0	14.7
	'Very clayey' sand: medium quartz	1.1	15.8
Mercia Mudstone	Mudstone, red	0.7+	16.5

SP 47 SW 79 **4490 7398** **Church Lawford Lodge** **Block E**

Surface level +111 m (+364 ft)
Water struck at +107 m
October 1980

Overburden	1.3 m
Mineral	3.9 m
Waste	11.3 m
Bedrock	0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil and made ground	1.3	1.3
Dunsmore Gravel	**a** 'Clayey' pebbly sand Gravel: fine and coarse; subangular flint with rounded quartzite, quartz, sandstone and ironstone Sand: fine and medium; quartz and flint	2.7	4.0
	b 'Clayey' gravel Gravel: as above Sand: fine to coarse, as above	1.2	5.2
Glacial Lake Deposits	Clay, brown, silty, laminated	6.6	11.8
	Clay, mainly reddish brown but grey 16.1 m to 16.5 m, with pebbles of quartzite, quartz, green sandstone and chalk	4.7	16.5
Blue Lias	Limestone and blue clay	0.5+	17.0

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
a	16	75	9	1.3-2.5	16	37	32	3	7	5
				2.5-4.0	16	43	31	3	6	1
				Mean	**16**	**40**	**32**	**3**	**6**	**3**
b	13	43	44	4.0-4.8	14	10	24	10	18	24
				4.8-5.2	13	7	18	13	29	20
				Mean	**13**	**9**	**23**	**11**	**22**	**22**
a+b	**15**	**65**	**20**	**Mean**	**15**	**31**	**29**	**5**	**11**	**9**

COMPOSITION

Depth below surface (m)	Percentages by weight in +4-64 mm fraction								
	Quartzite	Quartz	Sandstone	Flint	Limestone	Ironstone	Mudstone	Igneous	Others
4.0-4.8	11	8	12	58	0	11	0	0	0
4.8-5.2	20	6	18	44	2	9	0	trace	1
Mean	**14**	**7**	**15**	**53**	**1**	**10**	**0**	**trace**	**trace**

SP 47 SW 80 **4250 7296** **Burydyke** **Block D**

Surface level +110 m (+360 ft)
Water struck at +108.8 m
October 1980

Overburden	0.1 m
Mineral	2.4 m
Waste	7.5 m
Bedrock	0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.1	0.1
Dunsmore Gravel	'Clayey' sandy gravel Gravel: fine and coarse; subangular flint with rounded sandstone, quartzite, quartz and ironstone Sand: fine to coarse; quartz and flint	2.4	2.5
Glacial Lake Deposits	Clay, grey, silty, laminated	4.9	7.4
	Sandy silt	1.0	8.4
	Clay, brown, with pebbles of quartz, quartzite, sandstone and green mudstone	1.6	10.0
White Lias	Limestone, white	0.2+	10.2

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
18	53	29	0.1-1.1	19	26	31	6	12	6
			1.1-2.5	17	12	24	9	21	17
			Mean	**18**	**18**	**27**	**8**	**17**	**12**

SP 47 SW 81 **4370 7235** **Broomhill Farm** **Block D**

Surface level +108 m (+354 ft)
Water struck at +106 m
October 1980

Overburden	0.4 m
Mineral	2.4 m
Waste	6.9 m
Bedrock	0.8 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Dunsmore Gravel	'Clayey' sandy gravel Gravel: fine with coarse; subangular flint with rounded quartzite, sandstone, quartz and ironstone Sand: fine to coarse; quartz and flint	2.4	2.8
Glacial Lake Deposits	Clay, grey and reddish brown, silty	3.8	6.6
	Clay, reddish brown, with pebbles of quartzite, quartz, sandstone and red mudstone	3.1	9.7
Blue Lias	Limestone and dark blue clay	0.8+	10.5

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
13	57	30	0.4-1.4	10	14	24	13	25	14
			1.4-2.8	15	17	34	10	18	6
			Mean	**13**	**15**	**31**	**11**	**21**	**9**

SP 47 SW 82 **4472 7271** **Lynes's Spinney** **Block E**

Surface level +111 m (+364 ft)
Water struck at +100.5 m
September 1980

Overburden	0.4 m
Mineral	2.2 m
Waste	0.8 m
Mineral	1.1 m
Waste	6.0 m
Mineral	1.0 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Dunsmore Gravel	**a** 'Very clayey' pebbly sand Gravel: fine; subangular flint with rounded quartzite, sandstone, quartz and ironstone Sand: fine and medium; quartz and flint	1.0	1.4
	b 'Clayey' gravel Gravel: fine and coarse, as above Sand: fine to coarse, as above	1.2	2.6
	Clay, yellow-orange, sandy, laminated	0.8	3.4
	c 'Clayey' sandy gravel Gravel: fine and coarse, as above Sand: fine to coarse, as above	1.1	4.5
Glacial Lake Deposits	Clay, grey, with stony layers, lamianted 8.5 m to 9.5 m	6.0	10.5
Wolston Sand and Gravel	Silt, grey, and fine quartz sand	1.0+	11.5
	Borehole abandoned because of rock obstruction		

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
a	20	73	7	0.4-1.4	20	39	31	3	5	2
b	19	39	42	1.4-2.6	19	11	19	9	17	25
c	14	51	35	3.4-4.5	14	12	30	9	18	17
a+b+c	**18**	**53**	**29**	**Mean**	**18**	**20**	**26**	**7**	**14**	**15**

SP 47 SW 83 **4120 7177** **Assylum Farm** **Block D**

Surface level +106 m (+348 ft)
Water struck at +92.5 m
November 1980

Overburden 4.0 m
Mineral 3.6 m
Waste 13.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Alluvial Fan Deposits	Clay, orange-brown and grey, sandy	2.9	3.2
	'Clayey' pebbly sand, Gravel: fine; subangular flint and rounded quartzite, quartz, sandstone and ironstone Sand: fine and medium quartz	0.6	3.8
	Silty clay	0.2	4.0
	a 'Very clayey' pebbly sand Gravel: fine and coarse, as above Sand: fine and medium, as above	2.0	6.0
	b Gravel Gravel: fine and coarse, as above Sand: fine to coarse, as above	1.6	7.6
Glacial Lake Deposits	Clay, brown-grey	4.7	12.3
Wolston Sand and Gravel	Silt, grey-brown, sandy from 15.5 m to base	3.9	16.2
Glacial Lake Deposits	Clay, reddish brown, pebbly	4.8+	21.0

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}$ -1	+1 -4	+4 -16	+16 mm
a	30	65	5	4.0-6.0	30	44	18	3	1	4
b	4	40	56	6.0-7.6	4	6	24	10	26	30
a+b	**18**	**54**	**28**	**Mean**	**18**	**27**	**21**	**6**	**12**	**16**

SP 47 SW 84 **4211 7120** **South of Wood Cottage** **Block D**

Surface level +108 m (+354 ft)
Water struck at +105.5 m
September 1980

Overburden	0.4 m
Mineral	2.3 m
Waste	5.8 m
Bedrock	0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Dunsmore Gravel	'Very clayey' pebbly sand Gravel: fine and coarse; subangular flint with rounded quartzite, sandstone, quartz and ironstone Sand: fine and medium; quartz and flint	2.3	2.7
Glacial Lake Deposits	Clay, brown, silty, laminated in parts	2.8	5.5
	Clay, brown, with pebbles of quartzite, quartz, chalk, red and green sandstone, grey mudstone and coal	3.0	8.5
Blue Lias	Mudstone, blue-grey	0.1+	8.6

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
21	66	13	0.4-1.4	21	30	31	4	9	5
			1.4-2.7	21	34	26	5	10	4
			Mean	**21**	**33**	**28**	**5**	**9**	**4**

SP 47 SW 85 **4381 7137** **Heath Farm** **Block E**

Surface level +106 m (+348 ft)
Water struck at +103.4 m
October 1980

Overburden	0.4 m
Mineral	4.0 m
Waste	8.3 m
Bedrock	2.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.4	0.4
Dunsmore Gravel	**a** 'Clayey' pebbly sand Gravel: fine and coarse; subangular flint, with rounded quartzite, sandstone, quartz and ironstone Sand: fine and medium; quartz and flint	2.0	2.4
	b Sandy gravel Gravel: as above Sand: fine to coarse, as above	2.0	4.4

Glacial Lake Deposits	Clay, grey-brown, sandy and silty from 8.0 m to base	4.6	9.0
	Clay, reddish brown, with pebbles of quartzite, sandstone, red mudstone and grey-green limestone	3.7	12.7
Blue Lias	Clay, and limestone, blue-grey, fossiliferous	2.3+	15.0

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
a	12	74	14	0.4-1.4	13	37	37	3	6	4
				1.4-2.4	12	36	32	2	4	14
				Mean	**12**	**36**	**35**	**3**	**5**	**9**
b	8	58	34	2.4-3.4	12	12	31	12	22	11
				3.4-4.4	5	7	39	14	24	11
				Mean	**8**	**10**	**35**	**13**	**23**	**11**
a+b	**10**	**66**	**24**	**Mean**	**10**	**23**	**35**	**8**	**14**	**10**

SP 47 SW 86 **4468 7184** **Bourton Heath** **Block E**

Surface level +113 m (+372 ft)
Water struck at +110.2 m
October 1980

Overburden	0.5 m
Mineral	4.0 m
Waste	4.5 m
Mineral	2.1 m
Waste	4.5 m
Bedrock	0.4 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Dunsmore Gravel	**a** 'Very clayey' pebbly sand Gravel: fine and coarse; subangular flint with rounded quartzite, quartz, sandstone and ironstone Sand: fine and medium; quartz and flint	2.3	2.8
	b Gravel Gravel: as above Sand: fine to coarse, as above	1.7	4.5
Glacial Lake Deposits	Clay, brown, with pebbles of quartzite and sandstone	2.3	6.8
	'Very clayey' pebbly sand Gravel: fine and coarse; subangular flint, with rounded quartzite, sandstone, ironstone and trace quartz, mudstone and limestone Sand: fine; quartz	0.8	7.6
	Clay, brown, silty, laminated	1.4	9.0

Wolston Sand and Gravel	**c** Sandy gravel Gravel: fine with coarse, subrounded to rounded; green and red mudstone and green-grey sandstone with quartzite, quartz, Jurassic limestone and some flint, ironstone and igneous rocks Sand: medium and coarse; quartz	2.1	11.1
Glacial Lake Deposits	Clay, reddish brown, with pebbles of quartzite, sandstone and red mudstone	4.5	15.6
Blue Lias	Clay, blue	0.4+	16.0

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
a	21	61	18	0.5-1.5	23	27	27	4	10	9
				1.5-2.8	20	28	32	3	7	10
				Mean	**21**	**28**	**30**	**3**	**8**	**10**
b	8	39	53	2.8-4.5	8	7	23	9	25	28
a+b	15	53	32	**Mean**	**15**	**19**	**28**	**6**	**15**	**17**
	27	67	6	6.8-7.6	27	53	10	4	3	3
c	5	68	27	9.0-10.0	5	40	24	8	18	5
				10.0-11.1	4	32	22	11	20	11
				Mean	**5**	**36**	**23**	**9**	**19**	**8**
a+b+c	12	58	30	**Mean**	**12**	**25**	**26**	**7**	**16**	**14**

COMPOSITION

Depth below surface (m)	Percentages by weight in +4-64 mm fraction								
	Quartzite	Quartz	Sandstone	Flint	Limestone	Ironstone	Mudstone	Igneous	Others
0.5-2.8	9	16	21	43	1	10	0	0	0
2.8-4.5	14	8	19	36	1	21	0	1	0
Mean	**11**	**13**	**20**	**40**	**1**	**15**	**0**	**trace**	**0**
6.8-7.6	14	1	13	59	1	11	1	0	0
9.0-10.0	17	11	35	0	10	2	20	5	0
10.0-11.1	16	12	24	2	12	3	29	2	0
Mean	**16**	**12**	**30**	**1**	**11**	**2**	**25**	**3**	**0**
Mean	**13**	**11**	**22**	**30**	**4**	**11**	**8**	**1**	**0**

SP 47 SW 87 **4280 7047** **Frankton** **Block D**

Surface level +110 m (+360 ft)
Water not encountered
September 1980

Overburden	0.5 m
Mineral	0.7 m
Waste	6.2 m
Bedrock	0.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Dunsmore Gravel	'Very clayey' pebbly sand Gravel: fine and coarse, subangular flint with rounded quartzite, quartz, sandstone and ironstone Sand: fine and medium, quartz	0.7	1.2
Glacial Lake Deposits	Clay, brown, silty, laminated	2.5	3.7
	Clay, brown, and grey from 7.0 to 7.4 m; pebbles of chalk, red and green mudstone, green sandstone, coal, quartz, quartzite and grey siltstone/limestone	3.7	7.4
Blue Lias	Mudstone, grey	0.1+	7.5

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	$+1-4$	+4 -16	+16 mm
20	69	11	0.5-1.2	20	31	35	3	6	5

SP 47 SE 24 **4609 7418** **Southwest of Lawford Hill** **Block E**

Surface level +109 m (+358 ft)
Water struck at +105.5 m
September 1980

Overburden	0.8 m
Mineral	3.9 m
Waste	15.3 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.8	0.8
Dunsmore Gravel	**a** 'Very clayey' pebbly sand Gravel: fine and coarse; subangular flint with rounded quartzite, sandstone, quartz and ironstone Sand: fine and medium; quartz and flint	2.0	2.8
	b 'Very clayey' gravel Gravel: as above Sand: fine to coarse, as above	1.9	4.7

Glacial Lake Deposits	Clay, grey-brown	3.7	8.0
	Clay, brown, with small pebbles of quartzite, quartz, chalk, red and green mudstone and sandstone	7.0	15.0
	Clay, brown, laminated	1.5	16.5
	Clay, red-brown, with pebbles of quartz, quartzite, red mudstone and coal	3.5+	20.0

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
a	21	67	12	0.8-2.8	21	31	32	4	7	5
b	21	39	40	2.8-4.7	21	10	20	9	19	21
a+b	21	53	26	**Mean**	**21**	**21**	**26**	**6**	**13**	**13**

SP 47 SE 25 **4767 7423** **Cawston Old Farm** **Block E**

Surface level +110 m (+360 ft)
Water struck at +107.6 m
October 1980

Overburden	0.3 m
Mineral	0.7 m
Waste	0.2 m
Mineral	1.2 m
Waste	17.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Dunsmore Gravel	**a** 'Very clayey' sandy gravel Gravel: fine and coarse; subangular flint with rounded sandstone, quartzite, quartz and ironstone Sand: fine to coarse; quartz and flint	0.7	1.0
	Clay, yellowish brown, sandy; pebbles of flint and quartzite	0.2	1.2
	b 'Very clayey' sandy gravel: as above	1.2	2.4
Glacial Lake Deposits	Clay, brown, silty, sandy to 3.5 m, laminated	5.2	7.6
	Clay, brown, with pebbles of quartz, quartzite, sandstone and chalk	1.0	8.6
	Clay, brown, silty, laminated	0.7	9.3
	Clay, reddish brown, with pebbles as above	5.4	14.7
	Clay, brown, sandy, laminated	4.8+	19.5

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
a	24	50	26	0.3-1.0	24	20	23	7	12	14
b	21	44	35	1.2-2.4	21	17	19	8	15	20
a+b	22	46	32	**Mean**	**22**	**18**	**20**	**8**	**14**	**18**

SP 47 SE 26 **4541 7316** **Lawford Heath Farm** **Block E**

Surface level +108 m (+354 ft)
Water struck at +104 m
September 1980

Overburden	0.6 m
Mineral	5.6 m
Waste	2.7 m
Mineral	1.6 m
Waste	6.8 m
Bedrock	0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.6	0.6
Dunsmore Gravel	**a** 'Clayey' pebbly sand Gravel: fine with coarse; subangular flint with rounded quartzite, sandstone, quartz and ironstone Sand: fine to coarse; quartz and flint	3.0	3.6
	b 'Clayey' sandy gravel Gravel: as above Sand: as above	2.6	6.2
Glacial Lake Deposits	Clay, grey-brown, with small pebbles of red and green siltstone, chalk, flint, quartzite, quartz and coal	2.7	8.9
Wolston Sand and Gravel	**c** 'Clayey' sand: fine; quartz	1.6	10.5
Glacial Lake Deposits	Clay, red-brown, with small pebbles of red and green mudstone, Keuper sandstone, quartzite and quartz; grey mudstone below 15.0 m		
Blue Lias	Mudstone, blue-grey, hard	0.2+	17.5

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
a	19	63	18	0.6-1.6	22	31	30	6	6	5
				1.6-2.6	16	15	30	21	15	3
				2.6-3.6	19	20	27	10	14	10
				Mean	**19**	**22**	**29**	**12**	**12**	**6**
b	13	46	41	3.6-4.6	11	7	18	10	26	28
				4.6-6.2	14	7	34	11	25	9
				Mean	**13**	**7**	**28**	**11**	**25**	**16**
a+b	16	55	29	**Mean**	**16**	**15**	**29**	**11**	**18**	**11**
c	11	89	0	8.9-9.9	10	85	4	1		
				9.9-10.5	13	76	10	1		
				Mean	**11**	**82**	**6**	**1**		
a+b+c	15	63	22	**Mean**	**15**	**30**	**24**	**9**	**14**	**8**

SP 47 SE 27 **4730 7331** **Cawston Garage Farm** **Block E**

Surface level +114 m (+374 ft)
Water struck at +102.8 m
September 1980

Overburden 0.5 m
Mineral 1.9 m
Waste 19.1 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Dunsmore Gravel	'Very clayey' pebbly sand Gravel: fine and coarse; subangular flint with rounded quartzite, sandstone, quartz and ironstone Sand: fine and medium; quartz and flint	1.9	2.4
Glacial Lake Deposits	Clay, grey-brown, silty	5.3	7.7
	Clay, brown, with small pebbles of quartzite, quartz, chalk and red mudstone	3.5	11.2
Wolston Sand and Gravel	'Clayey' sand: fine; quartz	2.8	14.0
Glacial Lake Deposits	Clay, red-brown, with pebbles as above	1.7	15.7
	Silty clay, grey-brown	5.8+	21.5
	Borehole abandoned; unable to advance casing		

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				-1/16	+1/16 -1/4	+1/4 -1	+1 -4	+4 -16	+16 mm
20	70	10	0.5-1.5	22	26	36	5	7	4
			1.5-2.4	18	38	32	3	7	2
			Mean	**20**	**31**	**35**	**4**	**7**	**3**
19	81	0	11.2-14.0	19	78	3	0	0	0

SP 47 SE 28 **4615 7216** **Station Farm** **Block E**

Surface level +105 m (+346 ft)
Water struck at +99.4 m
September 1980

Overburden	0.5 m
Mineral	1.7 m
Waste	3.4 m
Mineral	3.3 m
Waste	8.0 m
Bedrock	0.2 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.5	0.5
Dunsmore Gravel	**a** 'Clayey' sandy gravel Gravel: fine with coarse; subangular flint with sandstone, quartzite, quartz and ironstone Sand: fine to coarse; quartz and flint	1.7	2.2
Glacial Lake Deposits	Clay, brown, with small pebbles of quartz, quartzite, red and green mudstone, sandstone, coal and chalk	3.4	5.6
Wolston Sand and Gravel	**b** 'Clayey' sand: fine; quartz	3.3	8.9
Glacial lake Deposits	Silt, grey-brown, laminated, sandy in parts; clay from 10.1 m to 11.2 m	2.3	11.2
	Clay, red-brown, with small pebbles of quartzite, quartz and red and green mudstone and sandstone	5.7	16.9
Lower Lias	Mudstone, blue-grey, hard	0.2+	17.1

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					-1/16	+1/16 -1/4	+1/4 -1	+1 -4	+4 -16	+16 mm
a	16	62	22	0.5-2.2	16	13	35	14	16	6
b	18	81	1	5.6-6.6	34	64	2	0	0	0
				6.6-7.6	13	77	8	0	2	0
				7.6-8.9	10	81	9	0	0	0
				Mean	**18**	**74**	**7**	**0**	**1**	**0**
a+b	**17**	**75**	**8**	**Mean**	**17**	**53**	**17**	**5**	**6**	**2**

SP 47 SE 29 **4748 7178** **Windmill Houses** **Block E**

Surface level +115 m (+378 ft)
Water struck at +112.5 m
October 1980

Overburden	0.2 m
Mineral	2.8 m
Waste	1.5 m
Bedrock	0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.2	0.2
Dunsmore Gravel	'Clayey' sandy gravel Gravel: fine and coarse; subangular flint with rounded quartzite, sandstone, quartz and ironstone Sand: fine to coarse; quartz and flint	2.8	3.0
Glacial Lake Deposits	Clay, reddish brown, with pebbles of flint, sandstone, quartzite, quartz and green mudstone	1.5	4.5
Lower Lias	Clay, black, laminated	0.5+	5.0

GRADING

Mean for deposit percentages			Depth below surface (m)	Percentages					
Fines	Sand	Gravel		Fines	Sand			Gravel	
				$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
17	42	41	0.2-1.2	19	31	25	5	15	5
			1.2-1.8	7	6	15	8	25	39
			1.8-2.5	27	15	18	6	13	21
			2.5-3.0	10	4	7	12	53	14
			Mean	**17**	**17**	**18**	**7**	**23**	**18**

SP 47 SE 30 **4572 7098** **Draycote Field Farm** **Block E**

Surface level +115 m (+378 ft)
Water level not recorded
October 1980

Overburden	0.3 m
Mineral	2.0 m
Waste	1.7 m
Mineral	5.0 m
Waste	3.0 m
Bedrock	0.5 m+

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Dunsmore Gravel	**a** 'Clayey' pebbly sand Gravel: fine and coarse; subangular flint with rounded quartzite, sandstone, quartz and ironstone Sand: fine; quartz and flint	2.0	2.3
Glacial Lake Deposits	Clay, brown, with pebbles of quartz, quartzite and sandstone	1.7	4.0

Wolston Sand and Gravel	**b** 'Clayey' sand: fine quartz	5.0	9.0
Glacial Lake Deposits	Clay, reddish-brown, with pebbles of quartz, quartzite, sandstone and green mudstone; blue-grey from 10.0 m to 12.0 m	3.0	12.0
Lower Lias	Clay, blue	0.5+	12.5

GRADING

	Mean for deposit percentages			Depth below surface (m)	Percentages					
	Fines	Sand	Gravel		Fines	Sand			Gravel	
					$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1 -4	+4 -16	+16 mm
a	13	69	18	0.3-1.3	13	19	42	4	7	15
				1.3-2.3	13	38	31	4	10	4
				Mean	**13**	**28**	**37**	**4**	**9**	**9**
b	12	88	trace	4.0-5.5	8	91	1	0	0	0
				5.5-7.0	12	86	2	0	0	0
				7.0-9.0	14	77	7	1	1	0
				Mean	**12**	**85**	**3**	**trace**	**trace**	**0**
a+b	**12**	**82**	**6**	**Mean**	**12**	**68**	**13**	**1**	**3**	**3**

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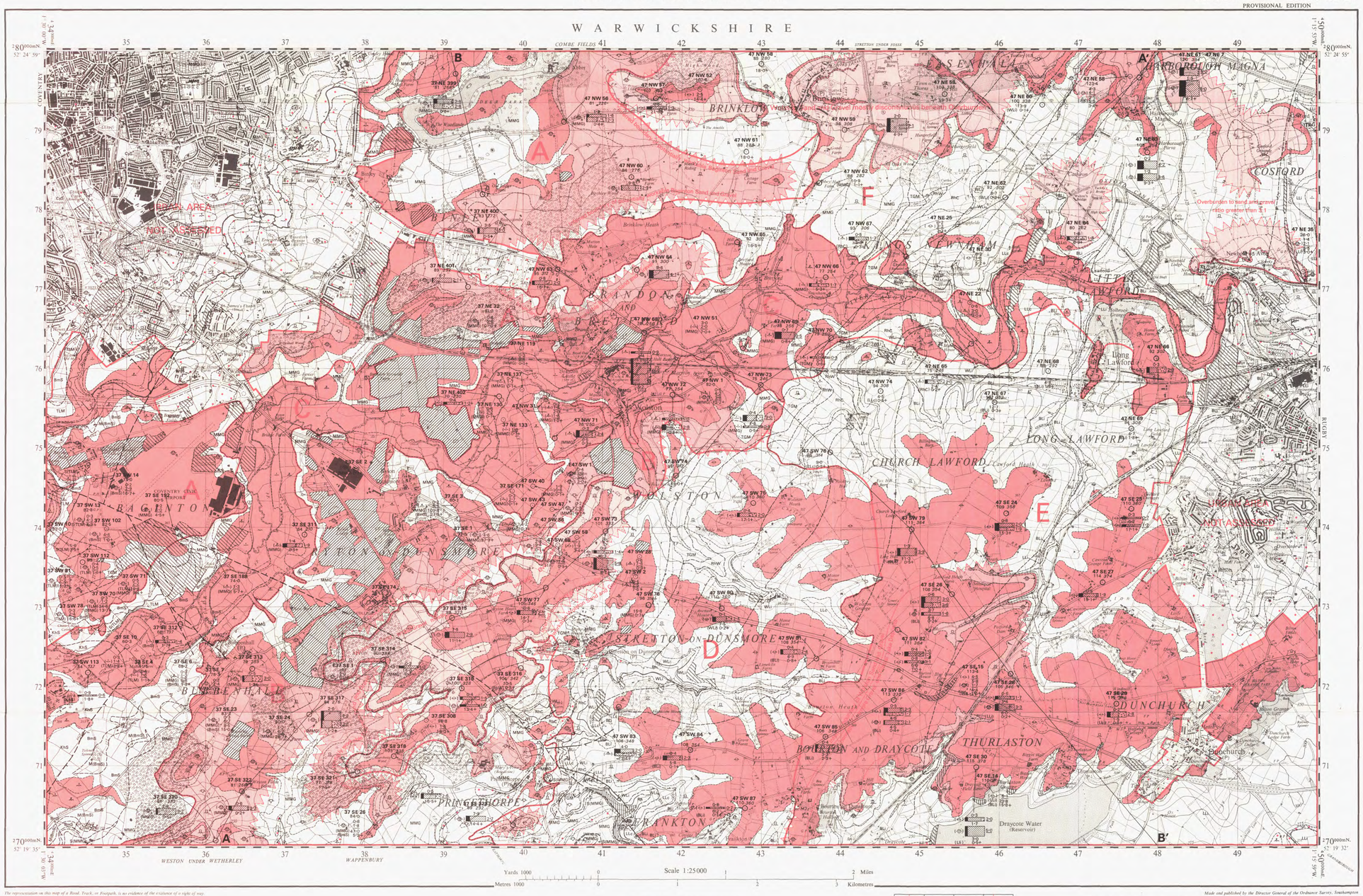

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Sand and Gravel survey by R.G. Crofts and B. Cannell in 1980.
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	184		185
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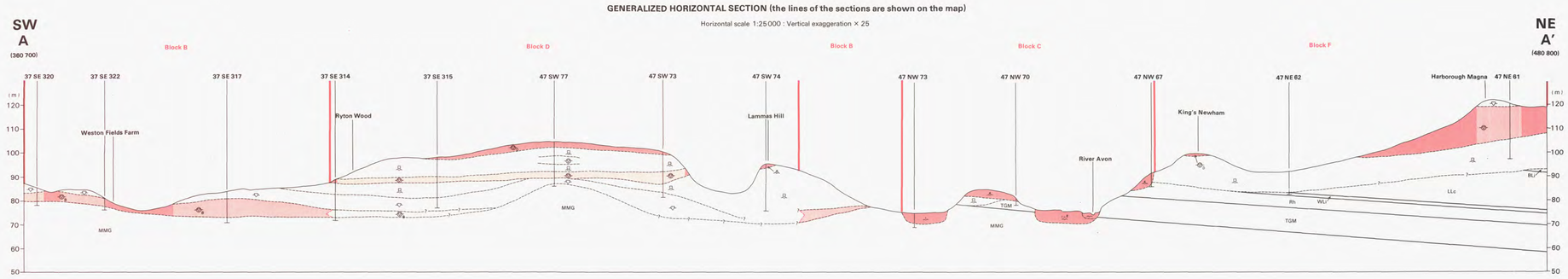
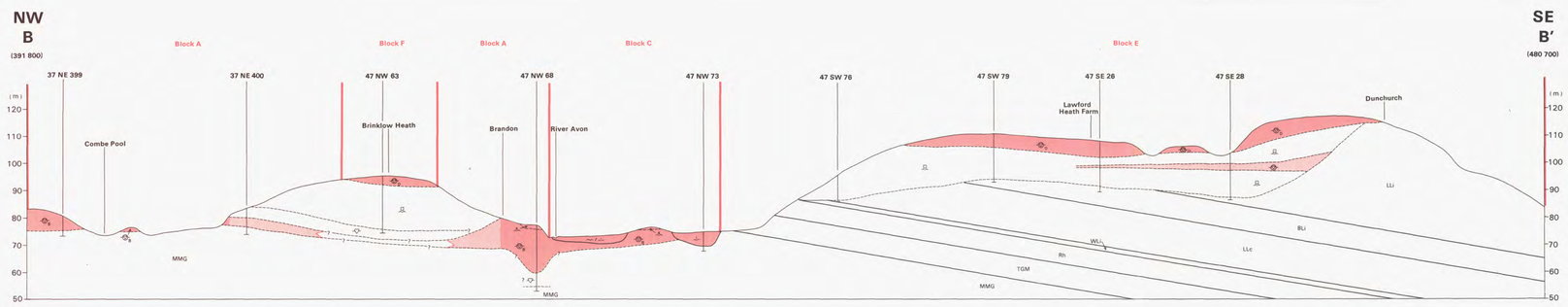
Draycote Water revised 1971.

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

GENERALIZED HORIZONTAL SECTION (the lines of the sections are shown on the map)

Horizontal scale 1:25 000 : Vertical exaggeration × 25





THE SAND & GRAVEL RESOURCES OF SHEET SP 47 & PART OF SP 37 (COVENTRY AND RUGBY, WARWICKSHIRE)

125

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

EXPLANATION OF SYMBOLS AND ABBREVIATIONS

Landslip L-1

DRIFT			
~	**Alluvium** – silts and clays with some gravel. A-7	Recent and Pleistocene	QUATERNARY
::	**River Terrace Deposits (First to Fourth Terrace)** – sand and gravel with some silt and clay. RT-11		
⩓	**Alluvial Fan Deposits** – flinty sand and gravel. AF-7		
<>	**Fluvioglacial Deposits (Dunsmore Gravel)** – loamy flinty sand and gravel. FL-26		
◈	**Glacial Sand and Gravel, undivided (including Wolston Sand and Gravel)** – mainly fine sand.		GS-80
⊥	**Glacial Lake Deposits** – clay and silty clay, largely stoneless and commonly laminated. GL-13		
<>	**Till** – red and grey stony clay. TL-18		
◈	**Glacial Sand and Gravel (Baginton Sand and Gravel)** – sand and 'Bunter'-type pebble gravel. GS-81		
SOLID			
LLi	**Lower Lias** – grey mudstone.	Lower Lias	JURASSIC
BLi	**Blue Lias** – grey mudstone with cementstone.		
LLc	**Lower Lias** – grey mudstone.		
WLi	**Langport Member (White Lias)** – white porcellanous limestone.	Penarth Group	TRIASSIC
Rh RhC RhW	**Cotham Member Westbury Formation** – grey-green mudstone overlying dark grey mudstone.		
TGM	**Blue Anchor Formation (Tea Green Marl)** – grey-green silty mudstone.	Mercia Mudstone Group	
MMG	**Mercia Mudstone** – red-brown mudstone with subordinate sandstone.		
S(MMG)	Sandstone in above.		
BmS	**Bromsgrove Sandstone Formation** – grey-buff micaceous sandstone with subordinate mudstone.	Sherwood Sandstone Group	PERMIAN
M(BmS)	Mudstone in above.		
KhS	**Kenilworth Sandstone Formation** – red and brown sandstone.	Enville Group	UPPER CARBONIFEROUS
TLM	**Tile Hill Mudstone Formation** – red-brown silty mudstone with flaggy sandstone.		
S(TLM)	Sandstone in above.		
CvS	**Coventry Sandstone Formation** – red-brown flaggy sandstone.		

Worked out sand and gravel WO-3

Made ground MG-2

BOUNDARY LINES

- Geological boundary, Drift
- Geological boundary, Solid
- Fault at surface, crossmark indicates downthrow side
- Inferred boundary between recognized categories of deposits
- Inferred boundary of continuous mineral at depth beneath exposed mineral
- Resource Block Boundary

Broken lines denote uncertainty

BOREHOLE DATA

SITE LOCATIONS

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

I.M.A.U. BOREHOLES

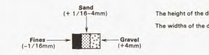
Note
1. The figures in *italics* are the imperial conversions of measurements recorded in metres.
2. Figures underlined denote thicknesses used in the assessment of resources.
3. The + sign indicates that the base of the deposit was not reached.
4. The Geological Classification is given only for mineral and bedrock.

Borehole Registration Number

Each I.M.A.U. borehole is identified by a Registration Number, eg. **47 SW 86**. The initial letters and numbers refer to the quarter sheet, and the second to the I.G.S. serial number for that quarter. The unique designation for borehole **47 SW 86** is **SP 47 SW 86**.

Grading Diagrams

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



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

EXPOSURE RECORDS

Information from the inspection of exposures is shown in the same way as for boreholes, but they are located by an asterisk, thus: ✳.

OTHER BOREHOLES

The layout of information is the same as for I.M.A.U. boreholes, although data available may not be as comprehensive. They are registered in the same series.

CATEGORIES OF DEPOSITS

- **Exposed mineral.** CAT-E6
- **Continuous or almost continuous spreads of mineral beneath overburden.** CAT-C1
- **Discontinuous spreads of mineral beneath overburden.** CAT-D1
- **Sand and gravel either not potentially workable (see Report) or absent.** CAT-A2
- **Sand and gravel not assessed.** CAT-N1

RESOURCE BLOCKS

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

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