Natural Environment Research Council

BRITISH GEOLOGICAL SURVEY

Geological Survey of England and Wales

TECHNICAL REPORT WA/88/45.

SP 61 SE

BRILL

Part of 1:50 000 Sheet 237 (Thame)

A.J.M. Barron

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Geological notes and local details for
1:10 000 sheets: SP 61 SE (Brill)
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INTRODUCTION

This report describes the geology of the 1:10 000 Sheet SP 61 SE covering the district between the villages of Brill and Chilton in north-western Buckinghamshire. The district was included in Old Series Sheet 45 SE, published in 1863 and revised in 1867. Parts of Brill Hill were resurveyed at the 1:10 560 scale by G.W. Lamplugh in 1904 and T.I. Pocock in 1905. The southern part of the hill and the area west of grid line 658 were surveyed by H.B. Woodward in the same year and this area was included in the 1:63 360 Oxford Special Sheet published in 1908. Notes on the railway cuttings were made by G. Barrow and H.B. Woodward.

The present survey was carried out by A.J.M. Barron in 1986. The survey and the map preparation were funded by the Thames Water Authority. B.M. Cox identified fossils collected in the field.

The Brill No.1 Borehole was drilled between the 18th of September and the 4th of November 1986 by Geotechnical Engineering of Gloucester and was logged by K. Ambrose, A. Horton and A.J.M. Barron. Micro-palaeontological determinations of the strata down to the Purbeck Beds from this and other boreholes were made by I.P. Wilkinson and macro-palaeontological determinations of the material from the Purbeck Beds down were made by B.M. Cox.

Shallow boreholes were drilled in April 1986 by A.J. Dixon of the Institute of Hydrology.

Brill lies in the north-west corner of the district, 16km west of Aylesbury and 15 km north-east of Oxford. The village is on the summit of a hill which rises to 187m OD. The village of Chilton and the hamlet of Easington in the south-east also stand on an outlying hill which rises to 142m OD. The small village of Dorton lies on lower ground in the north-east. In the extreme east, the land rises to another hill the bulk of which is outside the district. The ground falls away in the south-west towards the River Thame and in the north- east towards the River Ray. There are many scattered farms and the area is mainly arable with some grazing especially on the steeper slopes, and there are a few woods and copses. The formations to be described are all very poorly exposed.

Reports covering adjacent sheets are:

SP 61 NW	Arncott	(K. Ambrose)
SP 61 NE	Ludgershall	(M.G. Sumbler)
SP 71 NW	Waddesdon	(M.G. Sumbler)
SP 61 SW	Oakley	(A. Horton)
SP 71 SW	Chearsley	(A.J.M. Barron)
SP 60 NE	Long Crendon	(K. Ambrose)

GEOLOGICAL SEQUENCE

The geological sequence is as follows:

DRIFT	
QUATERNARY	Alluvium
	Head
SOLID	
CRETACEOUS	Gault
JURASSIC	Whitchurch Sand Formation
	Purbeck Beds
	Portland Beds
	including: Portland Stone
	Portland Sand
	Kimmeridge Clay Formation
	Ampthill Clay Formation
	Cumnor Formation
	including: Oakley Member
	Arngrove Spiculite Member (proved only in Brill No.1 Borehole).
	West Walton Formation
	Oxford Clay Formation, Upper Oxford Clay Member (proved only in Brill No.1 Borehole).

SOLID FORMATIONS

JURASSIC

Oxford Clay Formation

Upper Oxford Clay Member

Only the highest 5.61m of the Upper Oxford Clay were proved in the Brill No.1 Borehole in which it consists of pale to mid grey silty calcareous mudstone with thin siltstone beds, pyritic fossils and burrows.

West Walton Formation

The West Walton Formation is 15.3m thick in the Brill No.1 Borehole and comprises alternating dark, mid and pale grey calcareous mudstone with much shell debris, some pyritised, thin pale grey siltstone and argillaceous limestone beds, interburrowed horizons and many non- sequences, but only the uppermost thirteen metres crop out in the district. The outcrops are on the sides of shallow valleys in the north-east and the extreme south-west, where the strata produce a pale grey brown, slightly silty clay soil.

In his account of an excursion to Dorton, Brill and Arngrove, Davies (1907b, p.184) refers to the Dorton railway cutting [678 148] as exposing "inliers of Oxford Clay in the midst of the Corallian outcrops". It seems likely that it was the beds of the West Walton Formation which were exposed, for they were not distinguished from the Oxford Clay at that time. No evidence of the inlier recorded by Davies under the Dorton road bridge was seen during the present survey; the West Walton Formation crops out a little to the south and could easily have been exposed in an excavation for the bridge.

The Formation was also penetrated under the alluvium in two gas pipe- line boreholes (SP 61 SE/1B and 2B) in which up to 2.00m of pale greenish grey and pale and dark grey silty laminated clay was proved.

Cumnor Formation

Arngrove Spiculite Member

The Arngrove Spiculite Member (previously the Arngrove Stone of Davies (1907a)) was proved only in the Brill No.1 Borehole in which it consists of 1.64m of muddy grey sandstone, siltstone and silty mudstone with sponge spicules and shell debris, probably a marginal development of the Member seen in the type area. No lithological evidence for it was seen at the outcrop of the West Walton Formation/ Oakley Member boundary although in a few places east of Dorton [687 145, 694 146, and 693 144] the boundary is marked by a weak convex feature. The Member is thought to die out beneath Brill Hill. Davies (1907a) gives a detailed description of its field characteristics.

Oakley Member

The Oakley Member, previously the Oakley Clay (Buckman, 1927, p.49) or Oakley Beds (Arkell, 1933, p.409) crops out over large tracts of the low-lying ground in the north-east and south-west. In the Brill No.1 Borehole it consists of 4.20m of alternating beds of pale grey siltstone or silty nodular limestone and grey marl and mudstone, bioturbated and rich in the small bivalve Nanogyra. The limestones weather away and are not seen at the surface, where the strata produce a dark brown silty clay soil with abundant Nanogyra. The thickness of the Member is thought to vary between three and five metres in this area.

In his description of the Dorton railway cutting, Davies (1907b, p.184) notes "clay varying in colour from light grey to yellowish- white, with two bands of impure limestone" which he ascribes to the Ampthill Clay. These beds are now referred to the Oakley Member which was not separated from the Ampthill Clay at that time. The bivalve Nanogyra nana (then known as Exogyra nana) was recorded as extremely abundant. In a footnote to the report (p.185), Davies records "E.nana beds" at the southern end of the cutting and also mentions "Unexpected complexities of structure" (see Structure p.11, and Sumbler, 1988). Specimens collected by Davies and now in the B.G.S. collection (Zn 2483-2497) include Nanogyra nana, Lopha and Perisphinctes sp. Davies describes a railway cutting section in the B.G.S. fossil register as 5.15m of light grey and brown clay with brown ooids, on thin white marl beds and a 0.2m limestone bed, on 1.5m of stiff black to grey clay with large Gryphaea dilatata. This section, which comprises the Oakley Member on the West Walton Formation, is probably located at Ashendon Junction [692 138]. A specimen collected by Davies from the Oakley Member at Ashendon Junction (ZK 3953) comprises forty-four loose valves and clusters of Nanogyra nana, some encrusted with serpulids and foraminifera. H.B. Woodward, in unpublished field notes, recorded "Exogyra band" at Ashendon Junction [693 135] and about 800m south-east along the railway line [696 128] indicating the presence of the Oakley Member.

Ampthill Clay Formation

The Ampthill Clay Formation crops out over a large area of the district on the lower ground and on the lower slopes of the hills. In the Brill No.1 Borehole it consists of 20.25m of mid to dark grey mudstone with softer, paler layers and thin marl and siltstone beds, fossiliferous throughout. Two thin cementstone beds occur within 2m of the top of the Formation. The thickness at outcrop is difficult to estimate because of cambering and valley bulging (see Superficial Structures) and the uncertainty of the boundary with the overlying Kimmeridge Clay, but it is thought to vary between 15 and 23m. The strata produce a heavy grey brown clay soil, silty in places, with rare oyster shell debris, including Deltoideum delta (see Appendix 4, [6501 1255]). Below about 0.3m from the surface, the deposit is smooth grey clay. Several weak convex features were traced across the Ampthill Clay outcrop. These may be formed by the cementstones or harder mudstone beds. At the boundary with the overlying Kimmeridge Clay Formation, pale grey cementstone and shell debris is common at the surface; for instance in a stream bed 350m south-east of Chiltonpark Farm [6711 1282], 600m south of Leatherslade Farm [6526 1184], 150m south of Buttermilk Hall [6657 1192], around Grove Spinney [672 119] and 900m south-west of Chilton [6810 1095].

Kimmeridge Clay Formation

The Kimmeridge Clay Formation underlies the middle slopes of the larger hills and forms two small outliers. It consists of mid to dark grey mudstones with very fine-grained sand and silt beds in the upper part and thin impersistent limestones in the lower part. It was 55.6m thick in the Brill No.1 Borehole, including about 9.69m of very fine-grained sand and silt at the top, 1.35m of fine-grained sand and sandy limestone from 43.76m and 1.57 and 0.74m of very fine-grained sand from 51.12m and 53.30m respectively; the last bed was found only in the Borehole, and only three sand beds were traced at outcrop. Between 30 and 56m of the Formation are thought to be present in this district but the thickness has apparently been substantially reduced in places by cambering.

At outcrop the clay beds weather to a smooth grey brown clay soil; a little grey fine-grained limestone debris may be found in the lower part, for instance by Spa Wood [6688 1363], south of Buttermilk Hall [6655 1195] and on the north-east side of Dorton Hill [6830 1327 and 6856 1284]. Specimens collected from near Chilton (Appendix 4, [6810 1093 and 6792 1016] contain Nannocardioceras, Aspidoceras and Nanogyra virgula, indicating the Lower Kimmeridge Clay. In the upper part, the fine to medium-grained sand makes a lighter loamy soil. The lowest outcropping sand bed was traced only around the middle slopes of Rid's Hill [664 149]. The middle bed varies from 0 to 10m thick and occurs only in the north- west around Brill Hill, where it is impersistent; it is seen to die out, for instance, around Chiltonpark Farm [668 130] and north of Leatherslade Farm [655 126]. It was present in the Leap Hill No.2 Borehole (SP 61 SE/15 [6667 1237]). At the base of the bed, and at its horizon where absent, small black pebbles or "lydites" are common. These are thought to be abraded relics of phosphatised ammonite body chambers derived from the underlying clay formations and were seen north of Chiltonpark Farm [6669 1333], east of Parkpale Farm [6637 1304] and north-east of Leatherslade Farm [6567 1261].

The upper sandy unit (Wheatley Sand of Arkell (1947)) is continuous along its outcrop except in the extreme south-east [696 103] where it is absent over about 500m. It was formerly exposed in the Brill Brickyard [probably 6501

1422] beneath the Portland Beds and was described by Arkell (1947, p.110) as "three feet of brown and greenish marly sand". In the Brill No.1 Borehole it consists of very fine-grained grey sand and grey sandy silt beds with common lydite pebbles in the top 0.5m, and is shell debris-rich and finely bioturbated throughout. Both main sand beds are sufficiently resistant to form outliers and spurs such as those at Chiltonpark Farm [668 130], Leatherslade Farm [6535 1240], east of the railway [699 134] and at Rid's Hill [664 149], the summit of which was previously mapped as Portland Sand by the Survey. Davies (1907a, p.31) found no lydite pebbles there but did not suggest that it might not be Portland. Elsewhere the weathering products of the upper sand bed and overlying Portland Sand can be difficult to distinguish. Springs may arise at the base of either (see Water Supply).

The Brill Serpulite Bed first described by Davies (1907a) from the bottom of the Rid's Hill Brickpit, 150m off this district to the north [666 152] (Sumbler, 1988), is thought to lie at or near the base of the Kimmeridge Clay (Pringle, 1926, p.63, Arkell, 1933, p.462) but no direct evidence of it was seen in this district. Cementstone and shell debris, mentioned earlier (see Ampthill Clay Formation) as occurring near the base, may be material from the Bed.

Portland Beds

The outcrop of the Portland Beds between Oxford and Aylesbury is one of the largest in Britain and has received much attention in the literature. Fitton (1836)(see Appendix 3) described many sections in the area, Brodie (1857) recorded an unlocated section at Brill and Blake (1880) described the local sequence in his account of the Portland Beds of England and listed fossils found on an excursion to Brill (1893). Davies (1899) reported on the Portland Beds in his account of the geology of the area and Buckman (1922 and 1927), who lived in the area for the later part of his life and examined and collected from many localities, provided much valuable data. Arkell (1933) knew the area well and drew together much of the knowledge of the Jurassic and, more recently, Ballance (1963) elucidated the stratigraphy of the Thame-Aylesbury area. Neaverson (1925) studied the petrography of the Portland Sand from several localities in the vicinity but not from the subject area.

In this district, except where extensively cambered, the Portland Beds do not form a very broad outcrop, but they have a profound influence on the topography. They form the crest of the steeper slopes of the main hills by virtue of the resistance to weathering of the limestone beds. Previously, there were many small pits in the Beds, but these are now almost entirely overgrown or backfilled and exposure is very poor. The lowermost beds were formely exposed in the Brill Brickyard [probably 6502 1422] where Arkell (1947, p.110) described them as seven-and-a-half feet (2.3m) of "shelly, chalky, earthy, oolitic and marly beds" on 7 to 8 feet (2.1 to 2.4m) of "glauconitic, sandy and marly beds and limestone" overlying 1 foot (0.3m) of "Lydite Bed: brown clay with pebbles".

It has not been possible so far to relate the sequence seen in this area to that of Dorset and so no formation names have been used. No division on the map beyond 'Portland Sand' and 'Portland Stone' has been attempted, and these are not shown where there is severe cambering (see Superficial Structure) or lack of surface evidence in areas of pasture.

The Portland Beds consist of between two and six metres of inter- bedded limestone, marl and sand (Portland Stone) on between three and six metres of

fossiliferous sand, cemented in parts (Portland Sand). The thickness at outcrop is reduced in places to as little as two metres by the erosive base of the Whitchurch Sand.

In the Brill No.1 Borehole the recovery from the Beds was not good. Of the interval 16.5 to 24.0 which the Beds are thought to have occupied, only 3.32m of core was obtained, which consisted of brown, orange-brown and greenish brown, fine-grained, glauconitic sandstone, grey sandy and shell detrital limestone and grey marl. The Brill No.3 Borehole terminated in the Portland Beds, proving 0.03m of brown sandy clay on 0.19m of khaki fine to medium-grained sand above 0.15m of khaki, shelly, marly sand and marl (see Appendix 1).

At the surface, the Portland Sand weathers to a brown to greenish brown, finely sandy clay soil, with limestone rubble in places, the product of the greenish grey glauconitic sand and sandy limestone which was seen in several sections around Chilton (Appendix 2, localities E,F,K,N and P) at as little as 0.3m from the surface. Weathering of the basal 'lydite' bed leaves scattered black pebbles in the soil in places. In an excavation for a garage in Easington (locality N), 1.20m of Portland Sand were exposed very near the base of the Beds. Bivalves and very large ammonites are common in these strata (see Appendix 4).

A variety of lithologies was seen on the outcrop of the Portland Stone, the most common being a cream, fine-grained, semi-porcellanous bored limestone, a shell-detrital limestone and a marly oolite. All these were observed in brash in a field [6911 1051] north-east of Easington. In a section in an old stone pit [6512 1333] south-west of Brill, 0.5m of cream, shelly, rubbly oolite is exposed. Debris of the semi-porcellanous limestone is very common in fields near Ryman's Farm [6600 1244], south of Chilton [690 110] and 1200m east of Easington [699 101].

A large number of springs arise within and at the base of the Beds (see Water Supply).

Purbeck Beds

The beds lying between the top of the Portland Stone and the base of the Whitchurch Sand over much of this district are called here the Purbeck Beds, although there is some evidence that the Whitchurch Sand is also of Purbeck age.

The Purbeck Beds underlie a considerable part of the slopes of Brill Hill and smaller parts of hill slopes around Chilton and to the east of the railway. Elsewhere they are absent due to non-deposition or the unconformity at the base of the Whitchurch Sand.

The Purbeck Beds are now very poorly exposed. Sections in this area were first described by Fitton (1836)(see Appendix 3 of this report) but the Beds on Brill Hill were first identified by Brodie (1867) when they were a great deal better exposed, notably on the north side of the hill, where they were worked for brick clay and stone. Brodie noted the non-marine character of the fauna of the limestone. A generalised section in the pits is given by Phillips (1871, 418). The section described by Fitton (Appendix 3, locality A) of the beds on the north-west side of the hill appears to be slipped, but his locality B on the west side proved a total of about 7.85m of grey clay and

ochre now tentatively assigned to the Purbeck, and his locality C showed c2.83m of clay and ochre.

Pringle (1926, 85-86) gives a section described by G.W. Lamplugh in 1904 as "tough bright green clay with rusty spots...earthy fragments and ironstone concretions...6 to 9 inches, on brecciated white stone and marl with broken lumps of hard calcareous grit...Portland limestone below... seen for 3 feet". Pringle estimates the thickness of the beds on Brill Hill to be not more than "five or six feet...may have been locally thicker" and both he and Blake (1893, 73) note that the sections are obscured by landslipping. The present map of the area shows an apparent thickness at outcrop of up to 23m of Purbeck Beds; it is not suggested that the actual thickness is anywhere near this, but it is substantially thicker (up to 8m) than Pringle's estimate. The very extensive cambering and dip-and-faulting of the beds, especially on the north and west sides of Brill Hill (see Superficial Structures), has lowered the top of the Portland Beds by as much as 20m. The area of Brill Common is shown as Purbeck Beds outcrop but it is thought that there may be many places where Portland rocks may be found on it in small slipped and tilted blocks.

In the Brill No.1 Borehole (Appendix 1, SP 61 SE/10) the Purbeck Beds are thought to be represented by the interval c14.7 to c16.5m; 1.26m of core were obtained, consisting of grey marl and clay, with iron staining and shell debris. The Brill No.2 Borehole (SP 61 SE/11) proved 1.54m of Whitchurch Sand on 4.41m of pale grey and buff clay and marl without reaching the Portland Beds. The Brill No.3 Borehole (SP 61 SE/12) started in the Purbeck Beds and proved about 2.7m of interbedded pale grey to khaki clay, off-white, cream and buff marl, pale grey limestone and cream to khaki sand, on brown clay and khaki sand thought to represent the Portland Beds. The Brae Hill Close No.2 Borehole (SP 61 SE/29) proved 0.51m of made ground, topsoil and hill- wash on 0.58m of brown and grey mottled and grey brown clay.

At the surface the Beds appear as pale grey clay, pale marl and limestone debris. Around Chilton where they are very thin they are distinguished from the Whitchurch Sand clay facies by their pale colour and from the Portland Beds by the presence of clay.

I.P. Wilkinson examined five samples of clay for calcareous micro- fossils from the Purbeck Beds of the Brill No.1 Borehole (see Appendix 5). One sample (16.0-16.1m) contained a fauna consistent with the middle and upper parts of the Lower 'Purbeck' and indicating brackish, estuarine conditions. A second (16.4m) contained a fauna character- istic of the Lower 'Purbeck', indicating a more marine environment than the succeeding sample.

Whitchurch Sand Formation

The name Whitchurch Sands was proposed by Casey and Bristow (1964) for deposits of ferruginous sand recorded between the Portland or Lower Purbeck Beds and Lower Greensand or Gault, and cropping out from Wiltshire to Buckinghamshire; in this district they were previously called Shotover Sands (Blake, 1893) or Shotover Ironsands (Davies, 1899, p.40). They are referred to here as the Whitchurch Sand Formation. The strata have generally been considered to be of freshwater origin; Pringle (1928, pp.87-89) gives the earlier history of research. However, Casey and Bristow concluded that the Sand is marine-brackish Middle Purbeck (Cretaceous) age and equated it with the Cinder Bed of Dorset. Morter (1984) disagreed and placed it lower in the sequence "close to the top of the 'Lower Purbeck' and base of the 'Middle

Purbeck' i.e. within the Portlandian...stage as defined by Wimbledon and Cope (1978)". The position of the Formation is not yet resolved, so for the purposes of this report it is taken to be in the Portlandian and therefore in the Jurassic.

The Formation caps Brill Hill, Dorton Hill and hills north-west of Chilton [684 117 and 681 122], east of the railway [699 140], and forms a faulted outlier near Ryman's Farm [6595 1235]. It also underlies the Gault in the area south-east of Chilton. The Formation oversteps the underlying Purbeck Beds and the upper part of the Portland Beds to lie in places on the Portland Sand. It consists of two distinct facies; a very fine- to coarse-grained sand (the sand facies) over most of the district, and to the south-east of Chilton an orange-brown and grey very ferruginous silty clay (the clay facies), apart from the area [697 111] south-east of Chilton Grounds which is in the sand facies. The basal erosive and unconformable relationship of the Formation may in part account for its variation in thickness from two to eighteen metres. The total Formation (i.e. where overlain by Gault Clay) is thinnest in the south-east where the clay facies predominates. This may be due partly to the unconformity beneath the Gault and also to the finer facies comprising a condensed sequence.

At the surface, the sand facies of the Formation produces a brown sandy soil with ironstone debris. The clay facies produces a brown and grey-brown, silty, ironstone-rich clay soil.

The Brill No.1 Borehole begins in the Whitchurch Sand and the Formation here consists of c14.7m of buff, ochreous and brown very fine to medium-grained sand with pale grey and brown clay and mudstone beds up to 0.50m thick, mainly below 10m, thin pale buff to ochreous siltstone and silt beds up to 0.2m thick and thin dark purplish brown sandy ironstone beds. The sand is weakly to well-bedded and cross- bedded in places, and generally consists of well-sorted sub-angular quartz grains, with a little ironstone detritus. In places it is weakly cemented, and a few sandstone pebbles, burrows and clay pockets were observed. Shear planes and organic debris were seen in the clay beds which are sandy in parts. The clay beds were examined for calcareous microfossils by I.P. Wilkinson but were found to be barren (see Appendix 5).

The Brill Church Borehole (Appendix 1, SP 61 SE/13) proved 5.86m of orange and grey medium to coarse-grained sand interbedded with thin grey clay and ironstone beds without reaching the base of the Formation and a borehole at Brae Hill Close, Brill (SP 61 SE/31) proved 0.15m of made ground on 1.07m of "loam (understood to indicate a more-or-less equal mixture of sand, silt and clay) with some ironstone lumps, becoming more sandy with depth and increasing in ironstone content" without proving the base.

The Whitchurch Sand Formation is presently exposed at several localities. In the area known as The Walks [6540 1424] in Brill, 2.6m of orange and brown fine to medium-grained, poorly sorted sand with a 0.6m dark orange-brown bedded ironstone band was exposed. About 150m to the south-east [655 141] it was reported (1986) that excavations up to 18' (5.5m) deep at a building site had proved nothing but sand. A borehole at this site (Appendix 1, SP 61 SE/26) proved 2.0m of brown, grey and yellow sand with ironstone. In a section in the farmyard [6806 1256] at Dorton Hill (see Appendix 2, locality B) 0.4m of brown and orange-brown sandy soil on 0.4m of orange to dark purple sandy ironstone, on 0.4m of orange and dark green clay with ironstone was observed. A ditch section [6880 1080] (locality L) by Ash Tree Cottage exposed yellow-brown to pale brown silty clay with rusty limonitic nodules and, 450m

to the south, about 0.7m of mid grey and brown mottled silty clay under stony topsoil was seen in a section [6871 1034] (locality M) in Easington.

Sections described by Fitton (1836, pp.280-281) are summarised in Appendix 3. A general sequence on Brill Common of about 14m of white, brown and ochreous fine-grained sand with grey and brown clay beds and ironstone is given by Pringle (1928, p.93).

CRETACEOUS

Gault

Up to 15m of Gault caps the hilltops in the extreme south-east of the district, forming three outliers, one extending onto the ground to the south. It is not exposed in this district, but in sections in the vicinity it consists of grey silty clay with phosphatic nodules. At the surface the strata give rise to a very heavy grey brown to orange brown silty clay soil. Where the underlying Whitchurch Sand is not sandy, the Gault is distinguished from it by its greyer colour and lack of ironstone.

Both Upper and Lower Gault were thought to be present at a reservoir site 200m south of this district (SP 60 NE/49 [6912 0985], see Ambrose, in prep.), where a borehole (No.6) proved 11.40m of pale to dark grey silty mudstone and siltstone without reaching the base. The uppermost 9.76m were shown to be Upper Gault and the bottom 0.20m were thought to be Lower Gault (determinations by A.A. Morter). The core was lost between 9.76 to 11.20m. It is probable that both divisions are present in the subject area.

The Gault is unconformable on the underlying Whitchurch Sand which may in part account for the variation in thickness of the latter.

STRUCTURE

The regional structure of this district has a consistent low dip to the south-east of less than one degree. This is modified by a minor anticlinal structure [677 148] north of Dorton and, in the higher strata of the hill areas, by profound superficial structures (see Superficial Structures) and minor faulting.

The zone of folding north of Dorton was first detected by Davies (1907b and 1910) in the railway cutting. The most complicated part lies on the ground to the north (see Sumbler, in prep.). It is no longer exposed but surface mapping reveals that the structure does not extend far to the south-west, probably dying out in the inlier of Oakley Member [674 143] by Dorton Park Farm.

The minor faulting in the area south-west [660 124] of Ryman's Farm preserves two small outcrops of Portland Stone and one of Whitchurch Sands. However, the apparent steep dips of the strata (up to three degrees) owe more to cambering and non-diastrophic dip-and-fault structure than to tectonic faulting.

The fault to the south-east [693 102] of Chilton has a maximum down- throw of about 12m to the north, although it is thought that this has been accentuated by local non-diastrophic processes.

No evidence was seen of systematic jointing in the strata of the district.

SUPERFICIAL STRUCTURES

The disposition of all the strata which crop out on the higher ground has been profoundly altered by superficial cambering and dip-and- faulting. This is most apparent from the dips of the strata which slope outward in all

directions from Brill Hill and the hills around Chilton. For instance, the base of the Gault has been lowered about 25m to the north of Chapel Lane, Chilton [692 114], and the base of the Portland by nearly 30m near Home Farm [692 119] and about 50m near Ryman's Farm [658 121]. The cambers are thought to be largely composed of strata which are intensely faulted normal to the downhill direction with the intervening strata dipping downhill steeper than the overall dip of the camber in the manner described by Hollingworth and others (1944) and Horswill and Horton (1976). A section behind a barn at Home Farm [6876 1197] displays dip-and-fault structure in the Portland Beds; there is a normal fault with a downthrow of about one metre to the west separating blocks with easterly valleyward dips steeper than the camber (see Appendix 2, Locality D). A dip observed in a section at Dorton Hill [6806 1256] (Appendix 2, Locality B) probably results from cambering. Any existing jointing will have influenced the early stages of cambering. The poor recovery of the Purbeck and Portland Beds in the Brill No.1 Borehole indicates that even well away from the outcrop the strata may be considerably disrupted by joints and fissures. Jointing and fissuring will also be a major factor in water movement.

Another effect of cambering is the change in the apparent thickness of formations at outcrop. Increases in thickness are most noticeable in the Purbeck Beds on Brill Common and around Brill Hill and in the Portland Beds near Home Farm, Chilton [687 121] and south-west of Wombwell's Farm [695 106]. This is due to downhill dip and repetition of the strata by faulting. The apparent increase in the thickness of the upper formations is compensated for by the decrease in thickness by squeezing of the Kimmeridge and the Ampthill Clays, most noticeably north-east of Chilton [693 122] and north of Meads Farm [65 11]. The timing of the cambering event is not precisely known but it must partly predate the erosion of some of the minor valleys because the sand beds of the Upper Kimmeridge outlier at Chiltonpark Farm are at much the same level as the beds of the adjacent cambered spur of Brill Hill.

The position of the outcrop of the Oakley Member north-east of Chilton [69 12] suggests that valley bulging (see Horswill and Horton, 1976) may also have taken place.

LANDSLIP

In this district, landslips have been produced by the lubrication of existing shear planes in clay formations causing the detachment and downslope mass movement of the outer parts of spurs. Only six areas of landslipped strata are shown but it is likely that there are older inactive slips elsewhere which have degraded sufficiently as a result of erosion and cultivation to become unrecognisable.

The largest area of landslipped terrain is on the north-west flank [698 143] of the hill east of the railway, the upper part being sandy, the lower part clayey and apparently forming a mud flow. Around Brill Hill only one slip is outlined [654 131]. The western side of the hill at Chiltonpark Farm [667 130] is extensively slipped and three minor slips are shown near Chilton. There are landslips at Canoncourt Farm [686 114], west of Ash Tree Cottages [6824 1076] and near Springhill Cottages [682 115], the last of which showed signs of recent movement where the weight of a tractor had caused a fissure about 1m deep to open in 1986.

Landslipping in these areas is likely to be triggered by water seepage at the

base of the Whitchurch Sand, Portland Beds or sand beds in the Kimmeridge Formation (see Water Supply) lubricating shear planes in the underlying clay formations.

DRIFT

QUATERNARY

Scattered flints were found in two areas of this district; on outcrops of Gault [694 111, 690 106 and 690 101] and on the Ampthill Clay outcrop [67 10 and 67 11] to the east and north-east of Hornage Farm. The former group of deposits may be a relic of a high level drift deposit, the latter probably the remains of a degraded tract of Head.

Head

Seven tracts of brown sandy clay, some stony, are described as Head deposits. Most cap low knolls or subdued spurs on the lower hillsides, and are likely to be products of both hillwash and solifluxion.

A minor deposit of sandy clay [6576 1477] lies in a small valley 500m west of Coldharbour Farm. A tract flooring a col [665 135] 600m north-east of Parkpale Farm consists of less than 1m of orange-brown sandy clay with a few black pebbles. Two small springs arise from this deposit. The Leap Hill No.2 Borehole (SP 61 SE/15) proved about two metres of grey and orange-brown, very sandy clay and clayey sand on a Kimmeridge Formation sand bed in the centre of a minor tract of Head [6667 1237] 200m east of Leap Hill. A substantial deposit of brown, stony, very sandy clay overlies Portland Beds on a spur [689 121] 500m north of Chilton. At the surface, much ironstone debris is apparent. This deposit is exposed in a bank at Home Farm [6876 1198] (Appendix 2, Section D), where 1.5m of orange-brown to khaki mottled, fine to medium-grained sand can be seen. The other three Head deposits [690 133, 692 126 and 698 119] lie on the lower valley slopes of the stream running southwards alongside the railway and consist of up to about two metres of brown, stony, sandy clay with flint and ironstone clasts.

Alluvium

Tracts of alluvium up to 250m wide flank several streams, mostly on the low-lying ground in the north-east and south-west of the district. The narrower spreads in the south-west consist of probably not much more than 2.5m of grey and brown sandy silty clay with gravelly lenses and a basal gravel. About two metres of grey and orange-brown mottled, silty, sandy clay on gravel was seen in a stream bank [6502 1190] 600m south-west of Leatherslade Farm. The broader tract [690 140] 1km east of Dorton is considerably thicker; two boreholes (Appendix 1, 1B and 2B) near its margin prove 3.00m of silty, sandy, gravelly, alluvial clay. In one borehole 1.00m of gravelly sand underlies the clay.

Three degraded dams, probably intended to impound water for fishponds [6658 1303, 6700 1269 and 6711 1280] near Chiltonpark Farm, have modified the deposition of alluvium in this area.

The ornamental lake [6700 1353] in Spa Wood, which is now only partly flooded, may also have a thin alluvial deposit.

MADE GROUND

Four small areas of made ground have been delineated on the map. Two are sludge tips surrounded by earth banks at Dorton Hill [6800 1255] and at Canoncourt Farm [6872 1130]. A bank below a plantation [6785 1273] 300m north-west of Dorton Hill was reported as man-made. A small bank by the B4011 road [6750 1063] near Hornage Farm is thought to be spoil from an excavation at the gas pipeline valve house.

Elsewhere there are many minor pits which have been partially backfilled. On the north and west sides of Brill village on Brill Common, North Hill and South Hills the ground has been intensively excavated, mainly for brick clay from the Purbeck Beds, and the spoil heaps from these activities, together with village refuse, now grassed over, have given rise to an area of inextricable pits and tips.

WATER SUPPLY

The natural water supply of the district is dominated by the numerous springs arising within and from the bases of minor aquifers such as the Whitchurch Sand and Portland Formations and the sand beds in the Kimmeridge Clay. Several are shown on the Ordnance Survey map but many more were located in the course of the present survey. It is not known which are 'permanent' and which ephemeral. Whitaker (1921) gives details of some of the springs on the south side of Brill Hill (pp.45 and 270) and comments generally on the water supply of the area; a short account (pp.66 and 271) is given of the chalybeate well [6693 1358] at Dorton. Once a moderately fashionable spa, which gave its name to Spa Wood and Spa Farm, it is now entirely disused and over- grown, the water level is about 0.3m below ground level.

Whitaker also notes wells at Coldharbour Farm [6630 1483] (p.124), Sebastopol Farm, now Ixhill [6550 1036] (p.153), and Chilton Grove Farm [6745 1234] (p.95), water from which caused an outbreak of gastro-enteritis in Marylebone in 1873.

APPENDIX 1

BOREHOLES

		Depth m
1B. Gas pipeline borehole 42A [c688 140] S.L.+72.1m OD		
	Topsoil	to 0.20
Alluvium	Clay, pale grey and orange-brown mottled, silty	to 2.00
	Clay, pale brown and orange-brown mottled, soft, silty, sandy, with fine to medium-grained gravel	to 3.00
West Walton Formation	Clay, pale greenish grey and grey, silty, firm, with indistinct lamination	to 4.00
	Clay, pale grey, blocky, silty, firm to stiff, with indistinct lamination	to T.D. at 5.00

		Depth m
2B. Gas pipeline borehole 43A [c688 139] S.L.+72.1m OD		
	Topsoil	to 0.20
Alluvium	Clay, dark orange-brown and brown mottled, silty, soft to firm, paler and grey with depth	to 2.50
	Clay, pale brown, soft, silty, sandy, with fine to medium-grained gravel	to 3.00
	Sand, orange-brown, fine to coarse-grained, with much flint gravel and a little clay	to 4.00
West Walton Formation	Clay, dark grey, silty, micaceous, firm to stiff	to T.D. at 5.50

		Depth m
3. Gas pipeline borehole 44 [c681 132] S.L.+122.50m OD		
	Topsoil and sandy, slightly stony, clayey hillwash	to c2.80
Sand in Kimmeridge Clay	Clay, greyish green and brown mottled, sandy, very silty	to T.D. at 3.50

Depth m

4. Gas pipeline borehole 45
[c680 132] S.L.+122.20m OD

	Topsoil	to 0.25
Sand in Kimmeridge Clay	Sand, brown and orange-brown, fine-grained, silty	to 2.20
Kimmeridge Clay	Clay, grey and brown mottled, silty, firm to stiff	to T.D. at 3.00

Depth m

5. Gas pipeline borehole 46
[675 114] S.L.+81.30m OD

	Topsoil	to 0.20
Ampthill Clay	Clay, light brown, silty, sandy, with a little gravel	to 0.60
	Clay, grey and light brown mottled, silty, darker with depth, with gypsum and fossils	to T.D. at 3.50

Depth m

6. Gas pipeline borehole 47
[675 113] S.L.+81.05m OD

	Topsoil	to 0.20
Ampthill Clay	Clay, light brown, silty, sandy,	to 0.60
	Clay, grey and brown mottled, silty, with a little gypsum; darker with depth with yellow mottling and bands of brown, silty, sandy, shelly clay	to T.D. at 3.50

Depth m

7A. Gas pipeline valve house borehole 1
[c675 107] S.L.+76.00m OD

	Made ground	to 0.90
Ampthill Clay	Clay, pale grey and light brown mottled, shelly, firm to stiff, with gypsum	to 3.00
	Clay, greenish grey and light brown mottled, shelly and laminated	to T.D. at 5.40

		Depth m
7E.	**Gas pipeline borehole 48** [c675 107] S.L.+74.70m OD	
	Topsoil	to 0.20
Ampthill Clay	Clay, brown, silty, sandy, stiff	to 0.75
	Clay, dark grey and greenish grey, silty, firm to stiff, laminated and blocky, shelly and with gypsum	to T.D. at 3.50

		Depth m
8.	**Gas pipeline borehole 49** [c675 106] S.L.+76.35m OD	
	Topsoil	to 0.20
Ampthill Clay	Clay, brown, silty, sandy, stiff	to 0.75
	Clay, greenish grey and brown mottled, silty, shelly with depth and with gypsum; laminated and blocky	to T.D. at 3.50

		Depth m
9.	**Coldharbour Farm** [6630 1483] S.L.c+114m OD	
	Clay with sand bed and ?ironstone	to T.D. at 13.1

		Depth m
10.	**B.G.S. Brill No.1** [6570 1412] S.L.+184.65m OD	
	Topsoil, brown, sandy, with ironstone fragments	to 0.50
Whitchurch Sand Formation	Sand, fine-grained, mid ochreous brown, with weak bedding increasingly apparent downwards; well-sorted predominantly quartz grains and ironstone debris; sandstone pebbles common below 1.3	to c1.40
	Sand, buff, fine-grained, weakly bedded, with small sandstone pebbles; becoming predominantly pale orange-brown and better bedded below 1.8	to 2.00
	Sand, pale orange-brown, fine-grained, very weakly bedded, with a few derived ironstone fragments and buff clay wisps	to c2.55
	Sand, buff with grey mottling in parts, fine-grained, coarser in parts, with	

10. cont.

	Depth m
orange-brown ferruginous layers and pale grey clay wisps; ?burrow at 2.85; 7cm ironstone nodule at 2.95	to 2.95
Sand, pale buff, very fine to coarse-grained	to 2.97
Sand, pale to mid orange-brown, medium and fine-grained, with a few buff clay wisps	to 2.99
Clay, pale brownish grey, interbedded with fine-grained orange-brown sand	to c3.20
Sand, pale orange-brown and buff, fine to medium-grained, with buff clay wisps and layers	to 3.41
Silt, ochreous, with dark purplish, sandy ironstone layers	to 3.48
Sand, buff, fine-grained, with a few buff clay wisps; sharp change to pale brown at 3.73	to 3.92
Ironstone, dark purplish brown and ochreous, sandy	to 4.01
CORE LOSS	to 5.10
Siltstone, buff to pale orange brown, interbedded with fine-grained sand	to 5.30
5.30-6.15 CORE LOSS OF 0.50m	
CORE RECOVERED:	
Sand, pale brown with buff mottles, medium to fine-grained 0.35	to 6.15
Sand, pale grey, very fine-grained and finely laminated	to 6.35
Ironstone, dark purplish brown and ochreous mottled	seen to 6.40
CORE LOSS	to 6.96
Sand, pale buff, fine-grained, parallel and cross-bedded, with a few silty laminae	seen to 7.92
CORE LOSS	to 9.44
Sandstone, buff, fine-grained, with a few burrows, pebbles and ironstone fragments; interbedded with very fine-grained sand	

10. cont.

	Depth m
and silt in lower part	seen to 9.62
CORE LOSS	to 9.80
Siltstone, pale orange-brown and brown mottled, sandy	to 9.83
Sandstone, very pale grey, very fine-grained, with orange-brown mottling in parts and a few burrows	to 10.27
Mudstone, pale grey wth orange-brown mottling and laminae, very silty	to 10.38
Sandstone, pale grey and pale orange-brown mottled, very fine-grained, silty	seen to 10.49
CORE LOSS	to 10.75
Mudstone, pale khaki with grey and orange-brown mottling, sandy patches and common shear surfaces	to 11.03
Sandstone, orange-brown, ochreous and khaki mottled, very fine-grained and well laminated, with silt and mud laminae and a little ironstone; load cast at base	to 11.38
Mudstone, pale grey and khaki mottled, finely laminated, with ochreous and sandy layers and iron staining	to 11.74
Sandstone, orange-brown, fine-grained	seen to 11.76
CORE LOSS	to 11.91
Sandstone, buff to pale orange brown, fine-grained, ferruginous and cross-bedded in parts	to 12.26
Mudstone, pale grey and pale khaki-brown mottled, with sheared surfaces, plant debris and common iron staining	to c12.60
Mudstone, ochreous with iron staining, silty	to c13.4
CORE LOSS	to 13.69
Sand, pale brown, fine to medium-grained, with clay pockets, base estimated from gamma log	to c14.7

10. cont.

		Depth m
Purbeck Beds	CORE LOSS	to 15.24
	Clay, greenish grey, with orange-brown mottling and sandy fissures, intensively sheared; passing down into sandy silty clay with reduced ferruginous mottling, becoming bluish grey below 15.5, with scattered carbonaceous material; increasingly indurated below 15.7	to 15.97
	Marl, mid grey, with much off-white shell detritus and plant fragments; less silty below 16.4	to c16.5
Portland Beds	Limestone, pale khaki to fawn, with iron staining and shell debris; some core loss	to 16.73
	Limestone, buff to pale grey, with iron staining, shell debris and scattered ooliths	seen to 16.93
	CORE LOSS	to 17.10
	Marl, buff, khaki and pale grey, with iron staining and shell debris	to 17.30
	Limestone, buff to pale grey, with iron staining and scattered bivalves; passing to	to c17.60
	Marl, pale buff with iron staining, silty, with shell debris rich layers and brown muddy wisps	seen to 18.30
	CORE LOSS	to 19.80
	Sandstone, brown to orange-brown, fine-grained, with scattered coarser grains; weakly bedded; moderately well cemented; containing a few ferruginous clayey lenses with plant debris	to 19.95
	Sandstone, pale greenish brown, fine-grained, with scattered coarser grains; weakly bedded to 20.08m; well bedded below; browner downwards	seen to 20.29
	CORE LOSS	to 21.04
	Sandstone, pale to medium greenish brown, orange-brown and brown mottled and banded, fine-grained, with scattered glauconite grains and shell debris; moderately well cemented; with fine lamination and	

10. cont. Depth m

carbonaceous streaks below 20.35 seen to 21.49

21.49-23.01 CORE LOSS c1m

CORE RECOVERED:
Sandstone, green with pale pinkish grey and rusty patches, fine-grained, with a few coarser grains; weakly bedded; ammonite casts and a couple of small quartzite pebbles c0.5 to 23.01

Limestone, pale grey, sandy, glauconitic, shelly seen to 23.12

23.12-24.89 CORE LOSS 0.83

CORE RECOVERED:
Limestone, pale to flesh grey, medium to fine-grained with some coarser grains, and a black lydite pebble 0.15

Kimmeridge Clay Formation: including sand beds Upper Kimmeridge Clay

Sand, pale to mid buff, very fine-grained, very slightly micaceous, with silty pockets from 24.18 0.20

Siltstone, mid grey, argillaceous and sandy, with scattered black rounded lydite pebbles 0.30

Sand, mid grey, very fine-grained, with paler grey wisps and laminae, rare lydite pebbles near top and carbonaceous fragments below; finely bioturbated throughout 0.29
seen to 24.89

24.89-26.39 CORE LOSS 0.81 to 25.70

CORE RECOVERED:
Sand, olive brown, finely silty, with pale grey burrows and scattered carbonaceous debris; passes into 0.20

Silt, mid brownish grey, finely sandy 0.06

Sand, mid brownish grey, very silty, bioturbated, with scattered carbonaceous and shell debris 0.43
seen to 26.39

26.39-26.89 CORE LOSS 0.14

CORE RECOVERED:
Sand, mid brownish grey, bioturbated, very

10. cont.

Depth m

silty, shelly with darker laminae 0.36
seen to 26.89

26.89-28.00 CORE LOSS 0.27

CORE RECOVERED:
Sand, mid brownish grey, very silty, bioturbated, with darker laminae, shell and plant fragments 0.84
seen to 28.00

28.00- 28.73 CORE LOSS 0.06

CORE RECOVERED:
Sand, mid grey, extremely fine-grained, bioturbated, with shell debris 0.54

Silt, mid grey, coarse-grained, with sand bands, scattered shell debris and pyritic burrows 0.13
seen to 28.73

28.73-29.90 CORE LOSS 0.06

CORE RECOVERED:
Sand, mid grey, very fine-grained, silty, bioturbated, muddy, with scattered shell debris 0.96

Silt, mid grey, very finely sandy, muddy, with scattered shell debris 0.05

Sand, mid grey, very fine-grained, silty, bioturbated, muddy 0.10
to 29.90

Silt, mid grey, very finely sandy, muddy, with some shell debris, pyritic trails, sandy wisps at 31.20 and scattered ammonites; passing to to 33.80

Mudstone, mid grey, very silty, with some bivalve and ammonite shell debris and rare pyritic trails; passing to to 36.65

Siltstone, mid grey, very silty, with some shell debris; increasingly finely sandy downwards to 37.60

Mudstone, mid grey, silty, with scattered shell debris, some pyritic; passing to to 39.60

Siltstone, mid grey, muddy, with sand-filled burrows, scattered shell debris and bivalves, passing to to 39.75

10. cont. Depth m

Mudstone, mid grey, silty, with scattered bivalves to 40.00

Siltstone, mid grey, muddy, with sand-filled burrows, scattered shell debris and large bivalves; interburrowed to 40.15

Mudstone, mid to pale grey, with darker burrows, shelly in top to 40.35

Siltstone, mid grey, muddy, burrowed to 40.48

Mudstone, pale grey, smooth seen to 40.59

CORE LOSS to 40.70

Mudstone, pale grey, with pyritic trails, burrows and a few bivalves; passing to to 41.25

Siltstone, pale to mid greenish grey, with glauconitic wisps; bioturbated to 41.33

Mudstone, mid grey, with abundant bivalves and much shell debris seen to 42.51

CORE LOSS to 43.21

Mudstone, mid grey, smooth, with shell debris; increasingly silty downwards to 43.76

Sand, mid to pale grey, fine-grained, with rare shells seen to 43.86

43.86-44.78 CORE LOSS 0.31

CORE RECOVERED:
Sandstone, pale grey, fine-grained, bioturbated, with clay wisps, rare shells and a phosphate pebble at 44.4 0.51
seen to 44.78

Sandstone, pale grey, fine-grained, bioturbated, with clay wisps, common shells and pebbles at base seen to 45.11

CORE LOSS to 45.62

Silt, mid grey to khaki, sandy and muddy, ?bioturbated to 46.38

Mudstone, pale to mid grey, silty, bioturbated; increasingly silty down-wards, with very few shells, passing to to 50.75

Silt, mid greenish grey, very muddy,

10. cont.		Depth m
	finely glauconitic; bioturbated; coarser downwards; rare shell fragments	to 51.12
	Sandstone, mid greenish grey, very fine-grained, with much fine shell debris	to 52.69
	Mudstone, pale grey, smooth, with a few pyritic trails; passing to	to 53.20
	Siltstone, pale grey, muddy, bioturbated bioturbated	to 53.30
	Sand, mid greenish grey, very fine-grained and laminated, bioturbated	to 54.04
	Mudstone, pale grey, with dark silt-filled burrows at top; hard and blocky downwards with much fine shell debris; ammonites at 55m; shell bed at 56.68; chondrites mottling below; burrowed layer at 57.65; very shelly with interburrowing at base base	to 58.00
Lower Kimmeridge Clay	Mudstone, grey with olive tint, very shelly layers, fissile, large ammonites from 58.5	to 59.00
	Mudstone, mid grey, with many bivalves	to 59.29
	Mudstone, mid olive grey, fissile, shelly shelly	to 59.32
	Mudstone, mid grey, with scattered shell with olive tinted from 59.82	to 60.27
	Siltstone, pale greenish grey, muddy, with pebbles at 60.38	to 60.50
	Mudstone, mid grey, shelly, olive tinted from 60.75-60.79, and 60.89-61.25 seen	to 61.47
	CORE LOSS	to 61.56
	Mudstone, mid grey, increasingly shelly down, burrowed, brownish from 62.10, fissile from 62.87	to 63.00
	Mudstone, mid grey, shells increase down, with interburrowed horizons	to 63.17
	Mudstone, slightly olive brown, silty, with much shell debris seen	to 63.67
	CORE LOSS	to 63.73

10. cont.

	Depth m
Mudstone, slightly olive mid grey, very shelly	to 63.75
Mudstone, pale slightly greenish grey; large bivalves and ammonites at 63.90; darker below; ammonites from 64.00	to 64.62
Mudstone, dark grey, fissile, with much shell debris, ammonites and bivalves	to 65.80
Mudstone, mid greenish grey, with rare shells; silty pyritic bed at 66.00; passing to	to 66.16
Mudstone, slightly olive mid grey, silty with distinct laminae and common small ammonites	to 66.61
Mudstone, mid greenish grey, with scattered shells and a 5cm brown, silty, septarian nodule at 66.98; some chondrites mottling; bituminous below 67.55	to 67.67
Mudstone, mid grey, with scattered shells increasing down; paler and calcareous below 68.28; large ammonites at 68.42; silty below 68.50; marly and slightly darker below 68.63	seen to 69.01
CORE LOSS	to 69.40
Mudstone, mid grey, very shelly, interburrowed base	to 69.65
Mudstone, slightly olive grey, increasingly shelly down, slightly bituminous below 69.90	to 70.30
Mudstone, greenish grey, very shelly	to 70.47
Mudstone, slightly olive grey, passing to greenish grey very shelly mudstone below 70.60, with an interburrowed horizon at 71.10; less shelly below	seen to 72.00
CORE LOSS	to 72.73
Mudstone, very pale greenish grey, smooth, with scattered bivalves; some burrowing; ammonites from 75.25	to 76.00
Mudstone, mid grey, poorly fossiliferous, very shelly below 76.60	to 76.69

10. cont.

		Depth m
	Mudstone, pale grey, with scattered fossils; darker below 77.05, increasingly shelly; chondrites mottled and unfossiliferous below 77.14, ammonites at 79.35 and 79.51, silty and more shelly below, black pebbles from 79.52, abrupt interburrowed base	to 79.60
Ampthill Clay Formation	Mudstone, pale grey, silty, smooth, blocky, calcareous, with silty burrows rare shell debris and some pyrite trails and grains	to 80.09
	Marl, pale grey, muddy, passing to pale grey mudstone	to 80.39
	Cementstone, pale grey, very hard	to 80.60
	Mudstone, pale grey, hard, calcareous but decreasingly so down, with pyritic trails; very calcareous at base; passing to:	to 81.31
	Cementstone, pale grey, very hard, shelly; passing to	to 81.59
	Mudstone, pale grey, calcareous, fairly shelly, with chondrites; darker and more silty down	to c82.25
	Mudstone, mid grey, with scattered bivalves	seen to 82.55
	CORE LOSS	to 82.60
	Mudstone, mid grey, smooth, mottled, with scattered fossils	to 83.13
	Mudstone, slightly olive mid grey, with much fine and some large shell debris	to 83.19
	Mudstone, medium to pale grey, with much shell debris, calcareous below 83.39, interburrowed from 84.25 to 84.45, chondrites from 85.80	to 86.15
	Mudstone, pale grey, smooth, with pyrite trails and patches, shelly at 86.25	to 86.27
	Mudstone, mid to pale grey, smooth, with pyrite trails and scattered shells; 2cm serpulite bed at base	to 87.60
	Mudstone, slightly greenish grey, with much fine shell debris and some larger	

10. cont.

	Depth m
fossils; slightly darker and less shelly from 88.42	seen to 88.65
CORE LOSS	to 89.29
Mudstone, dark grey, smooth, with some phosphatic nodules; darker and carbonaceous below 89.70; burrowed, serpulids at 90.17 and ammonite at 90.20	to 90.35
Mudstone, slightly greenish grey, with a few shells, more shelly from 90.50	to 90.80
Mudstone, greenish grey, smooth	seen to 91.00
CORE LOSS	to 91.36
Mudstone, mid grey, with scattered fine shell debris and some larger shells; much shell debris at 91.80; smooth and with chondrites below; pyritic burrows at 92.30; ammonites at 92.25 and 92.42; interburrowed horizons at 92.61, 93.08 and 93.14; much shell debris below 92.75; smooth and barren below 93.14	seen to 93.64
CORE LOSS	to 96.82
Mudstone, mid greenish grey, with some fine shell debris	seen to 97.12
CORE LOSS	to 97.30
Mudstone, mid grey, with scattered shell debris; darker with plant debris from 97.80 to shell bed at 98.02; mid grey below, with pyrite trails and patches and more shells and shell debris; increasingly calcareous downwards	to 99.53
Mudstone, pale grey, calcareous, silty, with common shells and shell debris; bioturbated; pyrite trails below 99.62	to 99.85
Siltstone, pale grey, calcareous, with a few pyritic trails, darker muddy partings and shell debris, passing to	to 100.00
Mudstone, pale grey, calcareous, silty, with common shells and shell debris, pyrite trails, darker fissile partings, and chondrites mottling, passing to	to 100.83

10. cont.

		Depth m
	Siltstone, pale grey, calcareous, with a few pyritic trails and darker muddy partings; bioturbated	to 100.89
	Mudstone, pale grey, very silty, with a few pyritic trails and smears and some shell and plant debris; intensely bioturbated with darker muddy partings; less silty below 101.08, with some siltier layers; darker below 101.45; a few shear surfaces; paler, more silty and calcareous below 101.50; intensely bioturbated in basal 0.10; passing to	to 101.86
Cumnor Formation: Oakley Member	Siltstone, pale grey, hard, very calcareous, bioturbated, with pyritic trails; passing to:	to 101.95
	Limestone, pale grey, silty, hard, more argillaceous below 102.15, with pyritic trails	to 102.19
	Mudstone, pale grey, calcareous, silty, with a few shells and much shell debris, pyrite trails and muddy fissile partings; bioturbated	to 102.31
	Limestone, pale grey, silty, hard, with scattered bivalves and shell debris	to 102.41
	Siltstone, pale grey, muddy, calcareous, with some fine shell debris and pyritic trails; bioturbated; ammonite at 102.56, a few Nanogyra	to 102.58
	Marl, pale grey, silty, with abundant ferruginous ooliths, common Nanogyra and other shell debris; passing to:	to 102.80
	Mudstone, mid grey, silty, calcareous, with ferruginous ooliths, common Nanogyra and pyrite trails, some paler burrow mottling, and abundant shell debris from 102.93; ooliths absent below; darker and less silty below 103.24; echinoid spine at 103.28; abrupt inclined base	to 103.29
	Limestone, pale grey, silty, muddy, with common ferruginous ooliths and a few small pisoliths, scattered shells and shell debris, common Nanogyra; bioturbated; muddy to base; passing to:	to 103.60

10. cont.

		Depth m
	Marl, pale to medium grey, silty, muddy, with common Nanogyra; passing to:	to 103.75
	Mudstone, mid grey, silty, calcareous, with a few ferruginous ooliths, common Nanogyra and pyrite trails; some paler burrow mottling; scattered shell debris	to 103.95
	Limestone, pale grey, silty, muddy, with common ferruginous ooliths, a few small pisoliths, common Nanogyra, and a few small siliceous pebbles; darker and more muddy in basal 0.05; passing to:	to 104.35
	Marl, pale to medium grey, silty, with common Nanogyra and ferruginous ooliths, a few siliceous pebbles, pyritic trails, burrows up to 1cm wide and scattered shell debris; very oolitic at 104.79	to 104.80
	Mudstone, pale grey, calcareous, silty, with common ferruginous ooliths, Nanogyra, shear surfaces and burrow mottling and faint chondritic mottling below 104.90	to 104.93
	Marl, pale and mid grey mottled, silty, with common Nanogyra and ferruginous ooliths, burrow mottling and some other bivalves; more muddy from 105.08, with common burrows, scattered pisoliths and oncoliths and small siliceous pebbles; harder and more calcareous below 105.50; passing to:	to 105.55
	Limestone, pale to mid grey, muddy, with a few ooliths and burrow mottles; passing:	to 105.80
	Marl, pale to mid grey, silty, pyritic, with scattered ooliths and shell debris, carbonaceous fragments, a few Nanogyra and mud-filled burrows; shell debris and Nanogyra more common from 105.90; sandy with fine shell debris to passage base:	to 106.06
Arngrove Spiculite Member	Sandstone, pale to mid grey, fine-grained, muddy and silty, with fine shell debris, glauconite grains, pyrite and dark and pale grey mud-filled burrows; very calcareous silty matrix becoming well-bedded below 106.10; fewer quartz grains downwards; scattered shells and plant debris;	

10. cont.		Depth m
	shelly layer at 106.51	seen to 106.52
	CORE LOSS	to 106.60
	Sandstone, pale to mid grey, fine-grained, muddy and silty, with fine shell debris, common pyrite trails and grains, and a few ooliths; phosphate concretions from 106.70 to 106.75; increasingly dark with depth; passing to:	to 107.03
	Mudstone, mid to dark grey, silty, foram-rich, calcareous, with ?sponge spicules at 107.06 and some shell debris, bivalves and pyritic trails	to 107.08
	Siltstone, pale to mid grey, muddy, bioturbated, calcareous, with fine shell debris, forams, spicules, plant fragments, ammonites and bivalves	to 107.32
	Mudstone, mid grey, silty, calcareous, with paler burrow mottling, common plant and shell debris, forams and spicules	to 107.44
	Siltstone, pale to mid grey, muddy, bioturbated, calcareous, with fine shell debris; passing to:	to 107.48
	Mudstone, mid to dark grey, silty, pyritic, with paler burrow mottling; darker below 107.60; spicules rare	to 107.70
West Walton Formation	Mudstone, mid grey, silty, pyritic, with fine shell debris, forams, and dark grey mud-filled burrows up to 8mm wide; large shell fragments more common below 107.85; scattered plant debris, paler, more silty and calcareous below 107.90	to 108.04
	Limestone, pale and mid grey mottled, silty, muddy, with scattered forams and fine shell and plant fragments; phosphate nodules at 108.07; passing to:	to 108.25
	Siltstone, mid grey, calcareous, with paler and darker grey burrow mottling, scattered forams, shell and plant debris and pyritic trails; shelly base	to 108.40
	Mudstone, pale grey, silty, calcareous, with burrow mottling, scattered forams, shell and plant debris and pyritic trails; passing to:	to 108.42

10. cont.

	Depth m
Siltstone, pale grey, calcareous, hard, with burrows, shell debris rich pockets, scattered bivalves and ammonites	to 108.75
Mudstone, dark to mid grey, silty, with common shells and shell debris, scattered burrow mottling, plant debris and pyritic trails	seen to 109.45
CORE LOSS (see below)	
Mudstone, mid grey, silty, calcareous, with shells and shell debris, scattered plant fragments, more silty layers and burrows, and mud-filled burrows; shell material decreases downwards	0.49
Mudstone, pale grey, silty, bioturbated, with scattered shell debris	0.25
CORE LOSS (total 1.26m)	to 111.46
Mudstone, pale grey, silty, calcareous, with scattered shell debris and shells, carbonaceous specks and small pyritic trails; bioturbated; more silty from 111.60 to 111.70; mud-filled burrows	to 111.82
Mudstone, mid grey, silty, calcareous, with scattered shells and shell debris and pyritic trails; bioturbated; non-sequence at 112.00; paler below with darker mud-filled burrows; non-sequence at 112.20 and at base	to 112.33
Mudstone, mid grey, silty, calcareous, with abundant shells and shell debris and pyritic trails; non-sequence at 112.45; bioturbated; paler below 112.70; non-sequence at 112.78; less shelly below; some ammonites; shells increasing down; more silty from 112.90; non-sequence at 113.20; darker below, increasingly silty, paler and shell-detrital downwards to 113.30; non-sequence at 113.44; dark grey below, increasingly silty and shell-detrital downwards; very bioturbated below 113.60; ammonites near base	to 113.68
Siltstone, mid to dark grey, calcareous, muddy, bioturbated, with common fine shell and carbonaceous debris, passing:	to 113.80

10. cont. Depth m

Mudstone, mid grey, silty, calcareous, with common shells and shell debris; bioturbated; darker and more silty below 114.24; mid grey and silty below 114.37; non-sequence at 114.40; pale to mid grey below; a few pyrite trails; ammonites common from 114.57; abrupt base to 114.80

Mudstone, dark grey, slightly silty, calcareous, with shells and shell debris; burrowed; very silty from 114.95; hard and very calcareous below 115.00; ammonite and non-sequence at 115.08; some pyrite and carbonaceous material below; non-sequence at 115.24; mid grey below; pale from 115.45; common pyritic trails from 115.88; non-sequence at 116.09; mid grey below; much bioturbation; paler below 116.25; more fossiliferous from 116.45; passing to: to 116.80

Siltstone, mid grey, muddy, calcareous, heavily bioturbated, pyritic, with shells and shell debris to 116.88

Mudstone, mid grey, silty, with shells and shell debris and much bioturbation; very fossiliferous from 117.20; very silty below 117.60 to non-sequence at 117.74; calcareous below; heavily bioturbated and increasingly silty to non-sequence at 118.00; paler below seen to 118.14

CORE LOSS to 118.33

Mudstone, pale grey, silty, calcareous, bioturbated, with a few pyritic trails, a few shells and much shell debris; more silty below 118.50 to non-sequence at 118.83; mid grey below; common bioturbation; serpulid limestone nodule at 118.95; passing to: to 118.95

Siltstone, pale to mid grey, calcareous, hard, heavily bioturbated, muddy, finely pyritic, with a little shell debris to 119.00

Mudstone, pale to mid grey, very silty, calcareous, heavily bioturbated, with pyritic trails, fine carbonaceous debris and some shell debris; more silty below 119.40; serpulid limestone and pyrite nodules for 8cm to 119.74; sharp base to 119.75

10. cont. Depth m

Mudstone, pale grey, calcareous, silty, with pyritised burrows and trails, common shell fragments and mud-filled burrows; mid grey and more silty from 120.20; much carbonaceous debris below to base to 120.45

Siltstone, mid grey, muddy, calcareous, with pyritic trails, fine carbonaceous and shell debris; bioturbated; passing: to 120.70

Mudstone, mid grey, silty, with bioturbation, pyritic trails, shells and shell debris; siltier downwards; carbonaceous debris, less bioturbation and shells below 121.45; passing below 121.97 to darker mudstone with common fine carbonaceous and shell debris and bioturbation; mid grey below 122.01; with bioturbation; harder and very silty from 122.44; less silty and more shell debris below 122.88; very silty from 123.00 to non-sequence at base to 123.09

Oxford Clay Formation: Upper Oxford Clay Member

Mudstone, mid grey, silty, calcareous, with common carbonaceous debris at top, mud-filled burrows, and fossils, some pyritised; burrow mottling increasing downwards; paler below 123.51; more silty below 123.65; shell debris decreasing below; passing into: to 124.55

Siltstone, pale to mid grey, muddy, calcareous, bioturbated and shelly, with a few pyritic trails; passing to: to 124.75

Mudstone, pale to mid grey, very silty, calcareous, bioturbated, pyritic, with a little shell debris; less silty below 125.00; very silty below 125.25 with shell debris rich pockets seen to 125.80

CORE LOSS to c126.10

Mudstone, pale grey, silty, calcareous, with a few pyrite trails and shells and a little shell debris to 126.82

Siltstone, pale grey, muddy, calcareous, with a few bivalves and ammonites; passing to: to 127.10

Mudstone, pale grey, silty, calcareous, with scattered shell debris, some pyritised; bioturbated below 127.50; very

10. cont.

		Depth m
	silty below 127.60; mid grey from 127.95; less silty below 128.00; pale grey below 128.18, with vague burrow mottling, and a few pyritised ammonites and trails seen to T.D. at 128.70	

11. B.G.S. Brill No.2
[6606 1403] S.L. c+165m OD

		Depth m
	Topsoil, dark brown, sandy, stony	to 0.14
Whitchurch Sand Formation	Sand, pale brown, medium- to coarse-grained, quartzose, with a few ironstone and ?chert grains; paler and mottled with grey lower; faint bedding from 0.65; pale grey clayey wisps; ferruginous bands at 1.42 and 1.48; sharp base	to 1.54
Purbeck Beds	Clay, pale grey and orange mottled, with plant debris and a little sand; khaki and silty from 2.15 to 2.39; very pale grey below; orange-brown ferruginous pockets; carbonaceous debris very common below c3.5; finely sandy below	to 5.00
	Clay, olive green, with rusty streaks	to 5.05
	Marl, cream, sandy	to 5.06
	Clay, pale grey, with ferruginous streaks	to 5.07
	Marl, cream, sandy, pale grey and orange brown streaked in lower part	to 5.14
	Clay, pale grey, with ferruginous streaks, gritty marly pockets and carbonaceous material	to 5.23
	Marl, pale buff, sandy, less sandy with depth; passing into:	to c5.4
	Clay, pale grey to buff, with thin whitish marly layers; darker below; large cream marly pocket at base	to c5.8
	Marl, off-white to cream, fine-grained,	to T.D. at 5.95

		Depth m
12.	**B.G.S. Brill No.3** [6629 1402] S.L. c+146m OD	
	Topsoil, brown stony sandy clay	to 0.13
Purbeck Beds	Clay, buff, marly, rare sand grains, with a few shell fragments	to 0.28
	Marl, pale buff to off-white, gritty and shell fragmental, with a thin pale grey clay band	to 0.49
	Sand, pale greenish grey, very fine-grained, clayey	to c0.50
	Clay, pale to mid greenish grey and khaki mottled, slightly sandy, with some white shell fragments and ?rootlets; wispy lamination from 0.65; cream marly nodule at 0.77; browner below to base	to 0.84
	Marl, off-white to cream, gritty and shell fragmental	to 1.05
	1.05 to 2.00 CORE LOSS c0.47	
	CORE RECOVERED: Limestone, pale grey and orange-brown mottled, semi-porcellanous,	c0.14
	Sand, cream, marly, medium-grained	0.03
	Marl, cream, with a large off-white calcareous nodule	0.01
	Sand, khaki, fine-grained, increasingly clayey downwards	0.09
	Clay, pale grey and khaki-brown wispy, finely sandy, shell debris increasing downwards	0.06
	Marl, cream, gritty, with a lignite fragment	0.06
	Marl, cream to pale khaki, with an oyster	0.09 to 2.00
	2.00 to 3.05 CORE LOSS c0.35	
	CORE RECOVERED: Marl, cream, silt grade, with some shells and ?rootlets; rare large sand grains; paler to base	0.48 to c2.7

12. cont.

		Depth m
Portland Beds	Clay, mid brown, finely very sandy, with fine shell debris	0.03
	Sand, pale khaki, fine- to medium-grained, with quartz and glauconite grains; increasingly calcareous with depth, passing to pale buff sandy marl at base	0.19 to 3.05
	Sand, khaki, shelly, marly, and grey and khaki mottled marl	to T.D. at 3.20

13. **B.G.S. Brill Church**
[6552 1392] S.L. c+186m OD

		Depth m
	Topsoil, brown, sandy, passing to:	
Whitchurch Sand Formation	Sand, ochreous brown, silty with ironstone fragments	to 1.20
	Sand, orange-brown, clayey	to 1.54
	Ironstone, sandy, very dark rusty brown	to 1.62
	Sand, orange and yellow, with pale grey pockets	to 2.20
	Clay, chocolate brown	to 2.23
	Sand, yellow and grey finely laminated, coarse-grained, with some plant debris	to 2.71
	Clay, orange to dark brown	to 2.79
	Sand, pale orange, interlaminated with pale grey burrowed clay	to 3.35
	Clay, very pale grey	to 3.48
	Sand, pale orange and grey laminated, coarse-grained	to 3.53
	Clay, very pale grey, and orange sand, interlaminated	to 3.63
	Sand, dark orange, medium- to coarse-grained, passing to black, grey and orange laminated sand	to 3.86
	Clay, very pale grey	to 3.87
	Sand, orange and pale orange interlaminated, slightly clayey	to 4.09

13. cont.

		Depth m
	Clay, dove grey, finely laminated	to 4.13
	Sand, pale grey, medium-grained, with wispy orange laminae dying out downwards	to 4.88
	Clay, very pale grey, with black basal lamina	to 4.90
	Sand, very pale grey, with orange patches and laminae, black laminae and ?roots	to T.D. at 5.86

14. **B.G.S. Leap Hill No.1**
[6661 1240] S.L. c+120m OD

		Depth m
	Topsoil, brown, very sandy, with a few black pebbles	to 0.21
Upper Kimmeridge Clay	Clay, very sandy, passing down to slightly sandy khaki and orange brown wispy-bedded clay, with a few quartz and lydite pebbles to c0.6; passing into smooth, mid grey and orange-brown mottled clay	to 1.20
	Clay, mid grey and orange-brown mottled, finely sandy; increasingly grey downwards and moderately silty in parts; passing below 2.15 into smooth clay, with a glauconitic sand pocket, shell fragments and a few orange sandy wisps; selenitic; increasingly dark below 3.54	to T.D. at 5.00

15. **B.G.S. Leap Hill No.2**
[6667 1237] S.L. c+116m OD

		Depth m
	Topsoil, dark brown sandy clay	to 0.14
Head/Sand in Upper Kimmeridge Clay	Clay, grey and orange-brown wispily laminated, very sandy	to 1.20
	Clay, grey and orange-brown wispily laminated, very sandy and ferruginous; passing down into similar coloured wet clayey sand; sharp base	to c2.0
	Clay, mid grey and orange-brown wispy, finely sandy	to T.D. at 2.25

		Depth m
16.	**B.G.S. Ryman's Farm** [6600 1268] S.L. c+148m OD	
	Topsoil, brown sandy stony clay	to 0.40
Portland Beds	Clay, dun to khaki, very sandy, fine to medium-grained, with limonitic grains; 5mm dark brown sandy clay seam at base	to 1.41
Sand in Upper Kimmeridge Clay	Clay, pale grey and orangey brown wispy laminations, very sandy, fine to medium-grained; passing down into greyer clayey sand, with ferruginous nodule at 2.66; more distinct mottling below; fairly sharp base	to 3.23
	Clay, pale and mid grey wispily laminated, very sandy, fine- to medium-grained	to 3.52
	Clay, mid grey, moderately sandy and silty, sand fine-grained; passing down into darker sandy clay with a few orange and pale grey sandy wisps to 4.23; below is monotonous dark grey finely sandy silty clay	to T.D. at 5.00

		Depth m
18.	**Clarke's Field Close** [6561 1368] S.L. c+182m OD	
	Topsoil, dark brown silty sandy clay	to 0.2
	Made ground	to 0.7
Whitchurch Sand Formation	Sand, orange-brown, fine to medium-grained, with a few ironstone fragments and thin pale grey clay bands	to 1.90
	Clay, light grey and orange-brown, silty, with ironstone fragments and yellow silt partings; firmer with depth	to 4.15
	Sand, greyish brown and orange-brown mottled, silty, clayey, with light grey and orange clay partings; passing down into orangey yellow, fine to medium-grained sand	to T.D. at 5.00

		Depth m
26. Temple Street No.7		
[6553 1413] S.L. c+186m OD		
	Topsoil	to c0.4
Whitchurch Sand Formation	Sand, brown, fine-grained, silty, with ironstone	to 0.9
	Sand, very pale grey with yellow lenses	to T.D. at 2.0

		Depth m
29. Brae Hill Close No.2		
[6520 1386] S.L. c+178m OD		
	Made Ground	to 0.34
Hillwash	Loam with ironstone traces	to 0.51
Purbeck Beds	Clay, brown mottled grey, firm	to 0.92
	Clay, grey brown, stiff	to T.D. at 1.09

		Depth m
31. Brae Hill Close No.4		
[6526 1385] S.L. c+183m OD		
	Made Ground	to 0.15
Whitchurch Sand Formation	Loam with some ironstone lumps	to 0.50
	Loam, sandy with some ironstone lumps, becoming more sandy with depth and increasing in iron content	to T.D. at 1.22

APPENDIX 2

LOCALITIES

The classification abbreviations used below are as follows:

Oa	Oakley Member	Pl	Portland Beds
PlS	Portland Sand	PlSt	Portland Stone
WhS	Whitchurch Sand Formation		

		Thickness m
A.	The Walks, Brill. [6540 1424] Section exposed by landslip	
	Topsoil, stony, sandy	0.4
WhS	Sand, orange and brown, fine- to medium-grained, poorly-sorted, with 0.6m dark orange brown bedded ironstone at 2.0	2.6
B.	Dorton Hill Farm. [6806 1256] Section in farmyard	
	Topsoil, brown and orange brown, sandy	0.4
WhS	Ironstone, orange to dark purple, slightly sandy, showing signs of eastward cambering	0.4
	Clay, orange and dark green, with thin ironstone bed and race, irregular base	0.4
Pl	Sand, medium-grained, khaki	0-0.2
	Marl, cream to buff, iron-streaked, cemented in parts to fine-grained limestone	up to 0.5
C.	Dorton Hill Farm [6802 1255] Section exposed by slip	
Pl	Greenish-brown clay	c0.2
	Sand, ochreous and dark olive green, medium-grained, clayey, with ironstone nodules, race and 0.03m white fine-grained limestone band near top	0.2
	Brown sandy clay with ironstone	0.15
	Buff marl	c0.1
	Sand, medium-grained, clayey, yellow-brown, with orange and dark green pockets	0.4

D. Home Farm, Chilton [6876 1197]
Section behind barn, showing dip-and-fault

	Topsoil	up to 0.5
Head	Sand, orange brown to khaki mottled, fine- to medium-grained, well-sorted	c1.5
PlSt	Limestone, marly, and marl, off-white to cream, with some shell debris, iron staining, and khaki-orange shell-detrital sandy pods in parts	up to 1.0
PlS	Sand, khaki, fine- to medium-grained, loose, with a little rubbly sandy limestone	up to 2.5

Fault in middle of section, strikes N-S, throws down c1m to W
strata dip E, more steeply on eastern side of fault

E. Chilton [6873 1152]
Temporary excavation behind house

PlS	Limestone, sandy, and clayey sand, greenish-brown and orange, glauconitic, ammonites and bivalves	0.6

F. Chilton Grounds [6940 1146]
Section by barn

Pl	Limestone, greenish-grey, glauconitic, very rubbly, soft in parts, with serpulids	c0.3

G. Section in bank 600m ESE of Easington [6934 1012]

PlSt	Limestone, pale brownish-grey, finely oolitic, glauconitic and shell-detrital, roughly bedded	0.1
	Limestone, marly, very pale grey, very rubbly, with many bivalves and a large ammonite	0.45

H. Dorton Park Farm [6741 1441]
Ditch section

Alluvium	Clay, brown, silty, slightly sandy, with pebbles and fossil oyster debris	0.6-0.7
Oa	Clay, pale grey and ochreous mottled, calcareous, with numerous Nanogyra and race	up to 0.3

J. Section in abandoned stone pit 300m S of Manor Farm
[6512 1333]

PlSt	Oolite, cream, shelly, rubbly	0.5

K. Plantation near Ash Tree Cottages [6845 1082]

Pl Abundant rubbly limestone brash, greenish-grey and orange-brown, sandy, glauconitic, a few black pebbles, abundant large ammonites and bivalves

L. Ash Tree Cottages [6880 1082-6879 1078]
Ditch section

North end
WhS Clay, yellow-brown to pale brown, with rusty limonitic nodules increasingly dark southwards to:

South end
WhS Grey brown stony clay

M. Easington [6871 1034]

	Topsoil, clay, dark grey, stony	0.15-0.4
WhS	Clay, mid grey and brown mottled, silty, smooth	0.7

N. Easington [6860 1033]
Excavation for garage

	Topsoil and fill	0.35
PlS	Sand, grey, khaki and orange-brown mottled, fine- to medium-grained, passing down into sandy limestone, glauconitic, shell debris rich, especially in top, 0.1m well-cemented band at 0.3m, ammonites, bivalves and serpulids, passes down into finely sandy clay	1.20

P. Chilton [6890 1124]

	Topsoil and rubble	0.5
PlS	Limestone, greenish-grey to khaki, very rubbly, with pale orangish-brown ooids or rounded debris, very weathered in parts to stiff gritty sandy marl, shell fragments in lower part	0.6
	Sand, khaki, fine- to medium-grained	0.25

APPENDIX 3

PREVIOUSLY DESCRIBED LOCALITIES

Sections open previously around Brill were examined by Fitton (1836). Unfortunately they cannot be accurately located, but an indication is given of where they are thought to have been. The sections are summarised below. Fitton's original classification is given in braces.

A. BRILL.

A pit open in 1827. The note that the beds are inclined to the north- west suggests that the section is likely to have been on that side of the hill.

Whitchurch Sand {Lower Green-sand}.

1. Sand, yellow	c1.8m
2. Interbedded ferruginous sand and clay	4.6
3. Sand, black and grey alternating with white and ferruginous, with yellow ochre flakes	0.05
4. Fuller's Earth clay, green, yellow and red, with polished shear surfaces	0.15
5. Sand, firmer with depth	1.2
6. {Portland Stone} containing Trigoniae and other fossils	

As no intervening Purbeck strata are recorded but they are mapped all around Brill, it is thought that the section might be faulted or slipped, or is a composite of several exposures.

B. BRILL.

'A clay pit 20 feet below the road on the south-west of Brill, the beds declining to the west and south.' Probably at Manor Farm [6511 1367].

Whitchurch Sand {Lower Green-sand}

1. Sand; white at top, yellow and ferruginous below	1.8-2.1m
2. Gravel with coarse sand concretions	0.45
Purbeck	
3. Yellow ochre	0.53-0.56
4. Clay with ochre beds	c0.3
5. Clay, light bluish grey	seen to 1.5

A large whole tree preserved in lignite and pyrite was found about 1.8m below the base of this section, beneath which about another 3.7m of dark clay was proved by boring.

C. BRILL.

Another pit not far from B. (Possibly one 80m to the west [6502 1366])

Whitchurch Sand Formation

Sand, grey	c1.5m
Purbeck	
Clay, equivalent to bed 5 of B but darker and more	

	slaty, similar to bed 4 of A, with polished shear surfaces and interbedded with yellow ochre near base	1.37
6.	Yellow ochre, duller than bed 3 of B	c0.10
7.	Bed of irregular flattened ovoid masses of stratified grey and greenish grey shelly and lignitic clay	0.45
8.	Greenish matter, often stratified;-coarse Fuller's Earth	0.91
{Portland Stone}		
9.	Stone, whitish, rubbly, with Perna quadrata and Trigonia	0.38-0.45
10.	{Pitching Stone} a. calcareous sandstone	c0.23
	b. Fuller's Earth, yellowish green	0.15-0.20
	c. calcareous sandstone	0.18
11.	Clay, grey, bedded	0.15
12.	Limestone, bedded, with Perna	c0.76
13.	{White Limestone}	0.9-1.2

APPENDIX 4

PALAEONTOLOGICAL DETERMINATIONS by B.M. Cox.

Specimens AMB 323-328
[661 130]
70m on 360 from Parkpale Farm, Brill.

Glauconitic shelly limestone with bivalves including Protocardia dissimilis (J de C Sowerby) and trigoniid fragments, serpulids and ammonite whorl fragments presumed to be Glaucolithites (some encrusted with small oysters). A single lydite pebble is present.

Horizon: Glauconitic Beds (basal) or ?Upper Lydite Bed
Portlandian, Glaucolithus Zone.

Specimens AMB 329-330.
[659 122]
600m on 280 from Buttermilk Hall, Brill.

Glauconitic limestone with small oysters and other bivalve fragments and ammonite fragments (Glaucolithites?) with an encrusting fauna.

Horizon: Glauconitic Beds.

Specimens AMB 331-332.
[662 129]
50m on 170 from Parkpale Farm, Brill.

Cream-coloured, slightly glauconitic limestone with ?Camptonectes lamellosus (J Sowerby), Pleuromya sp. and a trigoniid internal mould.

Horizon: ?Glauconitic Beds.

Specimens AMB 333-334.
[6860 1033]
1250m on 183 from Chilton Church, Chilton.

Slightly glauconitic limestone with an ammonite whorl fragment (Glaucolithites?) with a poorly preserved encrusting fauna.

Horizon: ?Glauconitic Beds.

Specimens AMB 335-339.
[6845 1082]
800m on 197 from Chilton Church, Chilton.

Shelly, glauconitic limestone with lydite pebbles and Pleuromya?, trigoniids, oysters, serpulids, a gastropod and an ammonite (?Glaucolithites).

Horizon: Upper Lydite Bed
Portlandian, Glaucolithus Zone

Specimen AMB 340.
[6810 1093]
870m on 221 from Chilton Church, Chilton.

Worn nodule of shelly cementstone with poorly preserved impressions of a Nannocardioceras and Nanogyra virgula (Defrance).

Horizon: Lower Kimmeridge Clay (KC30 of Gallois and Cox, 1976)
Lower Kimmeridgian, Eudoxus Zone

Specimens AMB 341-344.
[6501 1255]
380m on 247 from Leatherslade Farm, Oakley.

Fragments of the oyster Deltoideum delta (Wm. Smith).

Horizon: Ampthill Clay Formation (although D. delta occurs in the lowest Kimmeridge Clay, the relative thickness of strata over which they can range in the Brill No.1 Borehole strongly suggests that loose specimens will be from the Ampthill Clay).

There is other material in the BGS collections from this area obtained or collected during previous work. Identifications of this can be seen in BGS files.

APPENDIX 5 By I.P. Wilkinson

CALCAREOUS MICROPALAEONTOLOGY OF THE 3.0-16.4m INTERVAL OF THE BRILL NO.1 BOREHOLE

Preparation: L Glew
Examination: I P Wilkinson

Introduction

Nine samples from the 3.0 to 16.4m interval of the Brill No.1 Borehole were examined for Foraminiferida and Ostracoda from a biostratigraphical and palaeoecological viewpoint, in order to determine the age of the deposit and whether it is Whitchurch Sand or Shotover Sands.

Sample details and fauna

Depth m	Fauna
3.0-3.1	Barren
10.27-10.38	Barren
10.75-10.85	Barren
12.26-12.40	Barren
15.35-15.55	Barren
15.55-15.63	Barren
15.63-15.70	Barren
16.0-16.1	Rhinocypris jurassica, Klieana alata, Macrodentina sp. (indeterminate fragments) Macrodentina rugulata, Lenticulina muensteri
16.4	Hechticythere serpentina, Rhinocypris jurassica, Klieana alata, (common) Paranotacythere rimosa, "Procytheropteron" cf. brodiei, Macrodentina rugulata (common), Lenticulina muensteri

Conclusions

The fauna at 16.4m is characteristic of the Lower "Purbeck". The characteristic Portlandian to Lower Purbeck species P. rimosa and H. serpentina, together with common K. alata and M. rugulata and rare R. jurassica, are consistent with the Quainton to Stair faunicycles of Anderson (i.e. "assemblage 1"). The absence of Anderson's "C-phase" ostracod species substantiates this age.

At 16.0-16.1m a similar fauna was recorded, although H. serpentina, P. rimosa and P. cf. brodiei were not found. This is consistent with the middle and upper part of the Lower Purbeck, particularly as "C-phase" species were not found.

The 15.70-3.0m interval was barren and biostratigraphical conclusions cannot be made.

The sands at the base of the examined part of the Brill No.1 Borehole cannot be assigned to the Shotover Sands, which are Hauterivian in age and stratigraphically too young. However the suggestion that the deposit may be Whitchurch Sand Formation cannot be wholly sub- stantiated. This latter was

generally considered to be at approximately the Upper/Middle Purbeck boundary and of earliest Cretaceous age (Casey and Bristow, 1964). The Ostracoda recovered from the Brill No.1 Borehole are of Jurassic age (i.e. Portlandian and basal "Purbeck") aspect and therefore stratigraphically older than would be expected. (This is consistent with the conclusions of Morter, 1984. A.J.M.B.).

Palaeoecologically the lowest sample examined has more "S-phase" species in it than at 16.0-16.1m, and the marine influence appears to be greater than in the succeeding sample. Chara oogonia were present in very small numbers at 16.4m, but in greater numbers at 16.0-16.1m at which level more brackish, estuarine conditions seem to be indicated. Water depths, particularly when the sample at 16.0-16.1m was deposited, were shallow, probably no more than 10 or 12m. No palaeoecological conclusions are possible for the 15.70-3.0 interval.

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