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INSTITUTE of HYDROLOGY

Hydrological implications of proposed mineral extraction and landfill on Burnham Beeches – a preliminary site investigation study.

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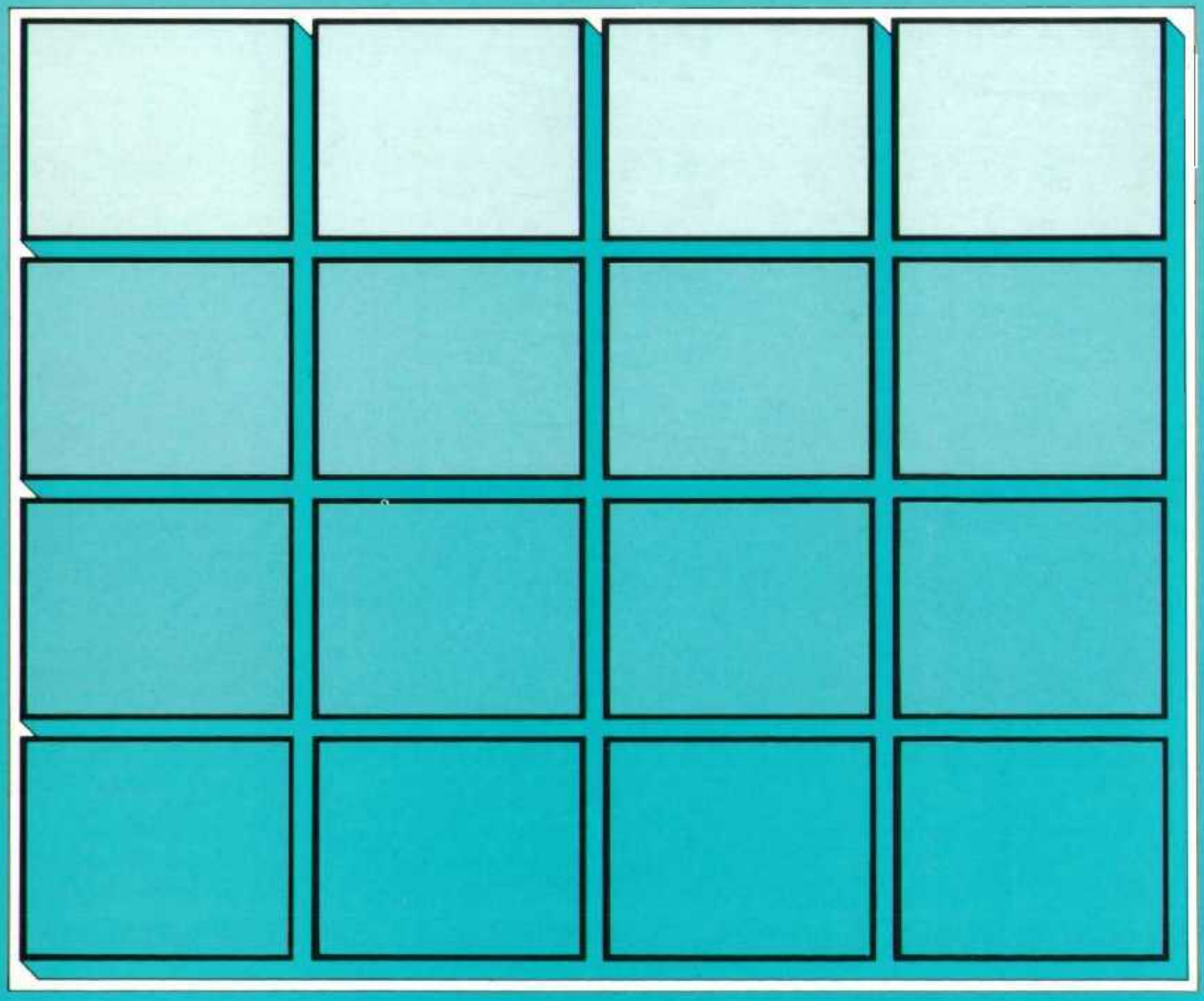

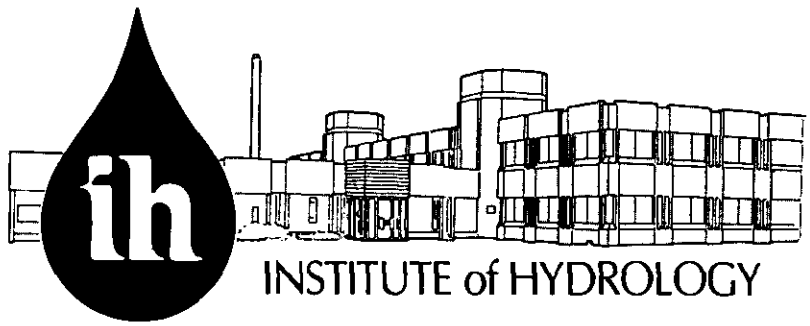

The **Institute of Hydrology** is a component establishment of the UK Natural Environment Research Council, grant-aided from Government by the Department of Education and Science. For over 20 years the Institute has been at the forefront of research exploration of hydrological systems within complete catchment areas and into the physical processes by which rain or snow is transformed into flow in rivers. Applied studies, undertaken both in the UK and overseas, ensures that research activities are closely related to practical needs and that newly developed methods and instruments are tested for a wide range of environmental conditions.

The Institute, based at Wallingford, employs 140 staff, some 100 of whom are graduates. Staff structure is multidisciplinary involving physicists, geographers, geologists, computer scientists, mathematicians, chemists, environmental scientists, soil scientists and botanists. Research departments include catchment research, remote sensing, instrumentation, data processing, mathematical modelling, hydrogeology, hydrochemistry, soil hydrology, evaporation flux studies, vegetation-atmospheric interactions, flood and low-flow predictions, catchment response and engineering hydrology.

The budget of the Institute comprises £4.5 million per year. About 50 percent relates to research programmes funded directly by the Natural Environment Research Council. Extensive commissioned research is also carried out on behalf of government departments (both UK and overseas), various international agencies, environmental organisations and private sector clients. The Institute is also responsible for nationally archived hydrological data and for publishing annually HYDROLOGICAL DATA: UNITED KINGDOM.

Hydrological implications of proposed gravel extraction on Burnham Beeches

Summary of advice given to the Corporation of The City of London by the Institute of Hydrology at Guildhall 13th March 1989 (14.30 - 16.00)

1. The results of our preliminary site investigation study undertaken during November 1988 indicate that a hydraulic connection exists between the gravels underlying the Beeches and the gravels comprising the eastern part of the proposed gravel pit.

2. If the gravel were to be worked dry and therefore dewatered there is a slight risk that the drawdown of the watertable could extend to the Beeches, given a sufficient period without recharge and providing the inferred hydraulic connection represents permanent saturated flow conditions through the gravels. If this connection is temporary and/or through the Reading Beds sand, this risk is reduced. If unsaturated flow conditions prevail between the two gravel bodies then there is no risk.

3. Protection measures could be undertaken to ensure that any drawdown effects associated with dewatering do not extend to the Beeches (e.g. through the use of a recharge ditch).

4. As there is a slight risk that groundwater levels will be affected by the proposed gravel extraction, it is advised that further work should be undertaken in order to gain a better understanding of the existing hydrogeology. This work would be necessary to:-

   a) assess the effectiveness of protective measures which the developer may propose

   b) form the basis of any predictive numerical modelling should it be required

   c) provide a pre-extraction baseline of hydrological conditions against which the results of continued monitoring during extraction could be assessed.

5. The proposed further work is as follows:-

   a) The drilling and installation of about 12 observation wells in order to improve the definition of the regional water table configuration with infill within the area between Crown Lane, Allerds Road, Crow Piece Lane and the watershed on the Beeches. These wells would also enable the definition of possible boundaries in case numerical modelling is required to quantitavely predict the effect of extraction on groundwater levels.

   b) The drilling and installation of a line of at least 3 observation wells between the gravel pit and Burnham Beeches to supplement existing wells. These would be used to investigate the drawdown effects of the existing pit and the monitoring of the pumped discharge from the pit.

   c) An EM31 geophysical survey, isotopic analysis, geological mapping and the drilling of about 5 boreholes to ascertain the nature of the inferred hydraulic connection between the gravel under the Beeches and the gravel which is proposed to be dug. One of these boreholes should be a deep hole near Juniper Cottage to prove the sequence of the Reading Beds in the area.

   d) The submission of an interim report following the work outlined in 5a)-c).

6. Following the installation of the observation wells in 5a)-c), groundwater levels should be monitored for a minimum of 1 year, preferably 2 years.

7. All observation wells (both the Corporation's and the developer's wells) should be monitored on the same day on a weekly basis.

8. Rainfall records should be continued.

9. The recommended further work could be carried out after the granting of conditional planning permission with a condition being that the further work would be undertaken and that water levels under the Beeches would not be altered. The Institute has been involved in cases elsewhere (e.g. Yarnton and Pixey Meads SSSI, Oxon and Stoke Common SSSI) where conditional planning permission was granted following a preliminary investigation and before further work was undertaken.

10. If extraction were to start at the western part of the application site where there was no evidence of any hydraulic connection between the gravels under the Beeches and the gravels which are proposed to be dug, this would give time to undertake the necessary further work and pre-extraction monitoring in the eastern part of the application site.

11. The overall study can be considered to comprise 4 phases:-

    Phase I Preliminary site investigation - November 1988 (completed)

    Phase II Hydrogeological study comprising work outlined in paras 5-8.

    Phase III (Optional) Numerical modelling to be undertaken if the results of Phase II suggest it is required.

    Phase IV Continued monitoring during extraction (and updating of any optional Phase III modelling)

12. Estimated costs for the recommended further work (Phase II) will be sent to the Corporation as soon as possible.

ANNIVERSARY

CITY OF LONDON
—LORD MAYOR—
1189—1989

Comptroller and City Solicitor,
PO Box 270, Guildhall,
London EC2P 2EJ

Telephone: 01-260 3040 (direct)
01-606 3030 (switchboard)

A.J. Colvin,
Comptroller and City Solicitor

My ref: EF 6407/03/VW/JMM
Your ref:

Please ask for Miss Wells

14th March 1989

Dear Mr. Dixon,

Gravel Extraction Application - Burnham Beeches.

Further to your meeting with my Deputy and Assistant Miss Wells on 13th March 1989, I have pleasure in enclosing a copy of the Minutes.

As agreed, I look forward to receiving the Letter which is to accompany your Report, together with a summary of your advice.

Yours sincerely,

A J Colvin

Comptroller and City Solicitor

Encl:

15 MAR 1989

DIRECTOR		
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FIRST CLASS

FA.O. Mr.A.J. Dixon,
Intitute of Hydrology,
WALLINGFORD,
Oxfordshire OX10 8BB.

13th March 1989

Meeting - Gravel Extraction, Burnham Beeches

In attendance:-

Mr A. Dixon - Institute of Hydrology

Mr L. Terrington)
) Town Clerk's Department
Mr D. Milnes)

Mr I. Turney - Superintendent of Kent and Surrey Commons

Mr. G. Karger)
) Comptroller and City Solicitor's
Miss V. Wells) Department

1. Mr Dixon was informed that the Corporation intended to release the Institute of Hydrology's report to Summerleaze, but that they would like it to be released with an accompanying letter from Mr Dixon to the effect that the report is a preliminary study and that more work is required to be carried out. Mr Dixon agreed to write the same.

2. Mr Dixon indicated that the next stage is the pre-extraction/pre-public inquiry stage which will involve further monitoring of the bore wells for a minimum of one year, but preferably two.

3. Mr Turney explained that since November 1988 his staff have been

monitoring the existing bore holes and all findings have been recorded. The Institute will be asked to collate this data.

Mr Dixon indicated that monitoring should take place on the Corporation's land, the applicant's land and the area of land in between these two areas. Summerleaze are collecting data from their own site but until recently had been taking readings on a different day to the Corporation, therefore reducing the usefulness of the data.

Mr Dixon recommends exchanging the data collected since November and said that links can be estab lished in a dry season, this winter having been particularly dry.

4. Mr Dixon indicated that there is a link between the two sites but he does not know the nature of the link. From the information he has at present he believes there is a slight risk to the Beeches but the hydrology here is difficult.

One remedy in respect of the slight risk to the Beeches is a re-charge ditch between the two sites, the bore holes being monitored at the same time to check that the ditch is working effectively.

To further establish the extent of the risk Mr Dixon suggested digging some 20 more bore wells, one of these being a deep one. This would involve around 2-3 weeks' work at a cost of approximately £200 per hole (shallow). These extra bore holes would enable Mr Dixon to ascertain the nature of the redding bed and would define boundaries to the system. (Redding bed - limits the extent of the draw down) The deep bore well would estab lish if there is a redding bed connection.

Mr Dixon suggested that 3 to 4 bore wells in the vicinity of the existing pit (ie. in the land immediately to the north of the hole) would give an idea of the drawdown occurring at the moment.

Mr Dixon did not think that the readings taken by the Corporation

since November 1988 would add much to what he already knows. What is needed are more monitored bore wells which would give an adequate network prior to extraction or inquiry. The minimum period of monitoring would be one year.

5. Mr Dixon believes that remedial measures are possible, encompassed in a conditional planning permission. Two examples of sites where remedial measures are being implemented are:-

(i) Walton Rectory Farm (Oxfordshire County Council) - a site of European importance where the hydrological risk was greater than the risk to the Beeches yet remedial measures were implemented.

(ii) Stoke Common (Buckinghamshire County Council) where planning permission was granted subject to conditions. This site is only 5-6 miles from the Beeches and is similar is geology. Conditional planning permission was granted following a preliminary study in 1984 by the Institute of Hydrology. Again the risk to the Common was greater than the risk to the Beeches, yet a re-charge ditch was implemented, the effect of which is still being monitored.

Mr Dixon felt it would be helpful to pool resources with the developers at Stoke Common, but these developers apparently do not want to hold back Summerleaze.

For the Beeches, Mr Dixon felt that remedies might be a re-charge ditch, or sealing with clay making it impermeable, or both. So far as a ditch is concerned, the worry would be de-watering.

Mr. Dixon compared Stoke Common with the Beeches. In the former case the water table was established before extraction, whereas here the water table has not been established in any great detail. Therefore, it is worth digging more bore holes to ensure the risk to the Beeches is slight. The slight risk to the Beeches of say 10% now might increase to 20%.

6. Mr Dixon said that our concern should be to insist that the water levels under the Beeches are not altered, not to think up remedial measures. 20 boreholes, plus monitoring over a period of 1 year, would establish the hydrology, and subsequently would enable a suitable design for remedial measures.

For example, a conditional planning permission for staged working and monitoring during extraction would not be an unreasonable condition to ask for. Extraction could begin at the western end where no water has been found in the gravels. This would then give the Corporation ample time to collect data over a 1 year period and to continue to monitor the eastern end to establish the hydrology of the area and to establish the degree of risk to the Beeches. From this one could deduce numerical modelling i.e. a Computer model.

7. Other possible measures the Corporation could take:-

(i) Geophysics - EM31 on the inter-terrace bluff to establish the link between the Beeches and the lower terrace. If anything of interest found then boreholes could be sunk in these particular target areas. EM31 goes to a depth of 5 metres and indicates the difference between gravel and clay.

(ii) Isotopes - Can indicate whether the water is fresh. i.e. a water sample is taken and would establish whether the link between the 2 terrace levels is through gravels and would give you an isotopic signature. The merit of this action would therefore be to prove whether there is a redding bed or gravel connection and the speed the water comes through. If there is a gravel connection then the risk is greater.

8. To advise the Corporation upon remedial proposals to safeguard Burnham Beeches, the Institute requires more information. The extra data which is necessary could be obtained from assessing the data taken from the Corporation's bore wells, those 4 of boreholes Summerleaze if they are prepared to release this information and

from data collected from extra boreholes. A hydrological contour map should then be able to be drawn up.

9. Mr Dixon agreed to let the Corporation have a Summary of the advice given at this meeting.

Time taken - 2.30-4.00pm.

HYDROLOGICAL IMPLICATIONS OF PROPOSED MINERAL EXTRACTION AND LANDFILL ON BURNHAM BEECHES - A PRELIMINARY SITE INVESTIGATION STUDY.

Contents

Figures

Tables

1. Introduction

This report has been prepared following a request from the Corporation of London, the owners and managers of Burnham Beeches Special Site of Scientific Interest (SSSI) to the Institute of Hydrology. The Corporation requested a rapid, initial assessment of the hydrological implications for the Beeches of a planning application to win sand and gravel from land nearby to the Beeches. In response to this request the Institute submitted a proposal, on the 26 October 1988 for a preliminary site investigation in the Burnham Beeches area to be undertaken during November 1988, essentially to determine the existing groundwater flow configuration. In this proposal it was also stated that whereas the Institute would advise the Corporation on possible effects of gravel extraction and landfilling on groundwater flow, it would not be concerned with the possible effects of landfill on water quality and methane production.

Subsequently at a meeting on 4 November 1988 with the applicant, Summerleaze Gravel Co. Ltd., Buckinghamshire County Council and the Corporation, it became evident that there were few scientific facts upon which any conclusions could be made about the existing groundwater flow configuration at Burnham Beeches, let alone any possible hydrological effects of gravel extraction in the area. It was was therefore agreed that the applicant would undertake an investigation to collect data on groundwater levels, in particular on their own land, acting on recommendations from the County Council. It was also recognised that the Institute would pursue the proposed investigation within the boundaries of the Beeches and on private land between the Beeches and the application site.

The study area in this report is shown in Fig. 1. Only the southern parts of the Beeches have been investigated, where there may be a risk of any hydrological impact from the proposed gravel extraction. Included in the study area is the application site which comprises a gross area of 52 ha and lies to the south of the Beeches separated by a minimum distance of 200 m. Data collected by the applicant has been used in this report. Privately owned land between the application site and the Beeches has also been investigated and we gratefully acknowledge the co-operation of these owners.

2. Existing data and field investigations

2.1 EXISTING DATA

Data made available for this study consisted of the following:

1. Wright, P.S. 1970. The study of associations between soils, topography and vegetation in the Burnham Beeches. Unpublished MSc thesis, University of Reading.

Location map

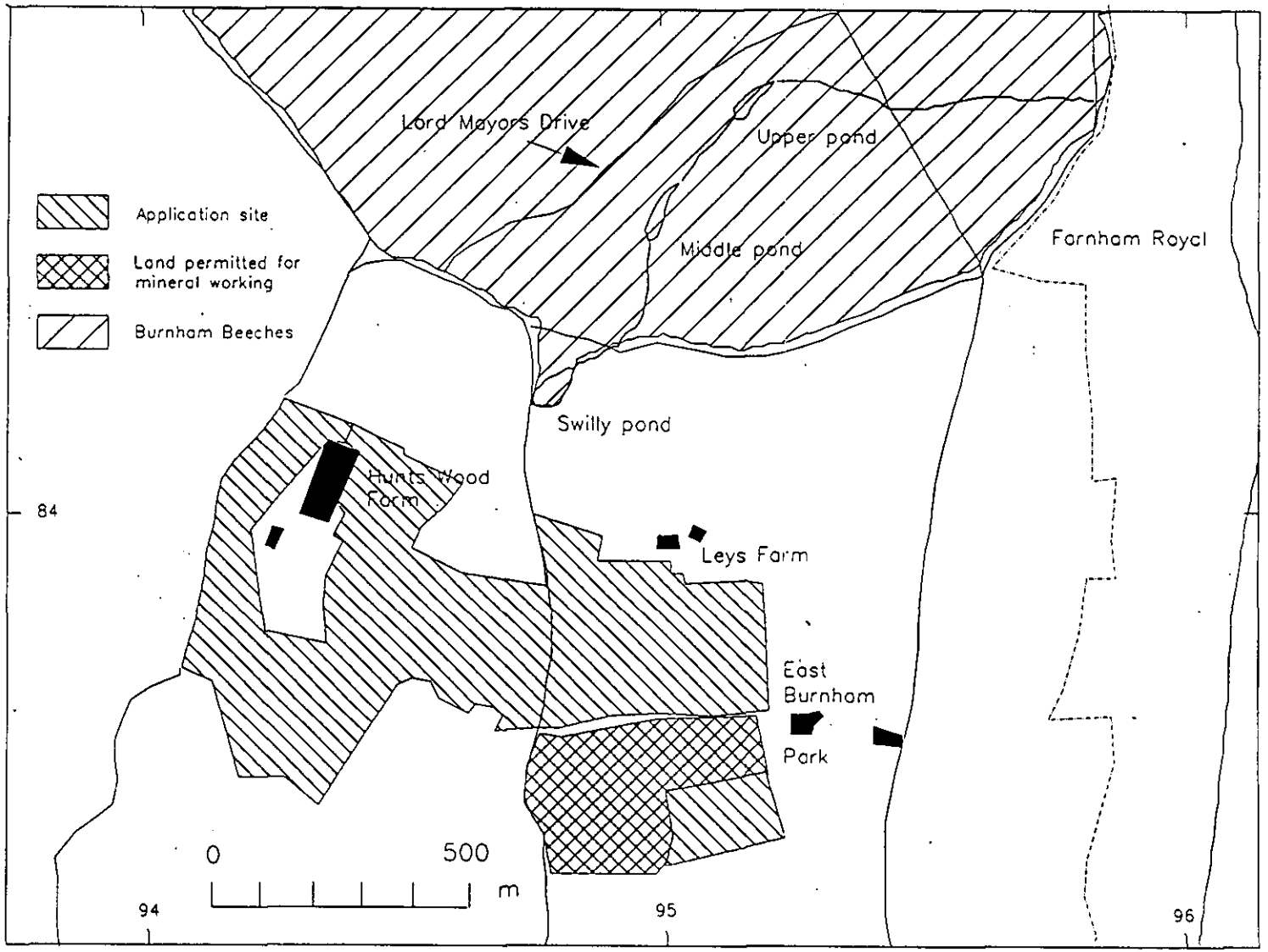


Figure 1

2. Hare, F.K. 1947. The geomorphology of a part of the Middle Thames. Proc. Geol. Assoc., Vol. 58, pp294-339.

3. Squirrell, H.C. 1974. The sand and gravel resources of the country around Gerrards Cross, Buckinghamshire: description of parts of 1:25000 resource sheets SU98, SU99, TQ08 and TQ09. Rep. Inst. Geol. Sci., No.74/14, 169 pp.

4. Well records for wells SU98/47, 48, 58, 90 and 96, Hydrogeological Records Dept., British Geological Survey, Wallingford.

5. Hydrogeological map of the area between Cambridge and Maidenhead 1984. British Geological Survey.

6. Applicant's borehole records comprising:-

B1-B3 Bishops Nurseries boreholes, Sept. 1986
H1-12 Hunts Wood Farm boreholes, Sept. 1982
Hg-n Hunts Wood trial pits
Hy-z Hunts Wood Farm boreholes, Oct 1988
MH1-6 Hunts Wood Farm boreholes, Sept. 1985
L1-4 Leys Farm boreholes, Oct. 1986
L5-6 Leys Farm boreholes, April 1987
L7-L12 Leys Farm boreholes, Nov. 1988.

7. Rainfall data was obtained from the Meteorological site at the Institute of Hydrology, Wallingford. Up-to-date records from a nearer station were unavailable.

8. Aerial photographs (stereoscopic pair)

2.2 FIELD INVESTIGATIONS

A visit was made by the Institute with Mr J. O. Mountford of the Institute of Terrestrial Ecology on 17 October 1988. The purpose of the visit was to identify ecologically sensitive parts of the beeches which were within the defined area of the Beeches potentially at risk. Details of this visit are given in Appendix I of this report.

Boreholes drilled for this study by the Institute have been given numbers prefixed with the letters BB (see Fig. 2). Full details of these boreholes and the lithological logs can be found in Appendix II of this report.

The Institute drilled nineteen boreholes between 3 November 1988 and 18 November 1988. Twelve boreholes were drilled with a Marlow hydraulic hammer system at diameters of 54 mm reducing to 35 mm (BB1-12). Cores were taken more or less continuously for lithological logging. Seven boreholes were drilled with a Pilcon Traveller rig with continuous flight augers at a diameter of 150 mm (BB13-19). Ten of the total nineteen boreholes were completed with steel standpipe piezometers for water level monitoring. Six piezometers were at nominal 50 mm diameter with 0.5 m perforated drive tips (BB4, 11, 13, 14, 16, 19). Four of the piezometers were at nominal 25 mm

Borehole locations

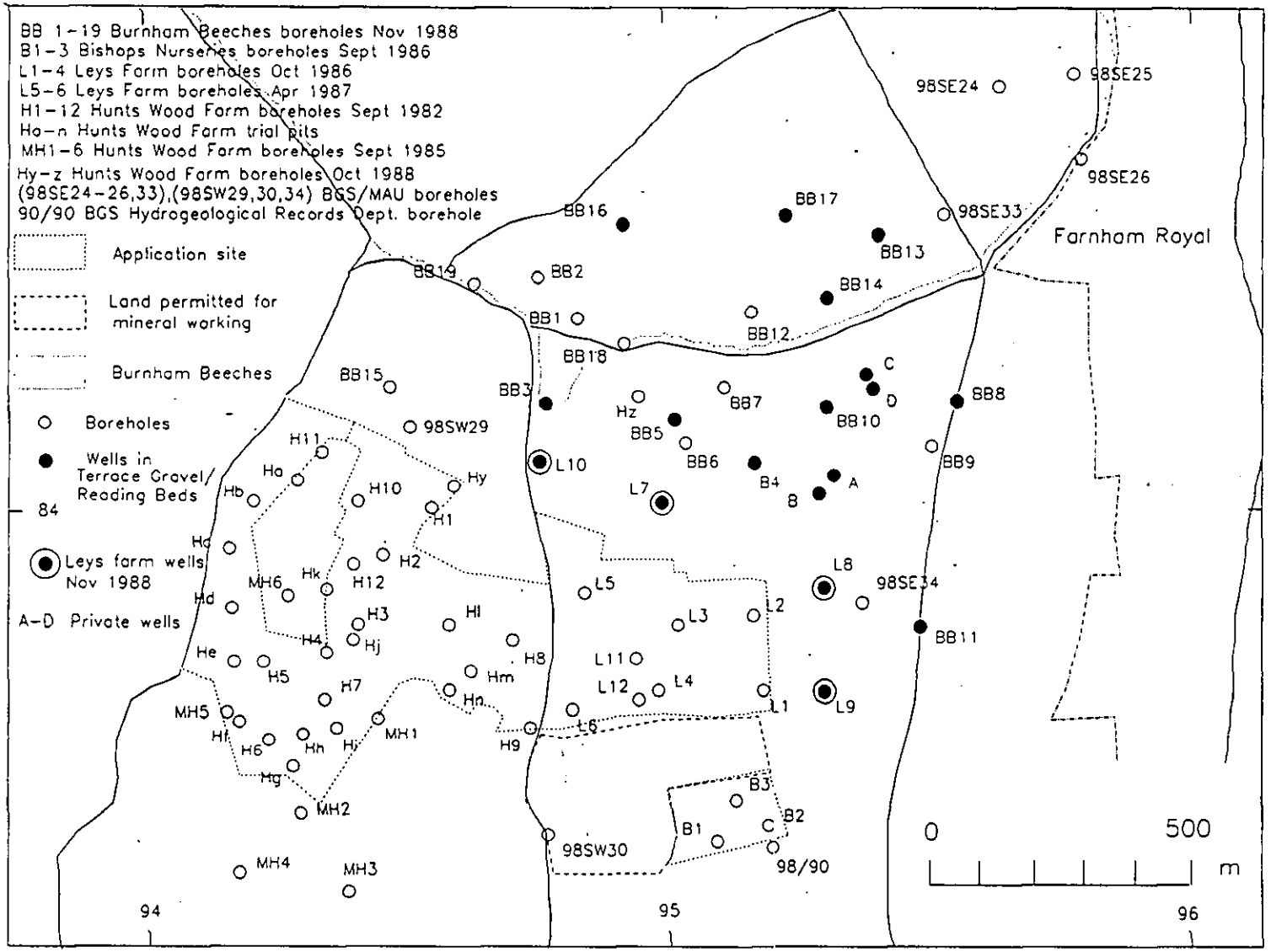


Figure 2

diameter with 0.3 m perforated drive tips with a porous plastic element (BB3, 5, 9, 10). Four of the 50 mm piezometers were developed with compressed air (BB16 and 17 were screened in Reading Beds sand and were wrapped in Terram and were therefore not developed).

Boreholes were surveyed to Ordnance Datum and the elevations of ground level and well top are given in Appendix III. Water levels were monitored on 28 November 1988 and 30 November 1988 in all 10 piezometers, together with privately owned wells (at sites A, B and C and D on Fig. 1) and the applicants wells L7-L10.

An estimate of stream discharge was made at the outlet from Middle Pond on 17 November 1988.

3. Ecological sensitivity to changes in water levels

Within the Beeches the habitats most vulnerable to changes in water levels are those associated with shallow groundwater and poorly drained land. Such areas have given rise to the development of wetland plant communities which would be threatened by any significant lowering of water levels associated with any dewatering during gravel extraction. Three wetland areas have been identified.

1. Upper, Middle and Swilly Ponds (see Fig. 1) and along the stream that links these ponds.

2. Upstream of Upper Pond, where the Corporation has recently cleared birch woodland and established a managed bog.

3. In the birch and pine woodland to the east of Middle Pond (Classes 6 and 7 in Fig. 3).

Many of the wetland species listed in Appendix 1 are restricted to these three areas and are rare in southeast England, having declined markedly over the last century.

Elsewhere beech, oak and mixed woodland predominate (see Fig. 3). These associations (Classes 1-4 in Fig. 3) are adapted to free-draining ground and deeper groundwater levels and are therefore not particularly at risk from any drawdown effect of dewatering.

4. Geology

The map which accompanies the IGS mineral assessment report (Squirrell 1974) represents the most up-to-date available geological survey of the area.

Vegetation (after Wright 1970)

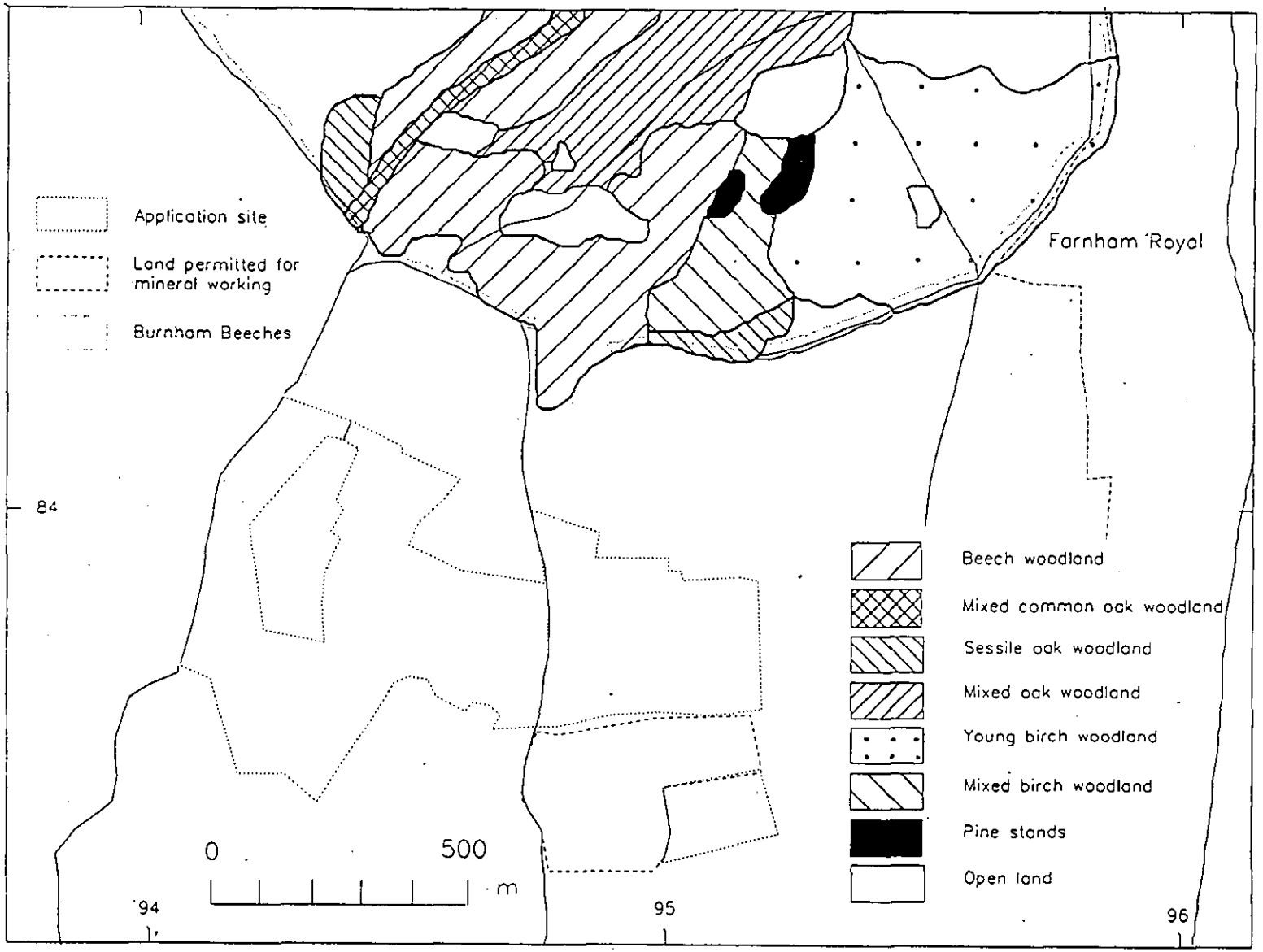


Figure 3

Most of the boundaries were mapped by the Geological Survey between 1902-1920 with only minor revision by Squirrell. Within the study area, this map shows most of the ground to be underlain by gravel (see Fig. 4). The gravel underlying the Beeches is mapped as "Glacial Sand and Gravel (including undifferentiated Head)". This is distinguished from the 'Boyn Hill Terrace' gravel on which the application site is located.

A more detailed classification of the terraces in this area was undertaken by Hare (1947). This classic work on the geomorphology of the Thames terraces identified the terrace gravel under the Beeches as being associated with the Winter Hill Terrace of the Thames (see Fig. 5). Hare mapped only areas of relatively flat ground as a terrace remnant; steeper facets were either classed as 'inter-terrace bluffs' or as 'recent minor valleys' (see Fig. 6). In Hare's map much of the ground within the Beeches and on land to the south is mapped as inter-terrace bluff or recent minor valleys. Hare, therefore, omitted the gravels which had been subsequently subjected to mass movement from his area of terrace remnants, whereas Squirrell chose to incorporate them within the mapped terrace gravel.

The nature and extent of the gravels which have been subjected to mass movement is of crucial importance in this study. The gravels underlying the Beeches and the application site are both in parts, waterbearing. If there is a hydraulic connection between these two different gravels then there is a possibility that changes in water levels in the vicinity of the application site could effect water levels within the Beeches. This possibility is more likely if a mass moved or soliflucted gravel of high permeability bridges the two distinct terrace gravels. Indeed, Hare gives a geological cross section across the inter-terrace bluff at the southern boundary of Burnham Beeches (reproduced in Fig. 7) which shows 'trail' and 'solifluction gravel' connecting the Winter Hill and Boyn Hill terrace gravels.

As the geological map (Fig. 4) is based on old survey (mapping techniques having improved since the period 1902-1920) and as Hare's map differs from Squirrell's map, a number of boreholes were drilled to specifically investigate the ground between the Winter Hill (Glacial Sand and Gravel of Squirrell's map) and the Boyn Hill terrace gravels. These boreholes (BB1, 2, 7, 8, 10 and 19) indicated that where gravel was present, it was thin. Other boreholes drilled near to the area of mapped bedrock on the inter-terrace bluff also proved thin gravel overlying bedrock (BB5 and 9) or bedrock (BB6). Table 1 below summaries the thicknesses of gravels in the inter-terrace bluff area.

Table 1 also shows the nature and thickness of proved bedrock. All these boreholes east of Swilly Pond proved clay bedrock. However BB1 proved sand underlying 1.2 m of clay and BB19 proved 3.0 m of chalk underlying 7.0 m of silt.

Geology (after Squirrell 1974)

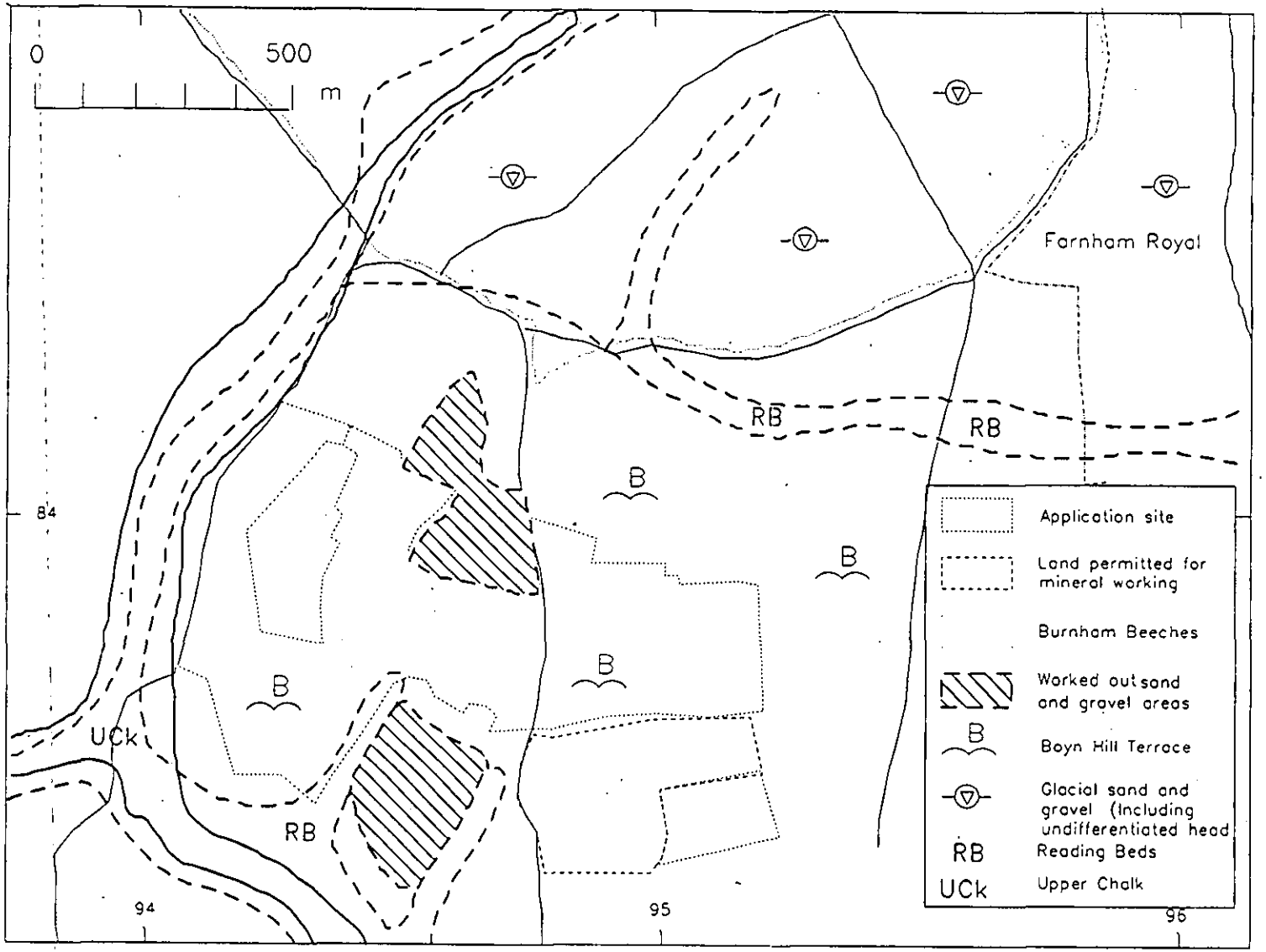


Figure 4

Geomorphology (after Hare 1947)

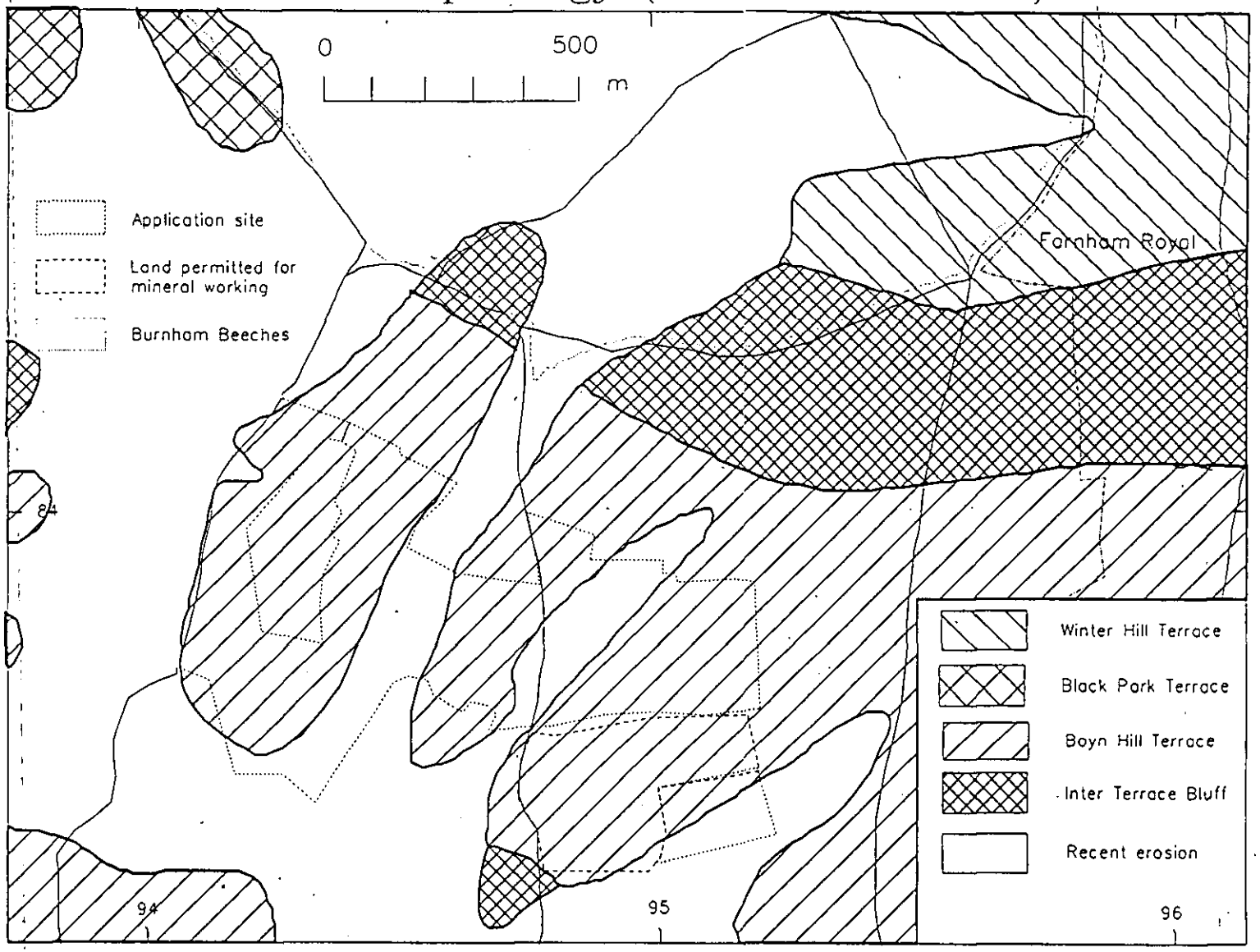


Figure 5

Topography

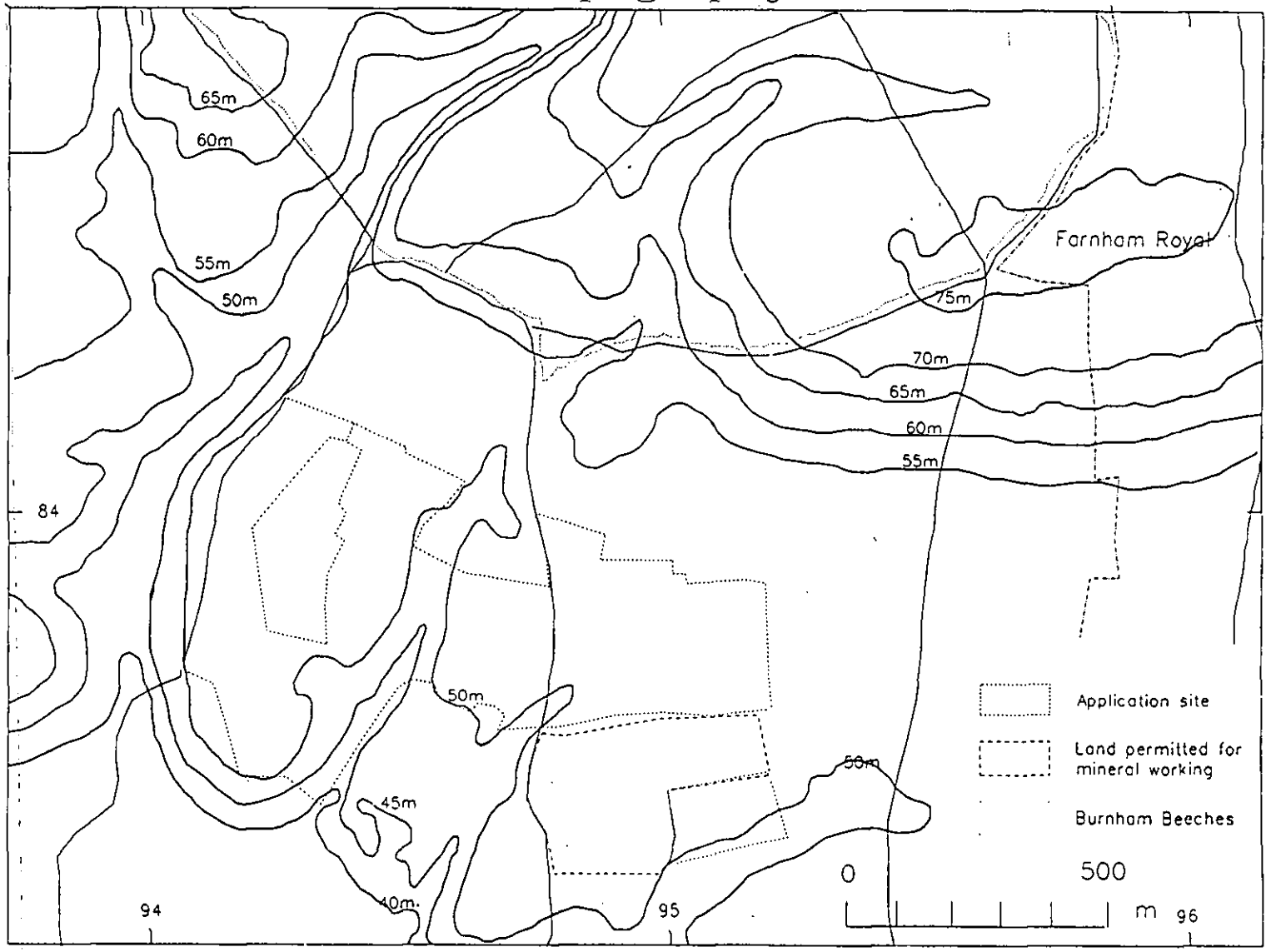


Figure 6

Section across the bluff above the Boyn Hill Terrace at Burnham Beeches(approx. along Lord Mayors Drive)
(after Hare 1947)

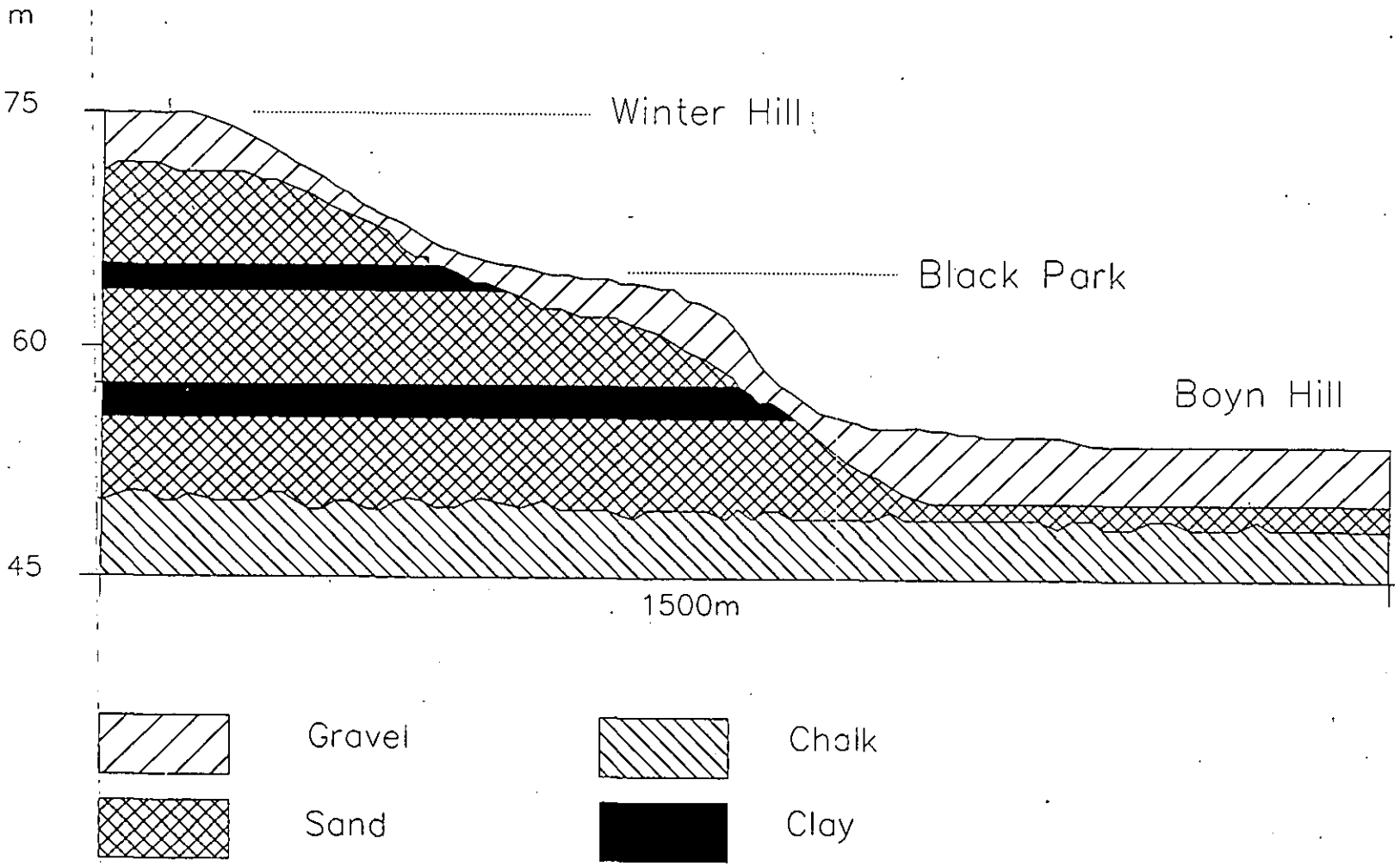


Figure 7

Table 1 *Thickness (m) of gravel and proved bedrock of boreholes in inter-terrace bluff area.*

	Tickness of gravel	Nature and thickness of bedrock proved
BB1	0.6	Clay (1.2) over sand (1.2+)
BB2	0.5+	-
BB5	1.5	Clay (1.1+)
BB7	-	Clay (3.2+)
BB8	1.5	Clay (1.4+)
BB9	0.5	Clay (2.0+)
BB10	0.8	Clay (2.7+)
BB19	-	Chalk (3.0+)

Elsewhere the gravel is of variable thickness (see Fig. 8). The thickest gravel proved in the area, is within the application site at L6 where 9.9 m of gravel underlies 4.8 of clay and soil. This exceptionally thick drift sequence (15.7 m) is probably associated with the existence of a Boyn Hill 'fossil' sinkhole or a recent solution/collapse feature. Thicknesses of up to 6 m occur at Huntswood Farm and on the high ground in the Beeches to the east of Middle Pond. A hoggin or soft silty clay commonly overlies the gravel and is sometimes found interlayered within or below it.

Bedrock within the study area is generally Reading Beds clay. However, in the west in the vicinity of Hunts Wood Farm, chalk was proved underlying gravel in the applicant's boreholes (H11 and Hy) and, as already mentioned, underlying silt at BB19. The proximity of the chalk to the base of the gravel in the west of the study area, is of hydrogeological significance, inasmuch as these gravels are likely to be dry, as water will percolate down into the unsaturated zone of the chalk until it reaches the chalk watertable at depth. Interlayered within the Reading Beds clays are bands of sand. At BB16, 5.7 m of sand were proved underlying gravel (which was damp at the base). Assuming a dip of 1:80 this band sub-crops beneath the gravel at East Burnham Park, where sand was proved in the applicants boreholes L1, B2 and B3. Reading Beds sand was also encountered at BB17 (where it was water-bearing) which assuming a dip of 1:80, sub-crops under the Boyn Hill Terrace east of Farnham Royal where it was proved in the MAU boreholes SU98/36 and 38. The Reading Beds sands are of hydrogeological significance as they provide a possible connection between the Winter Hill and Boyn Hill terrace gravel aquifers. The Reading Beds sands at BB17 are particularly important in the context of this study, as water in this formation, together with the overlying gravels, appears to feed the wetland immediately to the west.

Thickness of Gravel (m)

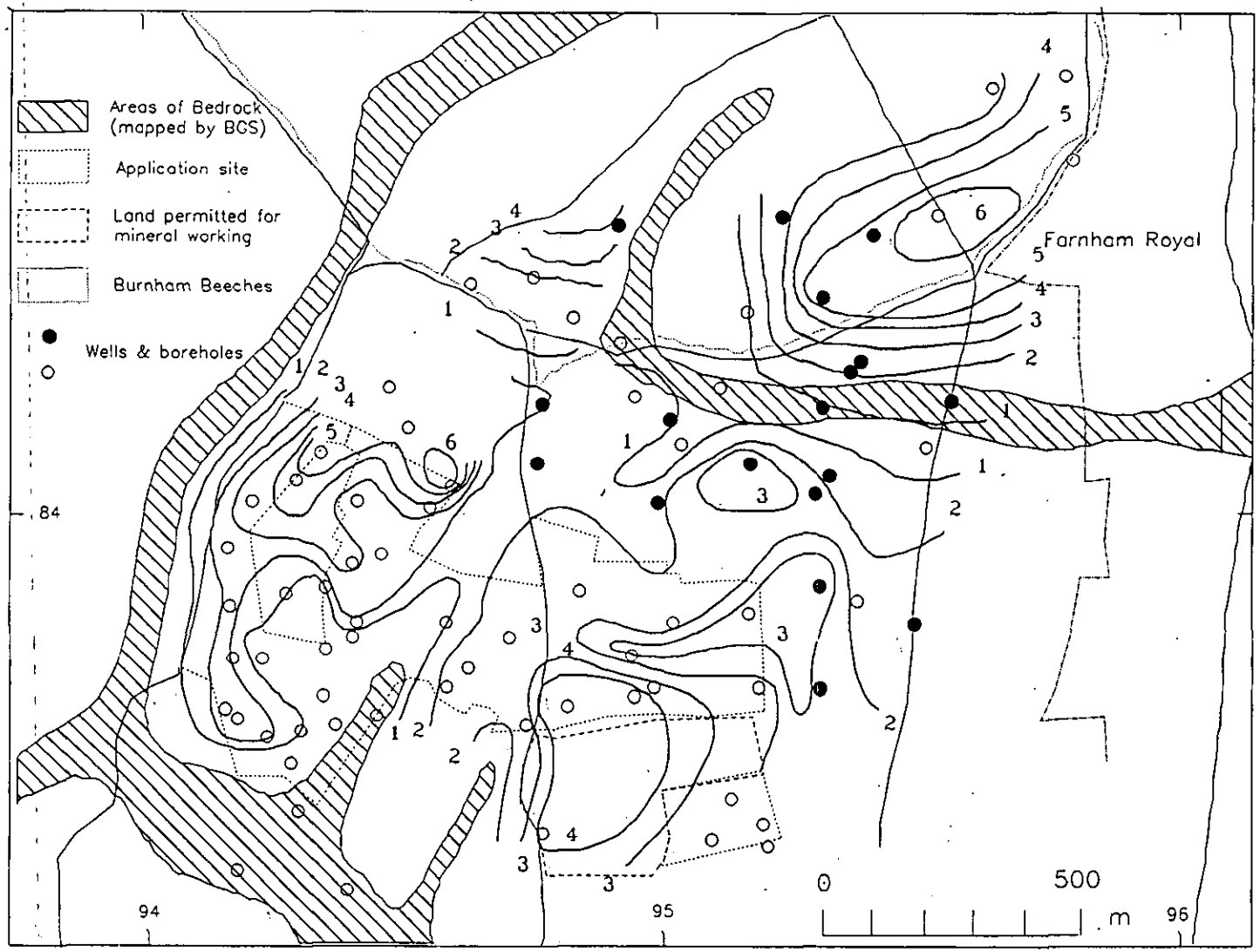


Figure 8

5. Hydrogeological conditions

5.1 SETTING

Rainfall figures for Wallingford are given in Appendix V (up-to-date rainfall data was not available from any station nearer to Burnham Beeches). At Wallingford the rainfall over the previous 12 months (December 1987-November 1988) was slightly below the 25 year mean. July was unusually wet and the period August-November was below average. November was fairly dry up to 28 November when the monitoring of groundwater levels was undertaken. More data must be obtained to evaluate any departure of the November water levels from the average low water levels in the area. The second monitoring of groundwater levels was undertaken on the 30 November after 12 mm had fallen at Wallingford between 0900 on 29 November and 0900 on 30 November in order to investigate the response of groundwater levels to a recharge event.

5.2 GROUNDWATER CONDITIONS

The study area can be divided into two, along a line running slightly to the east of the Upper Pond/Swilly Pond valley. Two the west of this line, groundwater was not encountered in the gravels during this investigation. To the east of this line, groundwater was recorded in thirteen wells.

In the eastern area, although water was not recorded in the gravels, the Reading Bed sand proved at BB16 became damp at 9.5 m B.G.L. indicating that the watertable was not far below. Elsewhere the applicant recorded water levels in the deeper chalk aquifer. The applicants trial pits (Hc, Hd, He, Hf, Hj, Hk and Hm) all struck water at depths ranging from 1.6 m B.G.L. at Hk to 3.5 B.G.L. at Hm. Unfortunately the records do not specify the date these holes were dug but these records indicate that there is at least groundwater under Hunts Wood Farm at certain times of the year.

Surprisingly the well at Swilly Pond (BB3) was dry, even though the pond was wet and 2.1 m of gravel was proved. The 1.6 m of clay which overlies this gravel must act as a natural seal to keep the pond wet through much of the year. The absence of water in the gravel below Swilly Pond and in the area to the west, in general can be attributed to the proximity of the unsaturated zone of the chalk bedrock. The Reading Beds are thin (Hz proved 0.8 m) or not present (Hy) providing areas where water can percolate down to the chalk aquifer. Thus the valley below Swilly Pond is dry, as is the deep valley which runs to the west of Hunts Wood Farm and Lord Mayor's Drive.

There is a possibility that there may be a narrow alluvial aquifer associated with the stream which feeds Swilly Pond. Borehole BB18 was drilled to investigate this but unfortunately was abandoned at 1.5 m due to exceptionally hard ground. Lack of time prevented re-siting this borehole. Certainly, immediately downstream from Middle Pond gravel can be seen exposed in the stream banks.

In the eastern side of the study area the groundwater contour map for 28 November 1988 (Fig. 9) shows flow essentially from the Beeches, southwards towards the application site.

At the Beeches in the vicinity of BB17, there is a flow to the southwest towards the wet ground that lies between BB17 and BB18. At BB17 groundwater was only 1.9 m B.G.L. and it can be inferred that this water gives rise to wetland further down the slope. Indeed, at BB12, Reading Beds clay was proved to outcrop, which presumably accounts for the spring between BB12 and BB14 (shown to the Institute by the Keeper of the Beeches on 27 October 1988).

On the inter-terrace bluff, groundwater was proved at BB10 (see Fig. 10). At this well only 0.13 m of the 0.8 m of gravel were saturated on 28 November 1988, rising to 0.26 m on 30 November 1988. However, further down slope on the Boyn Hill Terrace at BB4, there is clear evidence in Fig. 9, of a recharge mound, suggesting, in the absence of any surface water in the immediate vicinity, a significant groundwater link between the land under the Beeches and the Application site. This link could be via gravels or Reading Beds sands.

On the Boyn Hill Terrace, Fig. 9 shows groundwater flow spreading out southeast, south and southwest from BB4. The absence of water at L8 could be accounted for by a local steepening of gradient immediately northeast of L8 (as suggested in Figs. 9 and 10).

The differences in groundwater levels between the 28 and 30 November show a variable response. On the Beeches, BB13 and BB14 together with BB11 at the extreme southeast part of the well network, showed no response. The greatest response was at BB4, which showed a rise of 0.35 m. This indicates that groundwater rapidly moves down through the steep inter-terrace bluff after a rainfall event.

5.3 RELATIONSHIPS WITH SURFACE WATER

The only surface water of concern in the study area is the stream that feeds Upper Middle and Swilly Ponds. During November the flow in this stream was very low. On 17 November 1988 the discharge at the outlet pipes from Middle Pond was 2.7×10^{-4} $m^3 secs^{-1}$. South of BB18 the stream bed was dry. The Corporation have, however, observed substantial flows during wet periods. As mentioned above, the valley to the west of Hunts Wood Farm and Lord Mayor's Drive is dry up to some swallets.

The stream which feeds the ponds is recharged in part by groundwater from gravel underlying the Beeches. This is indicated in Fig. 9 which shows a groundwater flow direction towards the stream and reference has already been made to the spring between BB12 and BB14. Although there are no wells to the north of BB17 it is likely that there is some ground water flow northwards from BB17 recharging the Corporation's managed bog upstream of Upper Pond. The absence of any recorded groundwater in the gravels west of Middle Pond during November infer that little recharge occurs from these gravels during a low water period. Elsewhere recharge from any terrace gravel

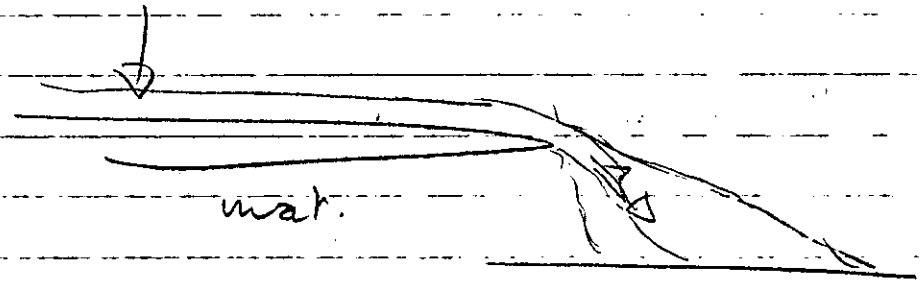
(5) alloy road to E of fill for flow net control
& pass flow bound

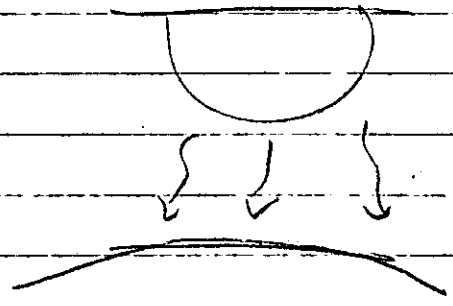
◊ 2 sites £10

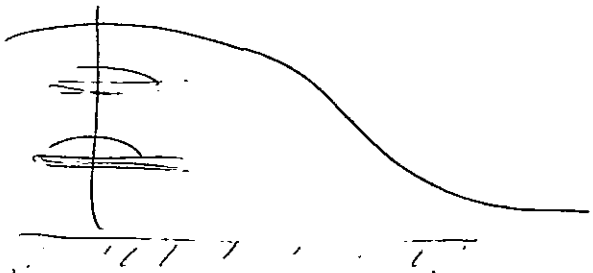
(6) if BB to/ plant area + a ? !

* 2 sites £10

18 sites say 150.
(~20)







20 avail.
but 17 'wells'

- further definition of hydrogeol sitn.
  - regional
    - : water levels &
    - : extent of 'saturation'
    - : physical geom of terrace — (RB
      (Gravel connection.

modelling

- further definition around 'risk' areas
  - local
    - : water levels
    - — highlight interconnect°.

- probable need to infill monitoring on 'regional' scale
- need to provide more detailed network between fit & BB. fine extract°.

1-2-4

① Areas 4, 5 + 1 strat hole each 2 for £60.
& perched aq.
general auger survey along outcrop ne. clay

② WL defin°. 7-(8) sites : towards area 1) £40.
& ne. sect° of grav on W side)

A

③ Re S around N of ex fit — it comb° with ② £10.
A requires 2 sites

④ Re Swilly Road area (risk?) — 2 sites £10.
X

Water level contours(m) 28th Nov. 1988

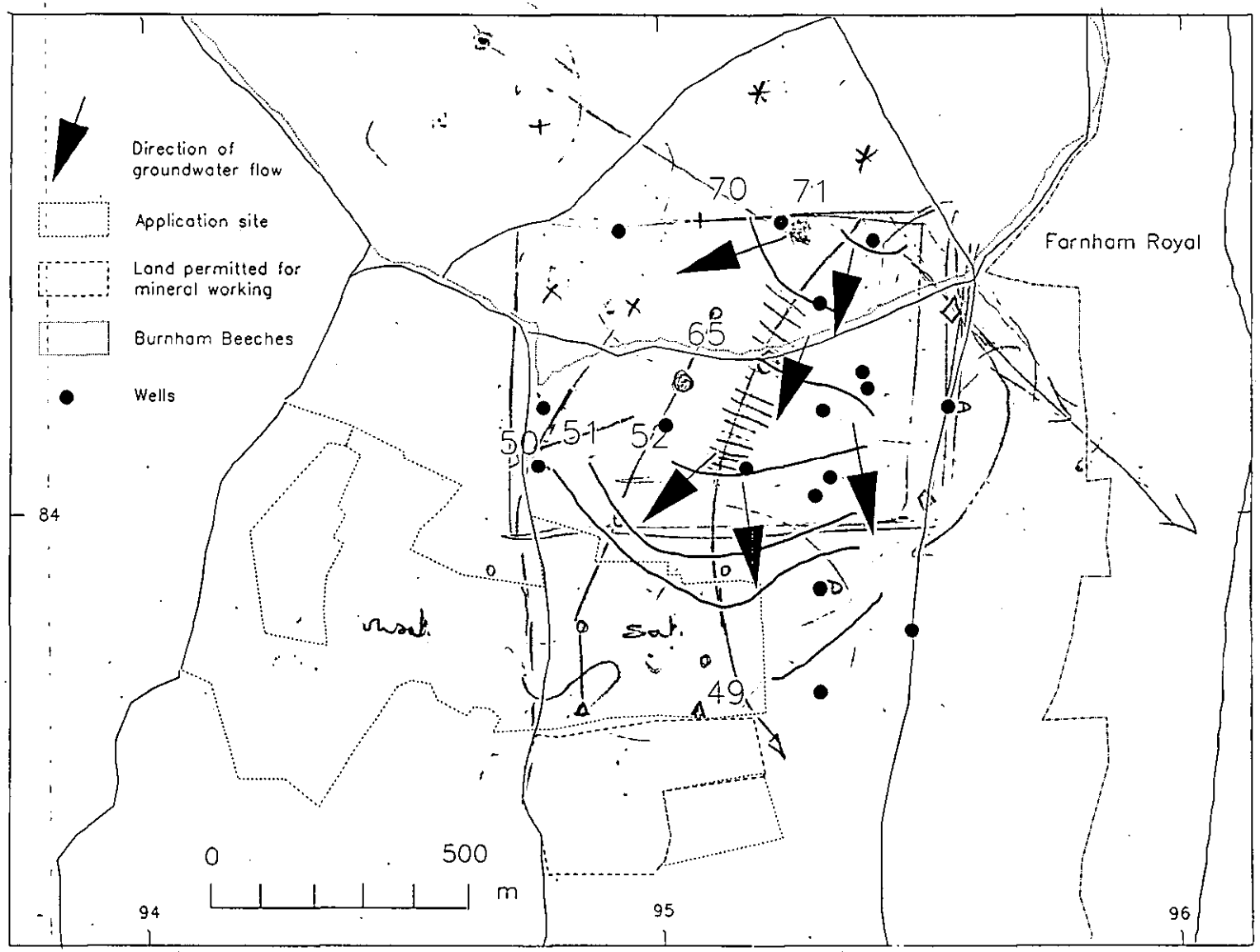


Figure 9

Section from BB17 to L9

Showing lithology and water levels (28/11/88)

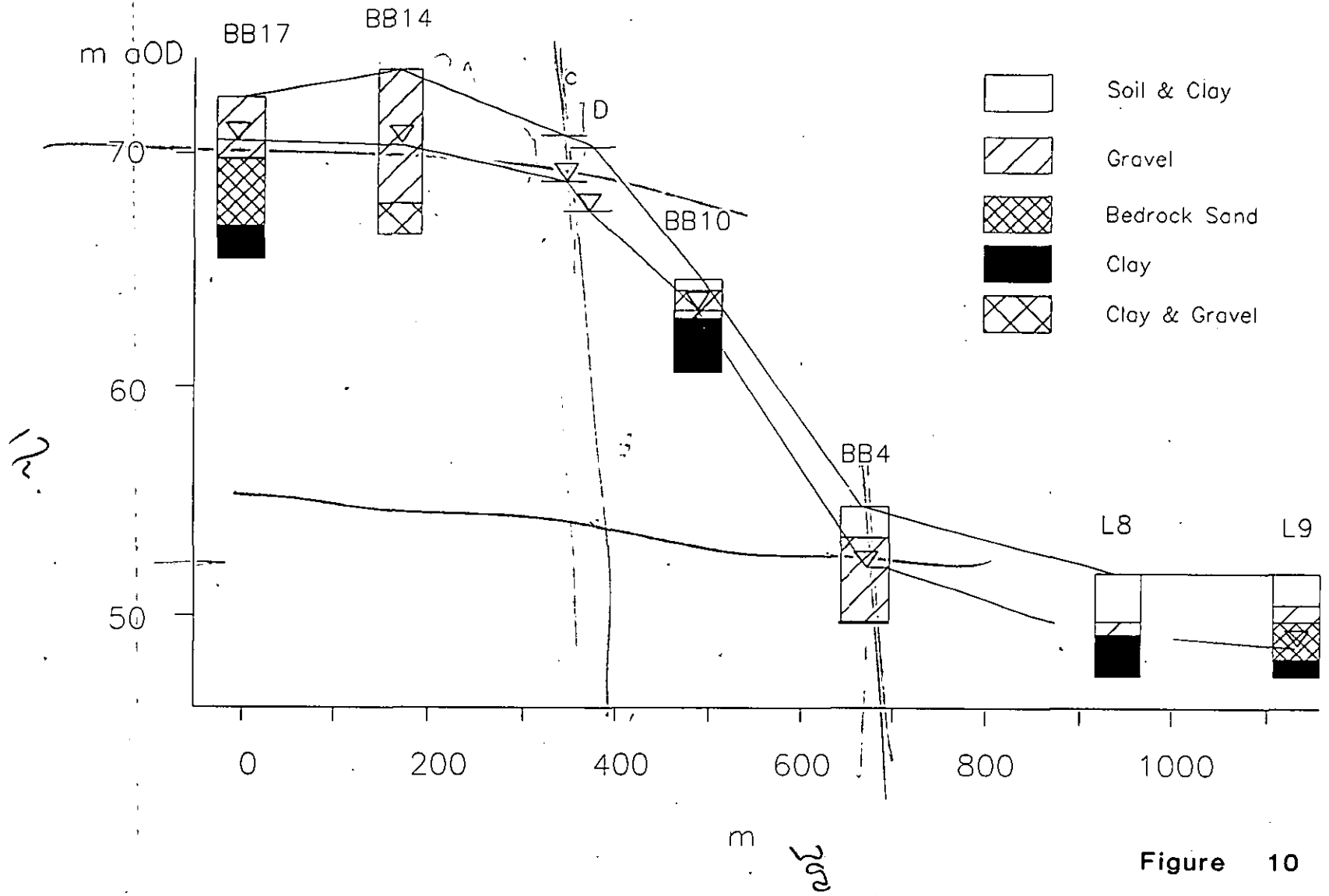


Figure 10

aquifer to the stream is outside the defined area of potential risk. Geological mapping and more boreholes would be needed to assess the role of the Reading Beds sand in recharging surface water.

6. Risk assessment

There are two aspects which must be considered in assessing the impact of the application on surrounding water levels. These are:

1. Assuming the proposed extraction will be undertaken by dry working, then surrounding ground water levels will be lowered during de-watering.

2. If the pit is to be lined and filled with landfill, then as groundwater has been shown to flow from the Beeches towards the application site in the eastern half of the study area (at least at the time of well monitoring), it is likely that groundwater levels will rise under land surrounding the northeast part of the site.

Without a more detailed investigation involving monitoring extreme high and low water levels, collection of data on aquifer properties (permeability and storage) and a much better understanding of boundary conditions, it is not possibly to quantitatively predict the extent of these likely effects.

An initial assessment of potential risk can. however, be made in the light of the findings of this investigation. Five categories of potential risk have been identified in the Beeches within the study area (see Fig. 11). Area 1 represents the highest and Area 5 the lowest risk. These areas have been identified on the basis of both ecological sensitivity to water level changes, together with the likelihood of any such water level changes occurring due to the proposed gravel extraction.

Each area is briefly discussed below:

Area 1. This area represents the mixed birch woodland and pine stands classified by Wright (1970) and identified as the third area of wetland in Section 3 of this report. The ground here was waterlogged in parts, even during the dry month of November 1988. Plants such as *Molinia* and *Sphagnum* were recorded (Appendix I). It is therefore an area which is sensitive to any lowering of the watertable. Figure 9 suggests that this wetland area is maintained by water from the gravels lying upslope, in the vicinity of BB13, BB14 and BB17. In Section 5 of this report, it was suggested that these gravels were in hydraulic connection with the lower gravels at the application sites at the time of well monitoring. It is therefore on this basis that this ecologically sensitive area fed by groundwater in hydraulic connection with the application site that it is identified as the area at most risk. As yet there is insufficient data to establish whether this hydraulic connection is direct or indirect.

Area 2. Upper, Middle and Swilly ponds together with the intervening wet valley bottom and a small triangular piece of land adjacent to Swilly Pond

Risk classification

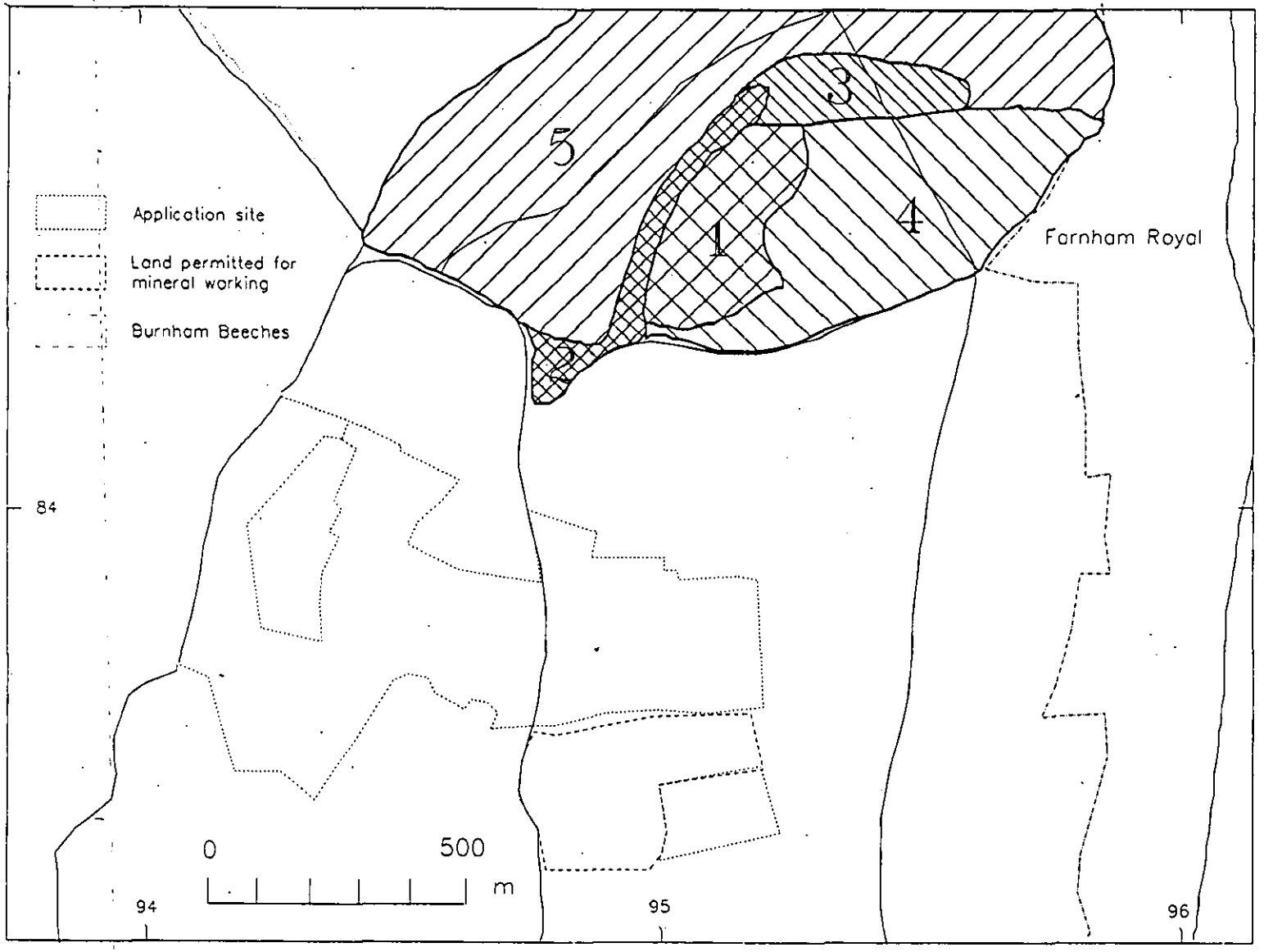


Figure 11

comprise Area 2. It includes the first wetland area referred to in Section 3 and is therefore sensitive to any lowering of water levels (see Appendix 1). However, during November 1988 the gravel at BB3 which underlies Swilly Pond, was dry. This considerably lowers the risk in this area. There could be a hydraulic connection via bedrock sands which presents a slight risk. Also if the well at BB3 becomes wet, and there is an indication that the water levels in the ponds and any alluvial aquifer are in direct hydraulic connection with the application site, then this area becomes the area at most risk.

Area 3. Within this area is the managed bog lying upstream from Upper Pond. It contains species sensitive to any lowering of the water levels but is some distance from the application site. However, as there may be some recharge from the gravel lying north of BB13, there may be a slight risk.

Area 4. This area is mapped by Wright (see Fig. 3) as mainly young birch woodland with an area of sessile oak woodland lying to the south of Area 1. Although the southern part of this area is underlain by gravels, which are in hydraulic connection with the application site, as no wetland area was encountered in this investigation, the area has been designated at a lower risk category.

Area 5. Land lying to the west of the Upper, Middle Swilly Ponds, comprising mainly beech and mixed woodland (Fig. 3) is in the western area where groundwater was not encountered or suggested to be at depth (BB16). Providing these conditions prevail, this area is at no risk.

Conclusions and recommendations

This study has indicated that underlying parts of the Beeches are in hydraulic connection with the gravels which it is proposed to extract. This connection can be inferred from the watertable contour map (Fig. 9) for 28 November 1988. The exact nature of the connection is unknown. However, some small amount of water was monitored at BB10, a well located on the 'inter-terrace' bluff and mapped as bedrock by the British Geological Survey. It is recommended that more boreholes should be drilled and wells installed to improve our understanding of the piezometry in this area. In particular, deeper wells in the inter-terrace bluff area would establish whether the connection is via the gravel or the Reading Beds sand layers.

Elsewhere, towards the west, groundwater was not found. One or two more wells should be installed in the area between the application site and the Beeches (as both BB15 and BB19 failed to find gravel). Furthermore, the alluvial aquifer upstream from Swilly Pond should be investigated (as BB18 had to be abandoned). Wells in this area, together with wells in the whole study area, should be monitored on a weekly basis (preferably at extreme dry and wet periods) in order to collect data on extreme high and low water levels. It is recommended that the Corporation undertakes this monitoring and that the Institute of Hydrology enters the data on our Groundwater Information Processing System.

Appendix I

ACCOUNT OF VISIT TO BURNHAM BEECHES - 27 OCTOBER 1988

J. O. Mountford, Institute of Terrestrial Ecology

A. Species lists for individual sites

(i) Swilly Pond - SU948842

Pond Proper:	*Glyceria fluitans*	*Iris pseudacorus*
	Juncus effusus	*Agrostis stolonifera*
	Lycopus europaeus	*Polygonum hydropiper**
	Ranunculus repens	*Salix atrocinerea*
	Salix fragilis	*Scrophularia nodosa*
	Solanum dulcamara	*Cardamine flexuosa*
(reported):	*Lythrum portula*	

*Some species approached *P. minus.*

Woodland adjacent:	*Carex remota*	*Fagus sylvatica*
	Geum urbanum	*Hedera helix*
	Ilex aquifolium	*Prunus avium*
	Pteridium aquilinum	*Sambucus nigra*
	Prunus laurocerasus	

Callitriche stagnalis - in stream into pond

The pond is dominated by mixed *Glyceria fluitans* and *Agrostis stolonifera* with no other species more than occasional. The upper shores have *Agrostis stolonifera* giving was to *A. capillaris* in a species-poor grass-heath. The surrounding woodland is beech over a holly understorey with some thorn bushes and occasional oak. The ground cover is sparse with *Mnium hornum* significant among the mosses. Some areas of bracken fern exist.

(ii) Middle Pond etc. - SU949845

Pond and banks:	*Agroistis stolonifera*	*Alnus glutinosa*
	Callitriche stagnalis	*Equisetum fluviatile*
	Iris pseudacorus	*Juncus bulbosus*
	Juncus effusus	*Juncus tenuis*
	Lycopus europaeus	*Molinia caerulea*
	Myosotis scorpioides	*Nuphar lutea*
	Polygonum hydropiper	*Ranunculus flammula*
	Tussilago farfara	*Typha latifolia*

Utricularia vulgaris s.l. (*U. neglecta* reported)
Sphagnum spp.

Woodland between here and road towards Swilly Pond contains many of the species listed under (i) with the following noted by the stream connecting the two ponds:

Cardamine flexuosa	*Carex demissa*
Carex remote	*Deschampsis flexuosa*
Dryopteris dilatata	*Glyceria fluitans*
Juncus effusus	

The pond has a large emergent stand of horsetail with water-lilly in the deeper water near the outlet. Areas of emergent Reedmace etc. occur near the north end and water-logged shorelines have *Myosotis* and *Ranunculus flammula*. The southern bank by the stream inlet has a patch of *Molinia* and *Sphagnum* with *Juncus bulbosus* and Utricularia in the water adjacent. Trampled areas have large populations of the alien rush *Juncus tenuis*. The woodland is largely like that in (i) but the streamside vegetation is richer and good areas of *bryophytes* exist on steep eroding earth slopes.

(iii) Upper pond and cleared bog to east - SU952848:

Cleared bog:	*Epilobium hirsutum*	*Epilobium palustre*
	*Juncus bulbosus**	*Juncus conglomeratus*
	*Juncus effusus**	*Juncus acutiflorus*
	*Molinia caerulea**	*Pinus sylvestris*
	*Polygonum hydropiper**	*Viola palustris*
	Potamogeton polygonifolius	
	Sphagnum spp*	
	Polytichum spp	
Reported:	*Narthecium ossifragum*	

Pond those from bog marked *, plus:

Iris pseudacorus	*Juncus tenuis*
Nuphar lutea	*Typha latifolia*
Utricularia vulgaris s.l.	

Woodland between pond and bog and immediately around both is much wetter with large areas of *Molinia/Sphagnum* along the stream line. Other species of note are:

	Alnus glutinosa	*Castanea sativa*
	Frangula alnus	
Where drier:	*Festuca gigantea*	*Sorbus area* s.l.
	Hieracium perpropinquum	

The pond is very similar to Middle pond with no horsetail and a very large bed of *Utricularia*. The bog is dominated by mixed mosses, rushes and *Molinia*, with pools well formed and covered in pondweed. *Juncus tenuis* is very common along paths here and *Agrostis capillaris* dominates open areas in the woodland.

(iv) North of Stag P.H. - SU954844

Dry grass heath near car-park and locally within woodland:

Agrostis capillaris	*Calluna vulgaris*
Carex binervis	*Deschampsia flexuosa*
Festuca ovina	*Galium saxatile*
Danthonia decumbens	*Nardus stricta*

Woodland, mostly secondary and less than 30 years old:

Dryoperis dilatata	*Juniperus communis**
*Molinia caerulea***	*Sorbus aucuparia*
Quercus cerris	*Sorbus* x *thuringiaca*

*Juniper grows here in a population of approximately 20 bushes which are being encouraged by woodland clearance.

**Spring areas support *Molinia/Sphagnum* with a little *Juncus* n.b. *Sorbus* x *thuringiaca* is the name given to the very rare natural and native hybrid between *S. area* s.l. (whitebeam) and *S. aucuparia* (rowan).

(v) Victory cross - SU951450

Woodland and pathsides near swallow-holes to the N, NW and W of Upper Pond:

Agrostis capillaris	*Ajuga reptans*
Calluna vulgaris	*Carex binervis*
Castanea sativa	*Corylus avellana*
Dryopteris dilatata	*Dryopteris filix-mas*
*Fagus sylvatica**	*Frangula alnus*
Geum urbanum	*Glechoma hederacea*
Hedera helix	*Ilex aquifolium*
*Juncus tenuis***	*Lonicera periclymenum*
Luzula pilosa	*Melampyrum pratense*
Melica uniflora	*Mentha arvensis*
Populus x *canescens****	*Prunus avium*
Quercus petraea	*Quercus robur*
Sanicula europaea	*Sorbus aria* s.s.
*Veronica beccabunga*****	*Viburnum opulus*
Symplocarpus foetidus (probably this)*****	

*Many beeches are old and hollow pollards.
**This rush dominates some paths.
***Six very well grown, apparently native, trees near swallow-holes.
****The alien skunk cabbage and the native brooklime grow in the water-logged areas near the swallow-holes,

B. Comments on rare or uncommon species recorded.

(a) *Lythrum portula* (water purslane) is relatively common south of the

Thames and in Wales but is generally an uncommon species of wet open (e.g. trampled or exposed mud) sites on acid soils. It was not seen during the visit but suitable habitats exist and within Bucks it must be counted an uncommon plant.

(b) *Prunus laueocerasus* (cherry laurel) an uncommon alien tree or shrub here naturalised in beech understorey. Of no conservation significance - except as a potential pest.

(c) *Utricularia vulgaris* s.l. (bladderwort) is an uncommon species nationally with concentrations in East Anglia, the New Forest, east Kent, etc. Whether this plant is *U. vulgaris* in the strict sense or *U. neglecta* as reported is irrelevant, either species rarely has such good populations as that in Upper Pond, and the site must be counted as valuable.

(d) *Molinia caerulea* (purple moor-grass) and *Sphagnum spp* (bog-moss) are both abundant components of bog, wet-heath and other water-logged communities in the north and west of Britain, but in the Home Counties, the combination of wetness and acidity is rare and these plants must be counted as important in terms of the habitat they represent.

(e) *Juncus tenuis* (slender rush) is a North American alien spreading rapidly in areas where drainage is impaired through soil compaction as along paths. Though still local and something of a botanical curiosity, it is of no conservation significance.

(f) *Carex demissa* (common yellow-sedge) has a similar distribution to those species dealt with in (d) but is hardly ever a dominant and is more typical of wet peaty places with some mineral flushing, though not in true fens usually. An interesting species to have and to be looked for in the Upper Pond Bog.

(g) *Potamogeton polygonifolius* (bog pondweed), *Narthecium ossifragum* (bog asphodel), *Viola palustris* (bog violet) and *Juncus bulbosus* (bulbous rush) are all plants primarily of acid bogs. They are hence all much commoner in the north and west. The pondweed and the rush occur in and around bog-pools and are widespread in the southeast but local. The asphodel is much less common, more typical of the bog surface and almost absent from England east of the Solent-Humber line except for small populations on the Surrey heaths, in the Weald and in west Norfolk. The plants here are a very valuable outlier of the Surrey populations. Bog violet grows in a wide variety of water-logged acid sites but is nonetheless uncommon in this region.

(h) *Frangula alnus* (alder buckthorn) is an important component of wet woodland and carr on peat in southern England. It is still widespread south of the Thames-Severn line and in the Vale of York and Cheshire/Shropshire plain. Not uncommon near here it is however a species of increasingly threatened habitats.

(i) *Nardus stricta* (mat-grass) and *Carex binervis* (green-ribbed sedge) are typical of heaths where there may be somewhat impeded drainage. They occur commonly on moors in the north and west of Britain but are local in southeast England.

(j) *Juniperus communis* (juniper) is still relatively common in the Scottish Highlands and the Lake District. The plant was once common on chalk downs in southern England, but has declined considerably over the last 50 years (see L. k. Ward's research). Populations off the chalk are almost extinct in this area and the group here is of great importance. It is interesting to note the growth form resembling that of Speyside woodlands.

(k) *Sorbus* x *thuringiaca* (rowan-whitebeam hybrid) is very rarely seen because the two parents are usually ecologically distinct, rowan on acid heaths and woods, whilst whitebeam grows on the chalk. This tree is thus of considerable interest.

(l) *Populus* x *canescens* (grey popular) is much rarer as a native than as a planted tree. Its origin as a probable hybrid between aspen and white poplar further complicates matters, since the common cultivation of the latter parent in shelter belts in recent years has allowed grey poplars in places well outside their putative native distribution. It is probably only a true native in England east of the Wash-Solent line, and these fine trees in natural woodland towards the west edge of the "native range" must be considered of great interest.

AJD/vw
28.11.88

Appendix II

Borehole logs

PROJECT: Burnham Beeches

BOREHOLE NO: BB1

DRILLING METHOD	LOCATION	
Power auger FROM 0 M. TO 2.8 M. Hyd. hammer FROM 2.8 M. TO 5.2 M.	Hawthorn Dell 63m E of junction of Hawthorn Lane with Crowpiece Lane along Hawthorn Lane & 45 m N of Hawthorn Lane.	G. REF.: 9481 8448 START DATE: 3/11/88 COMPLETION DATE: 3/11/88 CONTRACTOR IH

WATER STRUCK.	ROSE TO.	CASING DIAMETER/TYPE:
Water not struck		
.....M.BGL.	.....M.BGL.	.....MM FROM ..... M.TO..... M., TYPE .....
.....M.BGL.	.....M.BGL.	.....MM FROM ..... M.TO..... M., TYPE .....

TOTAL DEPTH: 5.2 M.

DRILLED DIAMETER	SCREEN DIAMETER/TYPE:
75 MM. FROM 0 M. TO 2.8 M.	..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....
54 " " 2.8 " 4.0 "	
35 MM. FROM 4.0 M. TO 5.2 M.	..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)	SUMMARY OF AQUIFER CONDITIONS / LITHOLOGY	DEPTH (MBGL)	BOREHOLE CONSTRUCTION (Casing/screen (gr. pack)	ELEVATION OF WATER M.AOD	DEPTH TO WATER M.BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL.	STRATIGRAPHIC UNITS
		Elevation of G.L. = 57.73 m AOD								
		Sandy GRAVEL						57.1	0.6	
1	BB1/1 0.6-2.8	Firm, strong brown (7.5YR5/6) sandy silty CLAY with occasional pebbles.								
2								54.9	2.8	Head
3	BB1/2 2.8-3.3	Firm, pale yellow (2.5Y 7/4), variegated, laminated, sandy silty CLAY.								Reading Beds.

BOREHOLE NO. BB1

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)			DEPTH (M. BGL)	BOREHOLE CONSTRUCTION (casing/screen/gr. pack)	ELEVATION OF WATER M. AOD	DEPTH TO WATER M. BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL	STRATIGRAPHIC UNITS		
4	BB1/3 3.7-4.0								53.7	4.0			
	BB1/4 4.4-4.6		Medium dense, strong brown (7.5YR5/6) fine-med. SAND becoming light grey (2.5Y7/2) at about 4.5m.										
5	BB1/5 4.9-5.2		dense, light yellowish brown (10YR6/4) very sandy GRAVEL.						53.7	5.0			
			End of borehole.						53.5	5.2			
6													
7													
8													

PROJECT: Burnham Beeches

BOREHOLE NO: 882

DRILLING METHOD: Hyd. hammer FROM 0 M. TO 2.0 M.
.....FROM ....M. TO ..... M.

LOCATION: Hawthorn Dell
94m along path NE of Henry's Night Club.

G. REF.: 947.8.4.46

START DATE: 3/11/88

COMPLETION DATE: 3/11/88

CONTRACTOR IH.

WATER STRUCK. ROSE TO.
Water not struck
.....M.BGL. .....M.BGL.
.....M.BGL. .....M.BGL.

CASING DIAMETER/TYPE:
.....MM FROM ..... M.TO..... M., TYPE .....
.....MM FROM ..... M.TO..... M., TYPE .....

TOTAL DEPTH: 2.0 M.

DRILLED DIAMETER
35 MM. FROM 0 M. TO 2.0 M.
.....MM. FROM ....M. TO .... M.

SCREEN DIAMETER/TYPE:
..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....
..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)	SUMMARY OF AQUIFER CONDITIONS / LITHOLOGY	DEPTH (MBGL)	BOREHOLE CONSTRUCTION (Casing/screen (gr. pack)	ELEVATION OF WATER M.AOD	DEPTH TO WATER M.BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL.	STRATIGRAPHIC UNITS
0	882/1 0.1-0.5	Drilling terminated because of hard gravel.							0.1	
	882/2 0.5-0.8	Humus.								
1	882/3 0.8-1.3	Firm, brown (7.5YR4/4) gravelly, sandy silty CLAY							0.8	
		Firm, yellowish brown (10YR5/6) clayey SILT with occasional pebbles becoming gravelly below 1.5m								Head.
2	882/4 1.3-2.0								2.0	
		End of borehole.								
3										

PROJECT: Burnham Beeches

BOREHOLE NO: BB3

DRILLING METHOD: Hyd. hammer FROM ....M. TO ..... M.
.....FROM ....M. TO ..... M.

LOCATION: At Swilly Pond near Crow Piece Lane.

G. REF.: 94758423

START DATE: 7/11/88

COMPLETION DATE: 7/11/88

CONTRACTOR: IH

WATER STRUCK. ROSE TO.
Water not struck
.....M.BGL. .....M.BGL.
.....M.BGL. .....M.BGL.

CASING DIAMETER/TYPE:
25 MM FROM 0 M.TO 3.7 M., TYPE 3/4" gas pipe.
..... MM FROM ..... M.TO ..... M., TYPE .....

TOTAL DEPTH: 5.2 M.

DRILLED DIAMETER
54 MM. FROM 0 M. TO 5.2 M.
..... MM. FROM ....M. TO .... M.

SCREEN DIAMETER/TYPE:
25 MM FROM 3.7 M. TO 4.0 M; TYPE/SLOT(MM) Perf. drive point with porous element
..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

SUMMARY OF AQUIFER CONDITIONS

Elevation of Well top = 50.74 m AoD
Elevation of GL = 50.74 m AoD
Stick up = 0

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)	LITHOLOGY	DEPTH (MBGL)	BOREHOLE CONSTRUCTION (Casing/screen (, gr. pack)	ELEVATION OF WATER M.AOD	DEPTH TO WATER M.BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL.	STRATIGRAPHIC UNITS
		Topsoil, very dark grey (5YR3/1) rooty humic loam						50.4	0.3	
		Sandy GRAVEL						50.2	0.5	
	BB3/1 0.5-0.8	Soft, pale brown (10YR6/7) sandy silty CLAY						49.9	0.8	
1	BB3/2 0.8-2.0	Firm, reddish yellow (7.5YR6/8) silty CLAY with light grey mottling (2.5Y7/2) at depth becoming light grey (N7) with reddish yellow (7.5YR6/8) towards base						48.7	2.0	
2		Firm, light grey (2.5Y7/2) silty sandy CLAY becoming reddish yellow (7.5YR6/8) at 2.1						48.5	2.2	
3	BB3/3 2.2-4.2	Med. dense, brown (7.5YR5/4) muddy very sandy GRAVEL								River Terrace Deposits (Boyn Hill)

BOREHOLE NO. BB3

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)			DEPTH (M. BGL)	BOREHOLE CONSTRUCTION (casing/screen/gr. pack)	ELEVATION OF WATER M. AOD	DEPTH TO WATER M. BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL	STRATIGRAPHIC UNITS		
4				37					464	43			
	BB3/4 43-52.		Firm, light grey (10YR7/1) and yellow (10YR7/8) mottled sandy silty CLAY with coarse flint pebbles towards base.	40									
5									455	5.2	Reading Beds.		
			End of borehole										
6													
7													
8													

PROJECT: Burnham Beeches

BOREHOLE NO: BB4

DRILLING METHOD

Hydr-transverse FROM 0 M. TO 5.0 M.

.....FROM ....M. TO ..... M.

LOCATION

In N.E corner of paddock immediately S. of East Burnham House.

G. REF.: 9516 8410

START DATE: 8/11/88

COMPLETION DATE: 8/11/88

CONTRACTOR IH.

WATER STRUCK. ROSE TO.

2.4 M.BGL. .....M.BGL.

.....M.BGL. .....M.BGL.

CASING DIAMETER/TYPE:

50 MM FROM 0 M.TO 2.5 M., TYPE 2" galvanised.

.....MM FROM ..... M.TO..... M., TYPE .....

TOTAL DEPTH: 5.0 M.

DRILLED DIAMETER

54 MM. FROM 0 M. TO 4.2 M.

35 MM. FROM 4.2 M. TO 5.0 M.

SCREEN DIAMETER/TYPE:

50 MM FROM 2.5 M. TO 3.0 M; TYPE/SLOT(MM) Perf. drive tip

..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

SUMMARY OF AQUIFER CONDITIONS

Elevation of well top = 55.30 AOD

Elevation of G.L. = 54.81 AOD

Stick up = 0.49

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)	LITHOLOGY	DEPTH (MBGL)	BOREHOLE CONSTRUCTION (Casing/screen (gr. pack)	ELEVATION OF WATER M.AOD	DEPTH TO WATER M.BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL.	STRATIGRAPHIC UNITS
0	BB4/1 0-1.5	Topsoil						54.6	0.2	
		Firm, yellowish red (5YR5/8) clayey SILT with some pebbles and light grey (N7) mottled laminae towards base.						53.3	1.5	
2	BB4/2 2.2-2.7	Dense, brown (7.5YR5/4) muddy sandy GRAVEL						53.1	1.7	
		Dense, strong brown (7.5YR5/4) sandy GRAVEL becoming very sandy GRAVEL at 2.7m and reddish yellow (7.5YR6/8) at 3.0	2.5		52.4 ▽	2.4 ▽				River Terrace Deposits (Boyn Hill Terrace)
3	BB4/3 4.2-5.8		3.0							

BOREHOLE NO. BB4

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)		DEPTH (M. BGL)	BOREHOLE CONSTRUCTION (casing/screen/gr. pack)	ELEVATION OF WATER M. AOD	DEPTH TO WATER M. BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL	STRATIGRAPHIC UNITS
								51.0	3.8	
4	BB4/4 3.8-4.2	Dense brownish yellow (10YR6/6) very gravelly SAND								
								49.9	4.9	
5		Firm-stiff, brown (7.5YR5/2) CLAY						49.8	5.0	Reading Beds
		End of borehole								
6										
7										
8										

PROJECT: Burnham Beeches

BOREHOLE NO: BB5

DRILLING METHOD: Hyd. hammer FROM 0 M. TO 3.2 M.
..... FROM .... M. TO ..... M.

LOCATION: On south side of old drive to East Burnham House at old entrance to Thompkins Lane

G. REF.: 9500 8419

START DATE: 9/11/88

COMPLETION DATE: 9/11/88

CONTRACTOR: H.

WATER STRUCK. Water not struck. ROSE TO.
.....M.BGL. .....M.BGL.
.....M.BGL. .....M.BGL.

CASING DIAMETER/TYPE:
....25...MM FROM ....0.... M.TO....1.9... M., TYPE ....¾" galv pipe
.....MM FROM ..... M.TO..... M., TYPE .....

TOTAL DEPTH: 3.2 M.

DRILLED DIAMETER
...54.....MM. FROM .0..M. TO 3.2. M.
.....MM. FROM ....M. TO .... M.

SCREEN DIAMETER/TYPE:
25. MM FROM 1.9. M. TO 3.2. M; TYPE/SLOT(MM) Perf. drive tip with porous element
..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

SUMMARY OF AQUIFER CONDITIONS

Elevation of well top = 56.97 AOD
Elevation of GL. = 55.85
Stick up = 1.12.

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)	LITHOLOGY	DEPTH (M.BGL)	BOREHOLE CONSTRUCTION (Casing/screen (gr. pack)	ELEVATION OF WATER M.AOD	DEPTH TO WATER M.BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL.	STRATIGRAPHIC UNITS
		Topsoil, very dark grayish brown (10YR3/2) silt loam						55.5	0.3	
		Soft-firm, brownish yellow (10YR6/6) SILT						55.2	0.6	
1	BB6/1 0.6-2.1	Dense, strong brown (7.5YR5/8) very muddy sandy GRAVEL	1.9					53.7	2.1	River terrace deposit / Head
2	BB6/2 2.1-3.2	Firm-stiff, reddish yellow (7.5Y6/8) thinly laminated, silty CLAY with light grey (5Y7/2) Mottling	3.2					52.6	3.2	Reading Beds
		End of borehole								

PROJECT: Burnham Beeches

BOREHOLE NO: BB6

DRILLING METHOD

Hyd. hammer FROM 0 M. TO 6.5 M.

..... FROM .... M. TO ..... M.

LOCATION

In S. corner of field where path from Hawthorn Lane to Leys Farm cross Thompkins Lane.

G. REF.: 95028413

START DATE: 9/11/88

COMPLETION DATE: 9/11/88

CONTRACTOR IH.

WATER STRUCK. ROSE TO.

Water not struck

.....M.BGL. .....M.BGL.

.....M.BGL. .....M.BGL.

CASING DIAMETER/TYPE:

.....MM FROM ..... M.TO..... M., TYPE .....

.....MM FROM ..... M.TO..... M., TYPE .....

TOTAL DEPTH: 6.5 M.

DRILLED DIAMETER

54 MM. FROM 0 M. TO 5.2 M.

35 MM. FROM 5.2 M. TO 6.5 M.

SCREEN DIAMETER/TYPE:

..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

SUMMARY OF AQUIPER CONDITIONS

Elevation of GL. = 54.37

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)	LITHOLOGY	DEPTH (MBGL)	BOREHOLE CONSTRUCTION (Casing/screen (gr. pack)	ELEVATION OF WATER M.AOD	DEPTH TO WATER M.BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL.	STRATIGRAPHIC UNITS
0		Topsoil, dark greyish brown silty CLAY						54.2	0.2	
1	BB6/1 0.2-2.2	Soft, yellowish red (5YR5/6) silty CLAY								
2								52.2	2.2	
3	BB6/2 2.2-3.5	Soft, brownish yellow (10YR6/6) sandy silty CLAY						50.9	3.5	

BOREHOLE NO. BB6

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)		DEPTH (M. BGL)	BOREHOLE CONSTRUCTION (casing/screen/gr. pack)	ELEVATION OF WATER M. AOD	DEPTH TO WATER M. BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL	STRATIGRAPHIC UNITS
4	BB6/3 2.5-4.2	Soft, light yellowish brown (10YR6/4) silty CLAY with yellowish red (5YR5/8) mottles, slightly laminated.						50.0	4.2	?
5	BB6/4 4.2-5.2	Soft-firm, strong brown (7.5YR5/6) silty CLAY.						49.2	5.2	
6	BB6/5 5.2-6.0	Med dense, strong brown (7.5YR4/6) gravelly clayey SAND becoming clayey SAND below 6.0m and pinkish grey (7.5YR6/2) sandy CLAY at base.						47.9	6.5	Lealty Beds.
8	BB6/6 6.0-6.5	End of borehole								

PROJECT: Burnham Beeches

BOREHOLE NO: BB7.

DRILLING METHOD

Hyd. hammer FROM 0 M. TO 3.2 M.

.....FROM ....M. TO ..... M.

LOCATION

46m from north east corner of field along path that runs from Hawthorn Lane to Leys Farm

G. REF.: 9510 8424

START DATE: 9/11/88

COMPLETION DATE: 9/11/88

CONTRACTOR HH.

WATER STRUCK. ROSE TO.

Water not struck.

.....M.BGL. .....M.BGL.

.....M.BGL. .....M.BGL.

CASING DIAMETER/TYPE:

.....MM FROM ..... M.TO..... M., TYPE .....

.....MM FROM ..... M.TO..... M., TYPE .....

TOTAL DEPTH: 3.2 M.

DRILLED DIAMETER

54 MM. FROM 0 M. TO 3.2 M.

.....MM. FROM ....M. TO .... M.

SCREEN DIAMETER/TYPE:

..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)	SUMMARY OF AQUIFER CONDITIONS / LITHOLOGY	DEPTH (MBGL)	BOREHOLE CONSTRUCTION (Casing/screen (gr. pack)	ELEVATION OF WATER M.AOD	DEPTH TO WATER M.BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL.	STRATIGRAPHIC UNITS
		Elevation of GL = 59.45 m AoD								
		Topsoil, Very dark greyish brown (10YR3/2) Strong Silty CLAY.						59.1	0.3	
	BB7/1 0.3-0.7	Soft-firm, strong brown (7.5YR5/8) Silty CLAY with Slight light grey mottling.						58.7	0.7	
1	BB7/2 0.7-1.8	Firm, yellowish red (5YR5/8) Sandy Silty CLAY with gravel and Slight light grey (N7) Mottling						57.6	1.8	
2	BB7/3 1.8-2.2	Firm - Stiff, strong brown (7.5YR5/6) Sandy Silty CLAY						57.2	2.2	Reading Beds.
3	BB7/4 2.2-3.2	Firm - stiff, yellowish brown (10YR5/8) clayey Sandy Silt						56.2	3.2	
		End of borehole								

PROJECT: Burnham Beeches

BOREHOLE NO: BB8

DRILLING METHOD: Hyd. trem FROM 0 M. TO 3.2 M. ..... FROM .... M. TO ..... M.

LOCATION: In field E of Keenacre Stables 35m N of gate on S. boundary, at boundary with Crown Lane.

G. REF.: 95558421

START DATE: 10/11/88

COMPLETION DATE: 10/11/88

CONTRACTOR: IH.

WATER STRUCK. ROSE TO.
Water not struck
..... M.BGL. ..... M.BGL.
..... M.BGL. ..... M.BGL.

CASING DIAMETER/TYPE:
25 MM FROM 0 M.TO 0.7 M., TYPE 3/4" galv. p/pe.
..... MM FROM ..... M.TO ..... M., TYPE .....

TOTAL DEPTH: 3.2 M.

DRILLED DIAMETER
64 MM. FROM 0 M. TO 3.2 M.
..... MM. FROM .... M. TO .... M.

SCREEN DIAMETER/TYPE:
25 MM FROM 0.7 M. TO 1.0 M; TYPE/SLOT(MM) Ref. drive tip. With pierced plastic sheath
..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

SUMMARY OF AQUIFER CONDITIONS

Elevation of well top = 67.54 m AOD
Elevation of GL = 66.19 m AOD
Stick up = 1.35.

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)	LITHOLOGY	DEPTH (MBGL)	BOREHOLE CONSTRUCTION (Casing/screen (gr. pack)	ELEVATION OF WATER M.AOD	DEPTH TO WATER M.BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL.	STRATIGRAPHIC UNITS
		Topsoil, greyish brown (10YR5/1) silt loam						65.9	0.3	
1	BB8/1 0.3-1.0	Loose - med dense, pale brown (10YR 6/5) loamy GRAVEL	0.7					65.5	0.7	
		Med. dense, greyish brown (10YR5/2) sandy Gravel (damp).	1.0					65.2	1.0	
2	BB8/2 1.0-1.8	Med. dense, Strong brown (7.5YR5/6) clayey Sandy GRAVEL						64.4	1.8	Head.
	BB8/3 1.8-2.8.	Firm, light bluish grey and yellowish brown (10YR5/6) mottled CLAY, thinly laminated with occasional roots.						63.4	2.8	
3	BB8/4 2.8-3.2	Firm, light bluish grey and yellowish brown mottled sandy silty CLAY with occasional strong brown (7.5YR5/6) thin (< 0.01m) sand lens, thinly laminated.						63.0	3.2	
		End of borehole.								

PROJECT: Burnham Beeches

BOREHOLE NO: BB9

DRILLING METHOD

Hyd. hammer. FROM 0 M. TO 3.2 M.

.....FROM ....M. TO ..... M.

LOCATION

In field to W. of Crown Hill Cottage, Crown Lane alongside boundary with Thompkins Lane 35m from SE. corner of field.

G. REF.: 9550.8413

START DATE: 10/11/88

COMPLETION DATE: 10/11/88

CONTRACTOR HH

WATER STRUCK. ROSE TO.

Water not struck

.....M.BGL. .....M.BGL.

.....M.BGL. .....M.BGL.

CASING DIAMETER/TYPE:

.....MM FROM ..... M.TO..... M., TYPE .....

.....MM FROM ..... M.TO..... M., TYPE .....

TOTAL DEPTH: 3.2 M.

DRILLED DIAMETER

54 MM. FROM 0 M. TO 3.2 M.

.....MM. FROM ....M. TO .... M.

SCREEN DIAMETER/TYPE:

..... MM FROM .....M. TO ..... M; TYPE/SLOT(MM) .....

..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

SUMMARY OF AQUIFER CONDITIONS

Elevations not surveyed.

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)	LITHOLOGY	DEPTH (MBGL)	BOREHOLE CONSTRUCTION (Casing/screen (gr. pack)	ELEVATION OF WATER M.AOD	DEPTH TO WATER M.BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL.	STRATIGRAPHIC UNITS
0		Topsoil, dark greyish brown (10YR 4/2) silt loam							0.3	
1	BB9/1 0.3-0.7	Firm, light yellowish brown (10YR 6/4) SILT							0.7	
	BB9/2 0.7-1.2	Dense, light yellowish brown (10YR 6/4) silty sandy GRAVEL							1.2	Head
	BB9/3 1.2-1.4	Stiff, strong brown (7.5YR 5/8) silty CLAY in fine angular patinated flint pebbles and light grey (N7) mottling							1.4	
2	BB9/4 1.4-2.9	Stiff, strong brown (7.5YR 5/8) and light grey (N7) silty CLAY with layered mottling.							2.9	
3	BB9/5 2.9-3.2	Firm, pinkish grey (7.5YR 7/2) clayey SILT becoming light grey (2.5Y 7/2) with depth with some strong brown (7.5YR 7/2) matrix type mottling.							3.2	
		End of borehole								

PROJECT: Burnham Beeches

BOREHOLE NO: BB10

DRILLING METHOD: Hyd. hammer. FROM 0 M. TO 4.2 M. ..... FROM .... M. TO ..... M.

LOCATION: Alongside W. Boundary of field S. of Keensacre, 21m from SW corner.

G. REF.: 95708421

START DATE: 10/11/88

COMPLETION DATE: 10/11/88

CONTRACTOR: HT.

WATER STRUCK. ROSE TO.
Water not struck.
.....M.BGL. .....M.BGL.
.....M.BGL. .....M.BGL.

CASING DIAMETER/TYPE:
25 MM FROM 0 M.TO 1.2 M., TYPE 3/4" galv. pipe
..... MM FROM ..... M.TO..... M., TYPE .....

TOTAL DEPTH: 4.2 M.

DRILLED DIAMETER
54 MM. FROM 0 M. TO 4.2 M.
..... MM. FROM .... M. TO .... M.

SCREEN DIAMETER/TYPE:
25 MM FROM 1.2 M. TO 1.5 M; TYPE/SLOT(MM) Pvc. drive typ with prods plastic element.
..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

SUMMARY OF AQUIFER CONDITIONS

Elevation of well top = 65.39 AOD
Elevation of GL = 64.63 AOD.
Stick up = 0.76

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)	LITHOLOGY	DEPTH (MBGL)	BOREHOLE CONSTRUCTION (Casing/screen (gr. pack)	ELEVATION OF WATER M.AOD	DEPTH TO WATER M.BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL.	STRATIGRAPHIC UNITS
0		Topsoil, very dark greyish brown (10YR3/2) loam, becoming yellowish brown (10YR5/4) stony silty CLAY with depth.						64.1	0.5	
0.5	BB10/1 0.5-0.9	Loose-Med. dense, brownish yellow (10YR6/6) muddy sandy GRAVEL.						63.7	0.9	
0.9		Soft-Firm, strong brown (7.5YR5/8) and light grey mottled CLAY						63.5	1.1	Head
1	BB10/3 1.0-1.5	Loose-med. dense, strong brown (7.5YR5/8) GRAVEL/SAND (damp.)	1.2					63.1	1.5	
1.5			1.5							
2	BB10/4 1.5-2.7	Soft, strong brown (7.5YR5/6) silty CLAY becoming brown (7.5YR5/4) with depth						61.9	2.7	
2.7	BB10/5 2.7-3.2	Soft-firm, light bluish grey and brown/yellow (10YR6/6) mottled, laminated, clayey SILT						61.4	3.2	Reading Beds
3.2		Firm-stiff, light bluish grey and strong brown (7.5YR5/8) CLAY								

BOREHOLE NO. BB10

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)			DEPTH (M. BGL)	BOREHOLE CONSTRUCTION (casing/screen/gr. pack)	ELEVATION OF WATER M. AOD	DEPTH TO WATER M. BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL	STRATIGRAPHIC UNITS		
4	BB9/9/6 3.2-4.0		Firm-stiff, pale yellow (5Y 7/4) clayey SILT						60.6	4.0	Reading Beds.		
									60.4	4.2			
5			End of borehole										
6													
7													
8													

PROJECT: Burnham Beeches.

BOREHOLE NO: BB11

DRILLING METHOD

Hyd. hammer FROM 0 M. TO 5.0 M.

..... FROM .... M. TO ..... M.

LOCATION

In grounds of Islamic Prem 19m N. of garages.

G. REF.: 95467.88363.

START DATE: 11/11/88

COMPLETION DATE: 11/11/88

CONTRACTOR IH.

WATER STRUCK. Water struck at 3.3 m BGL ROSE TO.

..... M.BGL. ..... M.BGL.

..... M.BGL. ..... M.BGL.

CASING DIAMETER/TYPE:

50 MM FROM 0 M.TO 3.4 M., TYPE 2" galv. P/P

..... MM FROM ..... M.TO ..... M., TYPE .....

TOTAL DEPTH: 5.0 M.

DRILLED DIAMETER

154 MM. FROM 0 M. TO 4.6 M.

135 MM. FROM 4.0 M. TO 5.0 M.

SCREEN DIAMETER/TYPE:

50 MM FROM 3.4 M. TO 3.9 M: TYPE/SLOT(MM) PVC drain/p.

..... MM FROM ..... M. TO ..... M: TYPE/SLOT(MM) .....

SUMMARY OF AQUIFER CONDITIONS

Elevation of well top = 52.10 AOD
Elevation of GL. = 51.54 AOD
Stick up = 0.56 m

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)	LITHOLOGY	DEPTH (MBGL)	BOREHOLE CONSTRUCTION (Casing/screen (gr. pack)	ELEVATION OF WATER M.AOD	DEPTH TO WATER M.BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL.	STRATIGRAPHIC UNITS
		Topsoil, very dark greyish brown (10YR3/2) silty clay loam becoming dark greyish brown with depth.						51.0	0.5	
1	BB11/1 0.5-1.9.	Firm-stiff, light yellowish brown (10YR6/4) clayey silt, becoming strong brown (7.5YR5/8) and light grey (5Y7/2) mottled and slightly sandy towards base.						49.6	1.9	
2	BB11/2 1.9-3.3	Very dense, strong brown (7.5YR5/6) sandy GRAVEL	3.4					48.2	3.3	River Terrace Deposits (Sand & Gravel)

BOREHOLE NO. BB11

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)			DEPTH (M. BGL)	BOREHOLE CONSTRUCTION (casing/screen/gr. pack)	ELEVATION OF WATER M. AOD	DEPTH TO WATER M. BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL	STRATIGRAPHIC UNITS		
4	BB11/3 33-4.2		Very dense, brownish yellow (10YR6/6) GRAVEL / SAND, with coarse black flint pebbles.	3.9									
5	BB11/4 4.7-5.0		Firm, brown (10YR5/3) laminated CLAY							4.7			
			End of borehole							5.0	Reading Beds.		
6													
7													
8													

PROJECT: Burnham Beeches

BOREHOLE NO: BB12

DRILLING METHOD: Hy.d. hammer FROM 0 M. TO 3.2 M.
.....FROM ....M. TO ..... M.

LOCATION: Alongside path running NW from the Stag Pt to Middle Pond 125m from car park at path intersection

G. REF.: 9515 8440

START DATE: 11/11/97

COMPLETION DATE: 11/11/97

CONTRACTOR IH

WATER STRUCK. ROSE TO.
Water not struck
.....M.BGL. .....M.BGL.
.....M.BGL. .....M.BGL.

CASING DIAMETER/TYPE:
.....MM FROM ..... M.TO..... M., TYPE .. ..
... .MM FROM ..... M.TO..... M., TYPE .....

TOTAL DEPTH: 3.2 M.

DRILLED DIAMETER
54 MM. FROM 0 M. TO 3.2 M.
.....MM. FROM ....M. TO .... M.

SCREEN DIAMETER/TYPE:
..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....
..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

SUMMARY OF AQUIFER CONDITIONS

Elevation of GL = 67.73 AOD

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)	LITHOLOGY	DEPTH (MBGL)	BOREHOLE CONSTRUCTION (Casing/screen (gr. pack)	ELEVATION OF WATER M.AOD	DEPTH TO WATER M.BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL.	STRATIGRAPHIC UNITS
		Topsoil, reddish brown (5YR4/3) humus						67.5	0.2	
		Soft, grey (5YR6/1) SILT becoming gravelly towards base						67.2	0.5	
1	BB12/1 0.5–1.2	Firm, light grey (5Y7/1) clayey SILT with strong brown (7.5YR5/8) banded mottling.						66.5	1.2	
2	BB12/2 1.2–2.2	Firm, strong brown (7.5YR5/8) clayey SILT with light bluish grey banded mottling						65.5	2.2	Reading Beds
3	BB12/3 2.2–3.2	Firm, light bluish grey, silty CLAY with yellow (10YR7/8) banded mottling.						64.5	3.2	
		End of borehole.								

PROJECT: Burnham Beeches

BOREHOLE NO: BB13

DRILLING METHOD

Hyd. hammer FROM 0 M. TO 1.0 M.
Power auger FROM 1.0 M. TO 7.0 M.

LOCATION

Near path junction 75m NW of Juniper Cottages.

G. REF.: 9540 8455

START DATE: 14/11/88

COMPLETION DATE: 15/11/88

CONTRACTOR IH.

WATER STRUCK. ROSE TO.

4.2 M.BGL. ..... M.BGL.
..... M.BGL. ..... M.BGL.

CASING DIAMETER/TYPE:

50 MM FROM 0 M. TO 4.8 M., TYPE 2" gal pipe
..... MM FROM ..... M. TO ..... M., TYPE .....

TOTAL DEPTH: 7.0 M.

DRILLED DIAMETER

54 MM. FROM 0 M. TO 1.0 M.
150 MM. FROM 0 M. TO 7.0 M.

SCREEN DIAMETER/TYPE:

50 MM FROM 4.8 M. TO 5.3 M; TYPE/SLOT(MM) Perf. drive tip.
..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

SUMMARY OF AQUIFER CONDITIONS

Elevation of well top = 75.20 m AOD
Elevation of GL = 74.66 m AOD
Stick up = 0.54

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)	LITHOLOGY	DEPTH (MBGL)	BOREHOLE CONSTRUCTION (Casing/screen (gr. pack)	ELEVATION OF WATER M.AOD	DEPTH TO WATER M.BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL.	STRATIGRAPHIC UNITS
0		Topsoil, dark brown (7.5YR3/2) stony silt loam						74.5	0.1	
		Firm, yellowish brown (10YR5/6) SILT with some gravel at base.						74.3	0.3	
		Dense, strong brown (7.5YR5/8) clayey sandy GRAVEL						74.0	0.5	
		Dense, strong brown (7.5YR5/8) SAND.						73.8	0.7	
1	BB13/1 0.7-4.2	Very dense, strong brown (7.5YR5/6) muddy GRAVEL/SAND.								River Terrace Deposit (Winter Hill)
2										
3										

BOREHOLE NO. BH13.

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)			DEPTH (M. BGL)	BOREHOLE CONSTRUCTION (casing/screen/gr. pack)	ELEVATION OF WATER M. AOD	DEPTH TO WATER M. BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL	STRATIGRAPHIC UNITS		
4						70.4	4.2 ▽		70.4	4.2			
			Dense, yellowish brown (10YR 5/4) very muddy GRAVEL/SAND.	4.8									
5				5.3					69.3	5.3			
	BB13/3 5.3-7.0		Soft, grey (N3) silty CLAY.								Reading Beds.		
6													
7			End of borehole.						67.6	7.0			
8													

PROJECT: Burnham Beeches

BOREHOLE NO: BB14

DRILLING METHOD

Power auger FROM 0 M. TO 7.0 M.

.....FROM ....M. TO ..... M.

LOCATION

Alongside path running from Juniper Cottage towards 'Wedding Beech' 37m E. from intersection with path running to Stag PH.

G. REF.: 9530 8443

START DATE: 15/11/88

COMPLETION DATE: 15/11/88

CONTRACTOR HH.

WATER STRUCK. ROSE TO.

3.3 M.BGL. .....M.BGL.

.....M.BGL. .....M.BGL.

CASING DIAMETER/TYPE:

50 MM FROM 0 M.TO 5.2 M., TYPE 2" galv. pipe

.....MM FROM ..... M.TO..... M., TYPE .....

TOTAL DEPTH: 7.0 M.

DRILLED DIAMETER

150 MM. FROM 0 M. TO 7.0 M.

.....MM. FROM ....M. TO .... M.

SCREEN DIAMETER/TYPE:

50 MM FROM 5.2 M. TO 5.7 M; TYPE/SLOT(MM) Perf. drive tip

..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

SUMMARY OF AQUIFER CONDITIONS

Elevation of well top = 74.55 m AoD
Elevation of GL = 73.48 m AoD
Stick up = 1.07 m

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)	LITHOLOGY	DEPTH (MBGL)	BOREHOLE CONSTRUCTION (Casing/screen (gr. pack)	ELEVATION OF WATER M.AOD	DEPTH TO WATER M.BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL.	STRATIGRAPHIC UNITS
1		Very dense sandy GRAVEL.						72.0	1.5	River Terrace Deposits (Undifferentiated)
2	BB14/1 1.5-2.0	Med dense, yellowish red (5YR4/6) gravelly SAND.						71.5	2.0	
3		Very dense sandy GRAVEL.						70.5	3.0	
	BB14/2 3.0-4.0	med dense, strong brown (7.5YR5/8) gravelly SAND								

BOREHOLE NO. BB14

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)			DEPTH (M. BGL)	BOREHOLE CONSTRUCTION (casing/screen/gr. pack)	ELEVATION OF WATER M. AOD	DEPTH TO WATER M. BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL	STRATIGRAPHIC UNITS		
4			Dense, strong brown (7.5YR5/8) GRAVEL/SAND						69.5	4.0			
5	BB14/3 4.0-5.0			5.2									
				5.4					67.7	5.8			
6			Soft-firm, strong brown (7.5YR5/8) gravelly CLAY.										
7									66.5	7.0.			
			End of borehole.										
8													

PROJECT: Burnham Beeches

BOREHOLE NO: BB 15

DRILLING METHOD

Power auger FROM 0 M. TO 10·0 M.

.....FROM ....M. TO ..... M.

LOCATION

In NE corner of paddock 92m NE of boundary with Hunts Wood Farm & 143 m SE of Grove Rd.

G. REF.: 9446 8424.

START DATE: 14/11/88

COMPLETION DATE: 16/11/88

CONTRACTOR HH.

WATER STRUCK. ROSE TO.

Water not struck

.....M.BGL. .....M.BGL.

.....M.BGL. .....M.BGL.

CASING DIAMETER/TYPE:

.....MM FROM ..... M.TO..... M., TYPE .....

.....MM FROM ..... M.TO..... M., TYPE .....

TOTAL DEPTH: 10·0 M.

DRILLED DIAMETER

150 .....MM. FROM 0 M. TO 10·0 M.

.....MM. FROM ....M. TO .... M.

SCREEN DIAMETER/TYPE:

..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)	SUMMARY OF AQUIFER CONDITIONS / LITHOLOGY	DEPTH (MBGL)	BOREHOLE CONSTRUCTION (Casing/screen (gr. pack)	ELEVATION OF WATER M.AOD	DEPTH TO WATER M.BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL.	STRATIGRAPHIC UNITS
		Not surveyed.								
		Topsoil.							0·5.	
1	BB15/1 0·5-6·5.	Soft-firm, brown (7·5YR5/4) sandy pebbly CLAY becoming more sandy and gravelly below 6·5m.								
2										
3										

	DEPTH (M.BGL)
BB15/2 6.5 – 10.0	GRAIN SIZE ANALYSES (Sample No. and location)
	DEPTH (M. BGL)
	BOREHOLE CONSTRUCTION (casing/screen/gr. pack)
	ELEVATION OF WATER M. AOD
	DEPTH TO WATER M. BGL
	SYMBOLIC LOG
	ELEVATION M. AOD
	DEPTH M. BGL
	STRATIGRAPHIC UNITS

BOREHOLE NO. BB15

14	13	12	11	10	9	
						DEPTH (M.BGL)
						GRAIN SIZE ANALYSES (Sample No. and location)
			End of borehole			
						DEPTH (M. BGL)
						BOREHOLE CONSTRUCTION (casing/screen/gr. pack)
						ELEVATION OF WATER M. AOD
						DEPTH TO WATER M. BGL
						SYMBOLIC LOG
						ELEVATION M. AOD
				100		DEPTH M. BGL
						STRATIGRAPHIC UNITS

BOREHOLE NO. BH5

PROJECT: Burnham Beeches

BOREHOLE NO: BB16

DRILLING METHOD

Power auger FROM 0 M. TO 10.0 M.

.....FROM ....M. TO ..... M.

LOCATION

Near path running from Beeches Oak to Middle Pond, 77m from gate at Lord Mayors Drive.

G. REF.: 9488.8457

START DATE: 16/11/88

COMPLETION DATE: 17/11/88

CONTRACTOR IH.

WATER STRUCK. ROSE TO.

Damp 9.5-10.0.

.....M.BGL. .....M.BGL.

.....M.BGL. .....M.BGL.

CASING DIAMETER/TYPE:

...50....MM FROM ....0.... M.TO....8.0... M., TYPE 2" gal. pipe

.....MM FROM ..... M.TO..... M., TYPE .....

TOTAL DEPTH: 10.6 M.

DRILLED DIAMETER

...150.....MM. FROM 0....M. TO 10.0 M.

.....MM. FROM ....M. TO .... M.

SCREEN DIAMETER/TYPE:

. 0. MM FROM 8.0 M. TO 8.5 M; TYPE/SLOT(MM) Perf. drive tip wrapped in terram.

..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

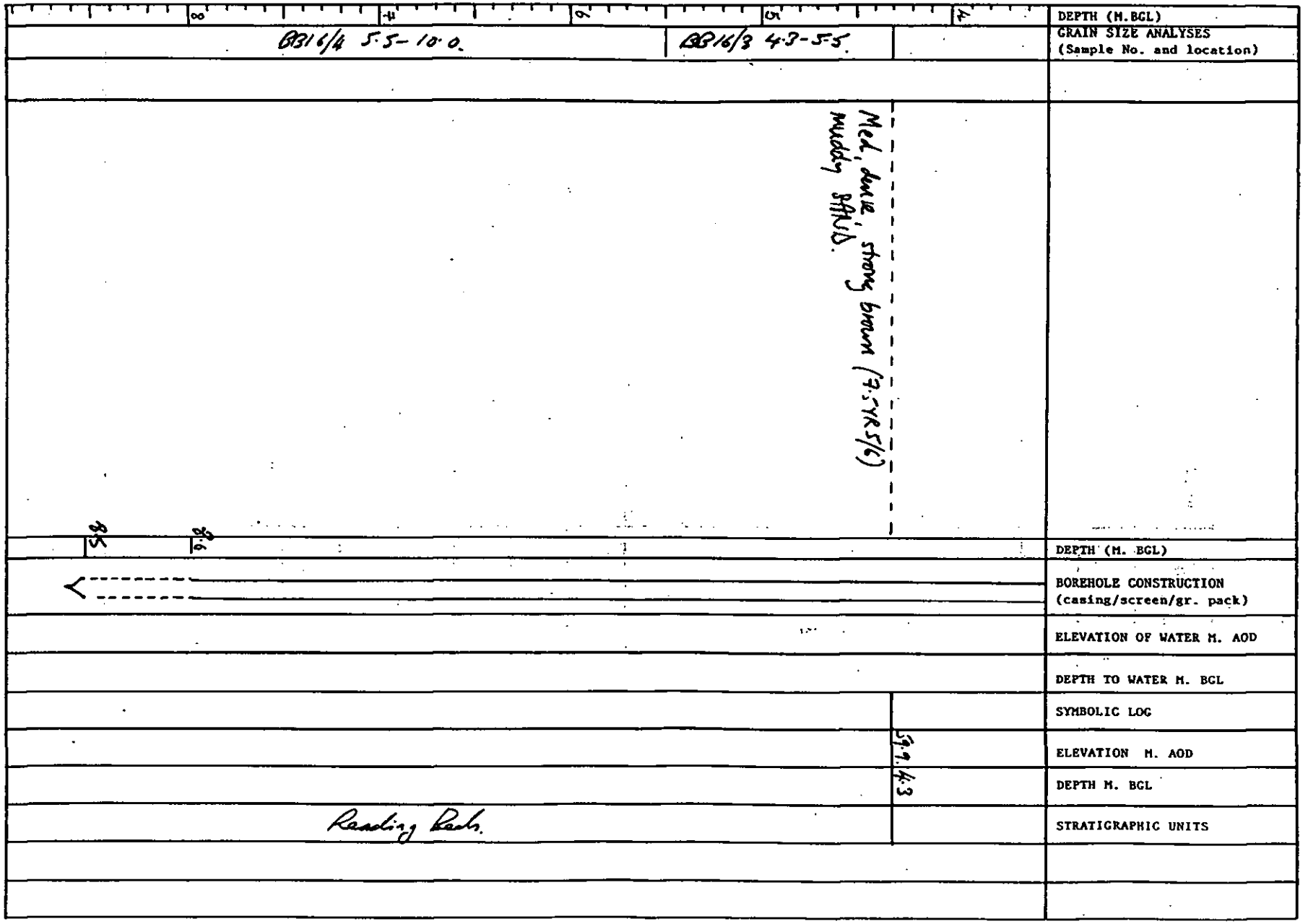
SUMMARY OF AQUIFER CONDITIONS

Elevation of well top = 65.72 m AOD

Elevation of GL = 64.18 m AOD

Stick up = 1.54m.

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)	LITHOLOGY	DEPTH (MBGL)	BOREHOLE CONSTRUCTION (Casing/screen (gr. pack)	ELEVATION OF WATER M.AOD	DEPTH TO WATER M.BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL.	STRATIGRAPHIC UNITS
0										
1										
2	BB16/1 0-3.0	Dense, yellowish red (5YR 4/6) muddy very gravelly SAND								
3								63.9	3.0	River Terrace Deposits (Upper Gravel)
		Very dense, yellowish red (5YR 4/6) sandy GRAVEL.								


8
4
6
5
4
DEPTH (M.BGL)
GRAIN SIZE ANALYSES (Sample No. and location)
BB16/4 5.5-10.0.
BB16/3 4.3-5.5.
Med. dense, strong brown (7.5YR5/6) muddy SAND.
8.5
9.6
DEPTH (M. BGL)
BOREHOLE CONSTRUCTION (casing/screen/gr. pack)
ELEVATION OF WATER M. AOD
DEPTH TO WATER M. BGL
SYMBOLIC LOG
39.1.43
ELEVATION M. AOD
DEPTH M. BGL
Reading Beds.
STRATIGRAPHIC UNITS
BOREHOLE NO. BB16

BOREHOLE NO. BB16

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)			DEPTH (M. BGL)	BOREHOLE CONSTRUCTION (casing/screen/gr. pack)	ELEVATION OF WATER M. AOD	DEPTH TO WATER M. BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL	STRATIGRAPHIC UNITS		
9													
10									54.2	10.0			
			End of borehole.										
11													
12													
13													
14													

PROJECT: Burnham Beeches

BOREHOLE NO: BB17

DRILLING METHOD: Power auger. FROM 0 M. TO ..... M.
.....FROM ....M. TO ..... M.

LOCATION: 25m along track N. of track running 25S m E of Middle Pond.

G. REF.: 9522.8458

START DATE: 17/11/88

COMPLETION DATE: 18/11/88

CONTRACTOR: M.

WATER STRUCK. ROSE TO.
1.9 M.BGL. .....M.BGL.
.....M.BGL. .....M.BGL.

CASING DIAMETER/TYPE:
50 MM FROM 0 M.TO 4.1 M., TYPE 2" galv. pipe
.....MM FROM ..... M.TO..... M., TYPE .....

TOTAL DEPTH: 7.0 M.

DRILLED DIAMETER
150 MM. FROM 0 M. TO 7.0 M.
.....MM. FROM ....M. TO .... M.

SCREEN DIAMETER/TYPE:
50 MM FROM 4.1 M. TO 4.6 M; TYPE/SLOT(MM) .....
..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)	LITHOLOGY	DEPTH (MBGL)	BOREHOLE CONSTRUCTION (Casing/screen (gr. pack)	ELEVATION OF WATER M.AOD	DEPTH TO WATER M.BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL.	STRATIGRAPHIC UNITS
1	BB17/1 0-1.5	Very dense, yellowish red (5YR4/6) muddy very sandy GRAVEL						70.8	1.5.	River Terrace Deposit (Lynch Hill)
2	BB17/2 1.5-2.6	Dense, strong brown (7.5YR 5/6) very sandy GRAVEL						69.7	2.6	
3	BB17/3 2.6-5.5.	Loose, brownish yellow (10YR6/6) silty SAND with gravelly band 3.3-4.0m								Reading Beds

SUMMARY OF AQUIFER CONDITIONS

Elevation of well top = 73.44 m AOD
Elevation of GL. = 72.28 AOD.
Stick up = 1.16

BOREHOLE NO. BB17

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)			DEPTH (M. BGL)	BOREHOLE CONSTRUCTION (casing/screen/gr. pack)	ELEVATION OF WATER M. AOD	DEPTH TO WATER M. BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL	STRATIGRAPHIC UNITS		
4													
5									66·8	5·5.			
6	BB17/4 5·5–7·a		Soft, grey (5Y 5/1) slightly gravelly sandy silt.										
7									65·3	9·0			
			End of borehole										
8													

PROJECT: Burnham Beeches

BOREHOLE NO: BB18

DRILLING METHOD

Power auger FROM 0 M. TO 1.5 M.

.....FROM ....M. TO ..... M.

LOCATION

N. of Hawthorn Lane at junction with Thompkins Lane on NW bank of stream

G. REF.: 9491.8434

START DATE: 18/11/88

COMPLETION DATE: 18/11/88

CONTRACTOR IH.

WATER STRUCK. ROSE TO.

Water not struck

.....M.BGL. .....M.BGL.

.....M.BGL. .....M.BGL.

CASING DIAMETER/TYPE:

.....MM FROM ..... M.TO..... M., TYPE .....

.....MM FROM ..... M.TO..... M., TYPE .....

TOTAL DEPTH: 1.5 M.

DRILLED DIAMETER

150 MM. FROM 0 M. TO 1.5 M.

.....MM. FROM ....M. TO .... M.

SCREEN DIAMETER/TYPE:

..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)	SUMMARY OF AQUIFER CONDITIONS / LITHOLOGY	DEPTH (M&GL)	BOREHOLE CONSTRUCTION (Casing/screen (gr. pack)	ELEVATION OF WATER M.AOD	DEPTH TO WATER M.BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL.	STRATIGRAPHIC UNITS
1	BB18/1 0-1.5	Elevation of GL = 54.33 Firm, brown (7.5YR5/4) gravelly silty CLAY.						52.8	1.5.	
2		Borehole abandoned because of hard ground.								
3										

PROJECT: Burnham Beeches

BOREHOLE NO: BB19.

DRILLING METHOD

Power auger FROM 0 M. TO 10.0 M.

..... FROM .... M. TO ..... M.

LOCATION

6m SW of Roskat Hawthorn Dell.

G. REF.: 5461.8445.

START DATE: 18/11/88

COMPLETION DATE: 18/11/88

CONTRACTOR IH.

WATER STRUCK. ROSE TO.

Water not struck.

..... M.BGL. ..... M.BGL.

..... M.BGL. ..... M.BGL.

CASING DIAMETER/TYPE:

..... MM FROM ..... M.TO..... M., TYPE .....

..... MM FROM ..... M.TO..... M., TYPE .....

TOTAL DEPTH: 10.0 M.

DRILLED DIAMETER

150 MM. FROM 0 M. TO 10.0 M.

..... MM. FROM .... M. TO .... M.

SCREEN DIAMETER/TYPE:

..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

..... MM FROM ..... M. TO ..... M; TYPE/SLOT(MM) .....

SUMMARY OF AQUIFER CONDITIONS

Elevation of GL. = 53.13.

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)	LITHOLOGY	DEPTH (M.BGL)	BOREHOLE CONSTRUCTION (Casing/screen (gr. pack)	ELEVATION OF WATER M.AOD	DEPTH TO WATER M.BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL.	STRATIGRAPHIC UNITS
								52.9	0.2	
1 2	BB19/1 0.2-2.0	Firm, yellowish red (5YR5/6) slightly gravelly silty CLAY								
	BB19/2 2.0-2.5	Soft, light grey (2.5Y7/2) silty CLAY with fine rounded chalk pebbles and coarse rounded chalk sand.						51.1	2.0	
3	BB19/3 2.5-4.0	Soft, strong brown (7.5YR5/8) and light grey (5Y7/2) sandy clayey SILT with coarse black flint pebbles.						50.6	2.5	

BOREHOLE NO. BB19

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)		DEPTH (M. BGL)	BOREHOLE CONSTRUCTION (casing/screen/gr. pack)	ELEVATION OF WATER M. AOD	DEPTH TO WATER M. BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL	STRATIGRAPHIC UNITS
4								49.1	4.0	
	BB19/4 4.0-4.7	Same as 2.0-2.5.						48.4	4.7	
5										
6	BB19/5 4.2-6.0	Soft, light yellowish brown (2.5Y6/4) clayey SILT with some small rounded chalk pebbles.						47.1	6.0	Head?
7	BB19/6 6.0-7.0	Same as 2.0-2.5.						46.1	7.0	
8	BB19/9 9.0-10.0	White (2.5Y8/2) chalk.								Chalk

BOREHOLE NO. BB19

DEPTH (M.BGL)	GRAIN SIZE ANALYSES (Sample No. and location)			DEPTH (M. BGL)	BOREHOLE CONSTRUCTION (casing/screen/gr. pack)	ELEVATION OF WATER M. AOD	DEPTH TO WATER M. BGL	SYMBOLIC LOG	ELEVATION M. AOD	DEPTH M. BGL	STRATIGRAPHIC UNITS		
9													
10									43.1	10.0			
			End of borehole										
11													
12													
13													
14													

Appendix III

Elevation of ground levels and well tops above Ordnance Datum

	Ground level	Well top
BB1	57.73	-
BB2	-	-
BB3	50.74	50.74
BB4	54.81	55.30
BB5	55.85	56.97
BB6	54.37	-
BB7	59.45	-
BB8	66.19	67.54
BB9	-	-
BB10	64.63	65.39
BB11	51.54	52.10
BB12	67.73	-
BB13	74.66	75.20
BB14	73.48	74.55
BB15	-	-
BB16	64.18	65.72
BB17	72.28	73.44
BB18	54.33	-
BB19	53.13	-
A	-	54.42
B	55.45	56.35
C	70.82	70.91
D	70.17	70.17
L7	53.42	54.08
L8	51.99	52.55
L9	51.92	52.52
L10	52.98	53.27

Appendix IV

Water level readings

	28 NOVEMBER 1988		30 NOVEMBER 1988		
	Depth to water	Elevation AOD	Depth to water	Elevation AOD	Difference
BB3	Dry	-	Dry	-	-
BB4	3.25	52.05	2.9	52.40	+ 0.35
BB5	Dry	-	Dry	-	-
BB8	Dry	-	Dry	-	-
BB10	2.13	63.26	2.00	63.39	+ 0.13
BB11	3.96	48.14	3.96	48.14	0
BB13	3.85	71.35	3.85	71.35	0
BB14	4.39	70.16	4.39	70.16	0
BB16	Dry	-	Dry	-	-
BB17	3.06	70.38	3.10	70.34	+ 0.04
A	4.20	51.22			
B	4.58	51.77	4.39	51.96	+ 0.19
C	2.21	68.70	2.20	68.71	+ 0.01
D	2.44	67.73	2.43	67.74	+ 0.01
L7	2.26	51.82	2.21	51.87	+ 0.05
L8	Dry	-	Dry	-	-
L9	3.91	48.61	3.89	48.63	+ 0.02
L10	3.38	49.89	3.36	49.91	+ 0.02

Appendix V

Wallingford monthly rainfall figures for 1988

Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Year
Rainfall (mm)												
18.8	100.3	27.6	39.1	23.8	44.9	46.9	74.4	44.8	27.6	48.0	26.5	522.7
25 years mean (mm)												
57.9	49.9	31.2	45.2	39.4	54.7	52.1	43.1	58.4	51.4	48.5	55.5	587.3

Wallingford Daily rainfall figures for November 1988 (0 900-0900 hrs thrown back) in mm

1	-	16	-
2	0.1	17	1.0
3	-	18	-
4	-	19	4.7
5	-	20	-
6	-	21	0.2
7	-	22	-
8	1.8	23	-
9	0.5	24	-
10	0.3	25	-
11	3.4	26	-
12	-	27	1.4
13	-	28	0.8
14	-	29	12.0
15	0.1	30	0.2

The demand for long-term scientific capabilities concerning the resources of the land and its freshwaters is rising sharply as the power of man to change his environment is growing, and with it the scale of his impact. Comprehensive research facilities (laboratories, field studies, computer modelling, instrumentation, remote sensing) are needed to provide solutions to the challenging problems of the modern world in its concern for appropriate and sympathetic management of the fragile systems of the land's surface.

The **Terrestrial and Freshwater Sciences** Directorate of the Natural Environment Research Council brings together an exceptionally wide range of appropriate disciplines (chemistry, biology, engineering, physics, geology, geography, mathematics and computer sciences) comprising one of the world's largest bodies of established environmental expertise. A staff of 550, largely graduate and professional, from four Institutes at eleven laboratories and field stations and two University units provide the specialised knowledge and experience to meet national and international needs in three major areas:

★

Land Use and Natural Resources

★

Environmental Quality and Pollution

★

Ecology and Conservation