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Great Blakenham Highways Depot Palaeoenvironmental Assessment

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by

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Summary

Deposits of palaeoenvironmental potential were encountered during borehole investigations at Great Blakenham Highways Depot, Suffolk in April 2010. Birmingham Archaeo-Environmental undertook palaeoenvironmental assessments on organic deposits from three cores. Pollen, plant macrofossil and beetle remains were extracted and assessed supported by three radiocarbon dates. The dates show that peat accumulation began at the end of the Romano-British/ early Anglo Saxon period However, due to likely contaminated of the upper peat through stripping and backfilling of the site no reliable date is available for the end of the peat deposition. The pollen, plants and beetles indicate a grassy meadow environment with areas of slow-flowing or still water nearby. High concentrations of cannabis-type in the pollen record reflect the 'retting' of hemp on or very close to the sampling site. Retting of hemp is largely linked to the Medieval period where it was grown for fibre, particularly for canvas and rope, however there are no radiocarbon dates from this section of the peat in Core 5 therefore a precise date of retting at the Great Blakenham site cannot be provided. Although pollen, plant macrofossils and beetles were present in the majority of the samples, concentrations and abundance of species were low and therefore no further work has been recommended.

KEYWORDS: Great Blakenham, Suffolk, Peat, Pollen, Plant macrofossils, Beetles

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1. INTRODUCTION

Birmingham Archaeo-Environmental (BA-E) was contracted by Entec UK Ltd to provide a palaeoenvironmental survey of the Suffolk County Council (SCC) Highways Depot Site, Great Blakenham in April 2010. The results of this were described in Hopla (2010). Five cores were recovered (see Figure 1 for locations) all containing humified peat associated with the River Gipping which have potential to provide information regarding past environments (palaeoenvironments). Recommendations were thus made for the palaeoenvironmental assessment of pollen, plant macrofossil and beetles, supported by three radiocarbon dates. This report describes the results of these assessments and makes recommendations for further analyses.

2. METHODS

2.1 Pollen Assessment

A total of 14 subsamples were assessed for pollen from Cores 2, 4 and 5. Pollen preparation followed standard techniques including potassium hydroxide (KOH) digestion, hydrofluoric acid (HF) treatment and acetylation (Moore *et al.,* 1991). At least 125 total land pollen grains (TLP) excluding aquatics and spores are usually counted for each sample at assessment level, however, pollen concentrations were very low in all the samples apart from Core 4 (4.11m) and Core 5 (5.64m) and full counts were not possible for these samples.

2.2 Plant Macrofossil Assessment and Beetle Assessment

Seven bulk samples were assessed for plant macrofossils and beetles from Cores 2, 4 and 5. These were processed using standard methods for waterlogged remains as described by Kenward *et al.* (1980). The heavy residues (the material which does not float) obviously contain larger vegetative remains (plant stalk/ wood fragments) in a few cases, but none of these were scanned for plant macrofossils/ insects for this assessment

The flots were sorted for both plant macrofossils and insect remains under a MEIJI EMZ low-power binocular microscope at magnifications between x12 – x20, partly because the quantity of plant macrofossils was relatively low and these flots were also being sorted for insect remains. Both the plant macrofossils and insect remains were stored in glass tubes with polyethylene stoppers in a mixture of water and ethanol to stabilise remains. Fully sorting samples at this stage and storing in ethanol follows methodologies proposed by English Heritage guidance (English Heritage 2002: 22; 2008: 4). Nomenclature for indigenous plant taxa follows Stace (2010).

The insect remains were sorted from the flot as described above and the sclerites identified under a low power binocular microscope at x7 –x45

magnification. The system for "scanning" faunas as outlined by Kenward *et al.* (1985) was initially followed in this assessment but it soon became clear that the faunas were so small that they could be fully recorded with no additional effort. The taxonomy follows Lucht (1987). This assessment was carried out to answer four main questions:

1. Are insect remains present? And if so, are they of interpretative value?

2. Do the insect remains from these samples provide information concerning the past water and river conditions present?

3. Do the insect remains from these samples provide information about the environment in the area at the time of these deposits formed?

4. Do the insect faunas recovered indicate a human presence in the landscape?

2.4 Radiocarbon Dating

Three sub-samples were submitted for radiocarbon dating to BETA, Florida. Sub-samples were taken from the top (4.10m); middle (4.56m) and base (4.98m) of the humified peat layer in Core 4, where it was considered preservation conditions would yield sufficient amounts of organic carbon for dating. Each sample underwent acid/alkali/acid pre-treatment prior to dating.

3. RESULTS

3.1 Radiocarbon Dating Results

The radiocarbon dating samples are summarised in Table 2. Radiocarbon dates were calibrated using Intcal04 (Reimer *et al*., 2004). The basal peat sample (4.98m depth) dated to 1630±40 BP (Cal AD 340-540; Beta-281673). The middle sample (4.56m depth) dates to 110±40 BP (Cal AD 1670 to 1780 (Cal BP 280 to 170) and 1800 to 1950 (Cal BP 150 to 0) and 1950 to 1960 (cal BP 0 to 0); Beta-281672). The upper sample (4.10m depth) produced a date of 143.5±0.4 pMC which indicates a modern age (ie. the dated fraction incorporates material living within the last 50 years). This implies that the peat deposits have probably been contaminated by material from the overlying made ground.

3.2 Pollen assessment

The results are presented in Table 1. The majority of the pollen samples yielded insufficient assemblages for palaeoenvironmental interpretations.

Core 2

Four subsamples were taken from Core 2 (4.58m, 4.74m, 4.90m and 5.06m depths). All four samples produced extremely low counts. From the few grains that were recorded Poaceae (wild grasses) appears in all samples along with Cyperaceae (sedges) which is present in all samples other than 5.06m. *Centaurea cyanus* (cornflower) appears in sample 4.58m which is typical of arable land and this environment is confirmed by the presence of cereal grains in samples 4.74m and 4.90m. It is difficult to confirm the nature of the landscape confidently due to the low

concentrations of pollen but the environment inferred from the four samples was open, disturbed and arable.

Core 4

Six subsamples were taken from Core 4 (4.11m, 4.26m, 4.42m, 4.58m, 4.74m and 4.90m depths). Three radiocarbon dates were also taken from this core at 4.10m, 4.56m and 4.98m depths. A basal date of 1630±40 BP (Cal AD 340-540; Beta-281673) indicates peat accumulation began at the end of the Romano-British period/ early Anglo Saxon period. The basal three samples all produced very low counts. This was to be expected from sample 4.90m as this was taken from a less organic, slightly sandy peat layer. Herbaceous pollen dominates these samples and includes grains of Poaceae, Cyperaceae, *Plantago lanceolata* (ribwort plantain), Caryophyllaceae (pink family), *Potentilla* (tormentils), *Rumex*-type (docks) and *Ranunculus*-type (buttercups). The pollen spectrum is typical of a grassy meadow environment with some damp bankside vegetation present in the form of sedges and the pink family.

The pollen concentrations start to improve in the upper section of the sequence with assessment percentages obtained in sample 4.11m and slightly higher counts from sample 4.42m. However sample 4.26m produced very low counts similar to the basal section. A date of 110±40 BP (Cal AD 1670 to 1780 and 1800 to 1950 and 1950 to 1960; Beta-281672) was obtained from 4.56m depth.

The pollen spectra are similar in all three samples and largely dominated by herbs. Poaceae reaches values of 30% TLP and Cyperaceae 18% in sample 4.11m. Other herbs recorded include Rosaceae (Rose family, accounting for 11% in sample 4.11m), lactuceae (dandelions), *Plantago lanceolata*, Apiaceae (carrot family), *Filipendula* (meadowsweet), Chenopodiaceae (fat hen), Secale (Rye), *Rumex*-type, *Centaurea cyanus* and Caryophyllaceae. Trees and shrubs rise slightly but are present at very low values of <5% TLP. These include *Corylus avellana*-type (most likely hazel), *Quercus* (oak), *Alnus glutinosa* (alder) and *Pinus sylvestris* (scots pine). The top of the sequence (4.10m) produced a post 0 BP age indicating that the material was living within the last 50 years, which is discussed in further detail below.

The pollen record indicates an environment similar to that at the base of the sequence which is largely open grassy meadow with damp banksides associated with the River Gipping illustrated by the presence of the carrot family, meadowsweet and the pink family. Arable land is also suggested by the occurrence of cornflower and rye.

Core 5

Four samples were taken from core 5 (5.48m, 5.64m, 5.80m and 5.95m depths). All produced low pollen counts apart from sample 5.64m which had very good concentrations and an assessment count was obtained. *Cannabis*-type increases to values of 81% in this sample and almost certainly reflect the 'retting' of hemp (see Gearey *et al*., 2005; Schofield and Waller, 2005), on or very close to the sampling site (see discussion). Retting of hemp is largely linked to the Medieval period where it was grown for fibre, particularly for canvas and rope (Edwards and Whittington, 1990). There are no radiocarbon dates from

this section of the peat in Core 5 therefore a precise date of retting at the Great Blakenham site cannot be provided.

3.3 Plant Macrofossil Results

Table 3 presents the results of the semi-quantified rapid scan for waterlogged plant macrofossils from the seven samples studied from Cores 2, 4 and 5. The plant macrofossils were well preserved, reasonably abundant (ca. 200 to 300 items) in most cases and were typical of marsh/ fen and waterside/ aquatic habitats. The results will be discussed below for each core.

Core 2
(4.58 - 4.89m and 4.89 - 5.20 m)

The two sub-samples from Core 2 were dominated by seeds of *Menyanthes trifoliata* L. (bog bean), with limited quantities of other plant taxa. Bog bean frequently occurs in wet places (marshes, bogs, fens and watersides) and often occurs on peats or gley soils (Hewett 1964: 726; Stace 2010: 677), typically grows in patches, but it can form stands on the edge of water bodies and often colonises abandoned peat cuttings (Hewett 1964: 729).

Core 4
(4.10 - 4.30m, 4.34 - 4.62m, 4.63 - 4.76m and 4.76 - 5.00 m)

The four sub-samples from Core 4 have produced different results. The upper two units (4.10 – 4.30m and 4.34 – 4.62m) were dominated by bog bean and rush seeds. Small quantities of other plant remains were present such as *Rununculus* spp. (buttercups), *Urtica dioica* L. (common nettle), *Persicaria* spp. (knotweed), *Rumex* spp. (docks) and *Carex* spp. (sedge). Again this suggests peat or gley soils, a waterside/ fen/ marsh habitat, as was also evident from the Core 2 samples. These upper two samples are potentially the post-Medieval period or later.

The third sample (4.62 – 4.76m) was dominated by well-preserved *Rumex* spp. seeds, still fully encased in their perianth. Notably, *Menyanthes trifoliata* L is absent from this deposit. *Urtica dioica* L., *Stellaria* spp. (stichwort) and *Carduus* spp./ *Cirsium* spp. (thistle) were also noted. Although rush and sedge seeds were recovered from this deposit, they were not particularly abundant and certainly there is no suggestion from the plant macrofossils that there was standing/ flowing water in the vicinity.

The lowermost sample (4.76 – 5.00m) was dominated by *Juncus* spp. (rush) seeds, suggesting damp ground conditions were present, or possibly this deposit formed in closer proximity to water. This lowest deposit has produced a late Roman/early Saxon date at 4.98m (1630±40 BP, Cal AD (2 sigma) 340 to 540 (Beta-281673)). Small numbers of a range of plants typical of meadow/marsh environments were recovered such as *Ranunculus* spp., *Urtica dioica* L., *Sambucus nigra* L. (elder/elderberry), *Chenopodium* spp. (goosefoot), *Galeopsis* spp. (hemp nettle), *Mentha* spp.(mint), *Bidens cernua* L. (nodding bur-marigold), *Polygonum* spp.(knotgrass), *Persicaria* spp), possible *Stellaria* cf. *palustris* Ehrh. Ex Hoffm.(marsh stitchwort) and *Carex* spp. The presence of elder and common nettle in this deposit may provide limited evidence for manure. *Aphodius* and *Onthophagus* dung beetles were reported from this which also provides limited

archaeoentomological evidence for grazing animals in the vicinity.

Core 5
(5.48 - 6.00 m)

Only one sample from Core 5 was assessed. As with the upper samples form Core 4 and the Core 2 samples, this sample was dominated by bog bean (*Menyanthes trifoliata* L.) and and rush (*Juncus* spp.), suggesting that the sediment formed at the edge of a water body or possibly in shallow water. Low numbers of a range of plant taxa were recovered including alder (*Alnus glutinosa* (L.) (alder) Gaertn., black mustard (*Brassica nigra* (L.) (Gaertn., black mustard, W.D.J. Koch), campion (*Silene* sp.(campion)), common/ long-headed poppy (*Papaver rhoeas* L./ *dubium* L. (common/ long-headed poppy)), elder (*Sambucus nigra* L. (elder)), field penny-cress (*Thlaspi arvense* L.(field penny-cress)), goosefoot (*Chenopodium* spp.), gypsywort (*Lycopus europaeus* L. (gypsywort)), knotgrass (*Polygonum* spp.) and knotweed (*Persicaria* spp.), mint (*Mentha* spp.), nodding bur-marigold (*Bidens cernua* L.(nodding bur-marigold)), possible lesser tussock-sedge (*Carex* cf. *diandra* Schrank (lesser tussock-sedge)), sedge (*Carex* spp.), thistle (*Carduus* spp./ *Cirsium* spp.) and willowherb (*Epilobium* spp.(willowherb)). Most of these taxa also suggest meadow/ marsh and/or waterside habitats.

3.4 Beetle results

The insect taxa recovered are listed in Table 4. The taxonomy follows that of Lucht (1987) for the Coleoptera (beetles). The majority of the insect fauna recovered were Chironomidae (non biting midges) with smaller number of Coleoptera (beetles). Preservation was generally poor with the sub-fossils displaying erosion and fragmentation. Most of the faunas recovered were very small and hence of limited interpretative value.

Core 2

The two samples from Core 2 (4.58–4.89 and 4.89–5.20) produced very limited and eroded insect faunas. The beetles recovered are not very specific in terms of interpretation beyond the *Enochrus* and *Hydroporus* species indicating the presence of slow-flowing or still waters (Hansen 1986; Nilsson and Holmen 1995) and the small weevils *Leiosoma deflexum* being associated with marsh marigold (*Caltha palustris* L.) on the one hand and *Tanysphyrus lemnae* with duck weed (*Lemna* spp.) on the other.

Core 4

The four samples from Core 4 (4.10–4.30m, 4.34–4.62m, 4.62–4.76m and 4.76–5.00m) all produced very small and poorly preserved faunas. The beetles recovered are also not very ecologically diagnostic and given the poor preservation any interpretation must be regarded as suspect. However, there are a number of indicators for slow-flowing or stagnant water conditions such as the *Haliplus* species, the hydrophilids *Coelostoma orbiculare* and *Laccobius* spp. and the Helodidae species recovered (Hansen 1986).

Sample 4.62-4.76m did contain a single individual of *Donacia vulgaris* which is a reed beetle that is associated with a range of waterside plants and *Prasocuris phellandrii* which is associated with a range of waterside

cow parsley (Apiaceae). The only other taxa of any significance are the *Aphodius* and *Onthophagus* dung beetles, which were found throughout the samples and may indicate the presence of grazing animals or grassland in the vicinity of the sampling site.

Core 5

The single sample from core 5 produced a very small fauna of highly eroded insects of which only the weevil *Notaris acridulus* was diagnostic. This species is associated with the *Glyceria* (reed grass) species of waterside plant.

4. DISCUSSION

All three palaeoenvironmental records generally illustrate similar environments throughout each core, with peat accumulation taking place in a waterlogged, floodplain environment with evidence for open grassy meadows with areas of slow-flowing or still waters near or on the sampling site (see Table 5). The pollen record however does provide evidence for arable land with the occurrence of cereal type, rye and cornflower in core 2 and 4. These plants are not reflected in the plant record, which would suggest that any arable activity was occurring directly on the dryland areas around the sampling sites.

The abundance of *Cannabis*-type pollen from these deposits does not apparently concur with the plant macrofossil data. However, recent work elsewhere in England has shown that significant representation of *Cannabis*-type pollen can occur without *Cannabis sativa* L. (hemp) plant macrofossils or with only low quantities of hemp seed (Gearey *et al*. 2005). In particular hemp 'retting' (processing) usually requires that the seeds are 'beaten off' the plant (e.g. Gearey *et al*. 2005, 218 quoting Thomas Tusser, 1580, *Five Hundred Points of Good Husbandry*, (ed. W. Mavor, London, 1812), September, verse 24.). Indeed, hemp seeds may have been intentionally saved for next years crop seed or, since hemp seeds are extremely nutritious, they may have been put to alternative use, especially as bird feed.

The radiocarbon dates from Core 4 indicate that peat accumulation began at the end of the Romano-British/early Anglo Saxon period. The top of the sequence however produced a modern age estimate, which would indicate that the dated material was living within the last 50 years. Prior to the site's construction much of the peat was stripped away and the site was backfilled with the 4-5m of made ground represented in the cores (Stephen Townend, pers.comm; Hopla 2010). It is therefore likely that some contamination has occurred within the upper peat deposits. Therefore there is no reliable date is available for the end of the peat deposition at the site.

5. CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER ANALYSIS

The pollen generally produced a low concentration and poorly preserved palynomorphs and hence no further pollen analyses are recommended. Although the waterlogged plant remains are well preserved, they are not particularly diverse and have produced relatively small assemblages, considering often more than 1L of sediment was processed. Further

analysis or identification is unlikely to greatly contribute to current interpretations. In addition, although it is uncertain whether the Core 2/ Core 5 results, which are strongly dominated by bog bean (*Menyanthes trifoliata* L.), should be treated as equivalent to the upper two deposits from Core 4 which has produced modern to post-medieval radiocarbon results, there is a strong likelihood that these floras are of a similar date. As a result, no further plant macrofossil analysis is recommended. The material from these deposits also produced small beetle faunas with limited potential for interpretation. These faunas are not regarded as of significant value and therefore, no further beetle analyses are recommended.

	Summary of Recommendations
Pollen	Low concentrations and poorly preserved. No further work recommended.
Plant Macrofossils	Small assemblages. No further work recommended.
Beetles	Small assemblages. No further work recommended.

6. ARCHIVE

Any samples taken which were not used in this assessment are currently stored at BA-E and will be retained for a maximum of one year before being discarded unless otherwise specified by the client.

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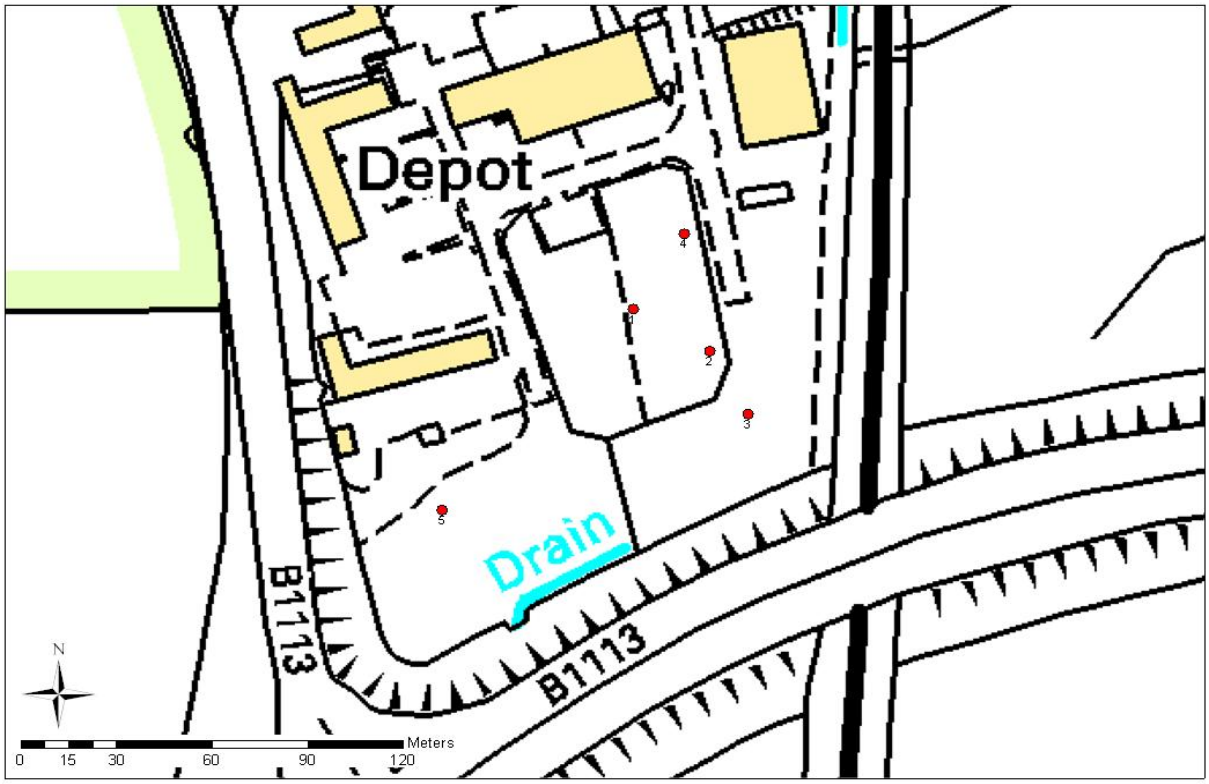

Core ID	X	Y
1	612350	249616
2	612374	249602
3	612386	249581
4	612366	249641
5	612290	249549

Figure 1. Core Locations

Core / Depth	Stratigraphy	Comments
Core 2 – 4.58m	Dark brown, well humified peat with wood fragments	Very low count Poaceae – 2 grains Cyperaceae – 2 grains *Centaurea cyanus* – 1 grain *Helianthemum* – 1 grain Rosaceae – 1 grain 1 unidentifiable grain
Core 2 – 4.74m		Very low count *Alnus glutinosa* – 1 grain Poaceae – 1 grain Cyperaceae – 1 grain Cereal indet. 2 grains 1 unidentifiable grain
Core 2 – 4.90m		Very low count Poaceae – 4 grains Cyperaceae – 2 grains Rubiaceae – 2 grains Cereal indet. 1 grain *Helleboros* – 1 grain Pteropsida (monolete) indet. – 1 grain 2 unidentifiable grains
Core 2 – 5.06m		Very low count Poaceae – 1 grain Pteropsida (monolete) indet.- 1 grain
Core 4 – 4.10m	Dark brown well humified peat	**Radiocarbon Date**: Conventional Age BP 143.5±0.4pMC (Beta-281671) Indicates an age post 0BP and has been reported as a % of the modern reference standard, indicating the material was living within the last 50 years (pMC =percent modern carbon)
Core 4 – 4..11m		Medium concentration and preservation **Percentages: 112 TLP** **Trees and Shrubs:** *Corylus avellana*-type (5%), *Quercus* (4%), *Alnus glutinosa* (3%), *Pinus* (3%) **Herbs**: Poaceae (30%), Cyperaceae (18%), Rosaceae (11%), Lactuceae (6%). Other herbs present at trace values include *Plantago lanceolata*, Apiaceae, Chenopodiaceae, Caryophyllaceae, *Filipendula*, *Urtica*, *Secale*, *Rumex*, *Centaura cyanus* **Spores**: *Pteridium aquilinium, Sphagnum*, Pteropsida (monolete) indet.
Core 4 – 4.26m		Very low count *Pinus sylvestris* – 2 grains *Alnus glutinosa* – 1 grain Poaceae – 1 grain *Plantago lanceolata* – 1 grain *Pteridium aquilinium* – 2 grains
Core 4 – 4.42m	Grey / blue clay	Low count **Trees and Shrubs**: *Corylus avellana*-type – 1 grain, *Quercus* – 1 grain, *Alnus glutinosa* – 1 grain **Herbs**: Poaceae – 8 grains, Cyperaceae – 7 grains, Caryophyllaceae – 2 grains, *Plantago lanceolata* – 1 grain, Rosaceae – 1 grain, *Helleboros* – 1 grain, *Rumex* type – 1 grain, *Centaurea cyanus* – 1 grain, *Aster* type – 1 grain **Spores**: Pteropsida (monolete) indet.- 5 grains, *Pteridium aquilinium* – 2 grains 2 unidentifiable grains
4.56m	Dark brown humified peat	**Radiocarbon Date**: Conventional Age BP 110±40, Cal AD (2 sigma) 1670 to 1780 and 1800 to 1950 and 1950 to 1960 (Beta-281672)
Core 4 – 4.58m		Very low count *Alnus glutinosa* – 1 grain Ilex – 1 grain *Rumex* type – 1 grain Caryophyllaceae – 1 grain *Ranunculus* type – 1 grain 1 unidentifiable grain

Core 4 – 4.74m	Grey clay	Very low count Cyperaceae – 2 grains Poaceae – 1 grain *Cirsuim* type – 1 grain *Polypodium vulgare* – 1 grain
Core 4 – 4.90m	Slightly sandy black peat	Very low count Poaceae – 3 grains Plantago lanceolata – 1 grain Caryophyllaceae – 1 grain Potentilla – 1 grain 1 unidentifiable grain
4.98m		**Radiocarbon Date**: Conventional Age BP 1630±40, Cal AD (2 sigma) 340 to 540 (Beta-281673)
Core 5 – 5.48m	Dark brown humified peat	Very low count Poaceae – 2 grains Alnus – 1 grain
Core 5 – 5.64m		**Percentages: 142 TLP** **Trees and Shrubs**: *Alnus glutinosa* (1%) **Herbs**: *Cannabis*-type (81%), Poaceae (11%), *Artemesia* (3.5%), Cyperaceae (2%) **Spores**: Pteropsida (monolete) indet – 4 grains
Core 5 – 5.80m		Low count **Trees and Shrubs**: *Alnus glutinosa* – 3 grains, *Quercus* – 2 grains, *Ulmus* – 2 grains, *Corylus avellana*-type – 1 grain **Herbs**: Poaceae – 8 grains, Cyperaceae – 8 grains, *Plantago lanceolata* – 1 grain, Cannabis type – 1 grain, *Artemesia* – 1 grain **Spores**: Pteropsida (monolete) indet. – 1 grain 3 unidentifiable grains
Core 5 – 5.95m		Very low count *Alnus glutinosa* – 1 grain Cyperaceae – 2 grains 2 unidentifiable grains

Table 1 . *Pollen results from Great Blakenham*

Sample/ Beta code	Material	13C/12C	Radiocarbon Age	Calibrated Age
4.10m Beta-281671	Peat Acid/alkali/acid	-26.2 ‰	143.5 ± 0.4 pMC	Post 0BP and has been reported as a % of the modern reference standard, indicating the material was living within the last 50 years ("pMC"=percent modern carbon)
4.56m Beta-281672	Peat Acid/alkali/acid	-28.2 ‰	110 ± 40 BP	Cal AD 1670 to 1780 (Cal BP 280 to 170) and 1800 to 1950 (Cal BP 150 to 0) and 1950 to 1960 (cal BP 0 to 0)
4.98m Beta-281673	Peat Acid/alkali/acid	-28.5 ‰	1630 ± 40 BP	Cal AD 340 to 540 (Cal BP 1610 to 1410)

Table 2. *Radiocarbon dating results from Core 4, Great Blakenhamm*

Table 3: *Rapid Scan results for the waterlogged plant macrofossils from Cores 2, 4 and 5, Great Blakenham, Suffolk*

Site Code	**Habitat**	**BA2068**	**BA2068**	**BA2068**	**BA2068**	**BA2068**	**BA2068**	**BA2068**	
Core No.		**2**	**2**	**4**	**4**	**4**	**4**	**5**	
Depth		**4.58 - 4.89m**	**4.89 - 5.20 m**	**4.10 - 4.30m**	**4.34 - 4.62m**	**4.63 - 4.76m**	**4.76 - 5.00 m**	**5.48 - 6.00 m**	
Sample Volume		**2 L**	**1.5 L**	**1 L**	**1.6 L**	**1 L**	**1.4 L**	**2 L**	
Latin Binomial									**English Common Name**
cf. PINACEAE - ovluate scale	-	-	-	-	-	-	-	+	Possible Pine Family
Papaver rhoeas L./ dubium L.	A D	-	-	-	-	-	-	+	common/ long-headed poppy
Ranunculus acris L./ repens L./ bulbosus L.	M Ws	+	-	-	-	-	+	-	meadow/ creeping/ bulbous buttercup
Ranunculus sceleratus L.	G Da	-	-	+	-	-	-	-	celery-leaved buttercup
Ranunculus subgenus RANUNCULUS	-	-	-	+	+	-	+	-	buttercup
Ranunculus subgenus BATRACHIUM (DC.) A. Gray	Ws Aqs	+	+	++	-	-	+	-	crowfoot
Rubus section Rubus	Wg	-	-	-	-	+	-	-	blackbery/ raspberry
Urtica dioica L.	Wg N	+	-	+	-	++	++	-	common nettle
Alnus glutinosa (L.) Gaertn.	Wo Da Ws	-	-	-	-	-	-	+	alder
Viola sp.	-	+	-	-	-	-	-	-	violet
Epilobium sp.	TDa	-	-	-	-	-	-	+	willowherb
Brassica nigra (L.) W.D.J. Koch	Wg Ws	-	-	-	-	-	-	+	black mustard
Thlaspi arvense L.	A Wg	-	-	-	-	-	-	+	field penny-cress
BRASSICACEAE - unident (?Iberis type)	-	-	-	-	-	-	-	+	Cabbage Family
Persicaria spp.	TDa	-	-	-	+	-	+	+	knotweed
Polygonum spp.	-	-	-	-	-	-	+	+	knotgrass
Rumex spp. - within perianth	-	-	-	-	-	++++	-	-	dock
Rumex spp.	-	-	-	-	+	+++	-	-	dock
Stellaria cf. palustris Ehrh. Ex Hoffm.	Ma F Br	-	-	+	++	-	++	-	marsh stitchwort
Stellaria spp.	-	-	-	-	-	++	-	-	stitchwort
Silene sp.	-	-	-	-	-	-	-	+	campion
Chenopodium sp.	-	-	-	-	-	-	+	+	goosefoot
Atriplex sp.	-	-	-	-	-	+	-	-	orache
Galeopsis spp.	TA TDa TWo	-	-	-	-	-	+	-	hemp-nettle

Site Code	**Habitat**	**BA2068**	**BA2068**	**BA2068**	**BA2068**	**BA2068**	**BA2068**	**BA2068**	
Core No.		**2**	**2**	**4**	**4**	**4**	**4**	**5**	
Depth		**4.58 - 4.89m**	**4.89 - 5.20 m**	**4.10 - 4.30m**	**4.34 - 4.62m**	**4.63 - 4.76m**	**4.76 - 5.00 m**	**5.48 - 6.00 m**	
Sample Volume		**2 L**	**1.5 L**	**1 L**	**1.6 L**	**1 L**	**1.4 L**	**2 L**	
Lycopus europaeus L.	F Da Ws	-	-	-	+	-	-	+	gypsywort
Mentha spp.	-	-	+	+	+	-	+	+	mint
Menyanthes trifoliata L.	Aqs B F	++++	+++	++++	+++	-	-	++++	bog bean
cf. *Menyanthes trifoliata* L. - perianth	Aqs B F	-	-	-	-	-	+	+	possible bog bean
Carduus sp./ *Cirsium* sp.	-	+	-	-	-	++	-	+	thistle
Sonchus asper (L.) Hill	Cg Wg	-	-	-	-	+	-		prickly sowthistle
Bidens cf. *cernua* L.	Aq Ws Ma	-	-	-	+	-	+	+	possible nodding bur-marigold
Sambucus nigra L.	Wo Wa TN	+	+	+	+	-	+	+	elder/ elderberry
Alisma sp.	Aq	-	-	+	-	-	-	-	water-plantain
Potamogeton spp.	Aq	-	+	-	-	-	-	-	pondweed
Juncus spp.	TDa TWs	+	++	+++	+++	+	++++	+++	rush
Carex cf. diandra Schrank - urticle	Ma Ws As	-	+++	-	+	-	-	+	possible lesser tussock-sedge
Carex spp. - 3-sided	TWs TDa	+	-	-	+	++	+	+	sedge
POACEAE - small-sized caryopsis	-	+	-	+	+	-	-	-	Grass Family
POACEAE - medium-sized caryopsis	-	+	-	-	-	-	+	-	Grass Family
Unidentified	-	-	-	-	+	-	-	-	
Unidentified - plant frass	-	++++	+++	++	++++	+++	++++	+++++	
Unidentified - rootlets	-	++++	+++	+++	+++	+++++	+++++	+++++	
OTHER REMAINS									
Acarina		+++	++	-	+++	++++	++++	++++	mites
Bryophite		++++	+	-	-	-	-	+++++	moss
Chara		-	+	++	-	-	-	-	stonewort (green algae)
Chironomids		+++	-	-	+	+++	++	+++	non-biting midge
Molluscs (freshwater)		-	-	+++	+	-	-	-	freshwater snails

Key: + = < 5 items, ++ = 5 - 25 items, +++ = 25 - 50 items, ++++ = 50 - 100 items and +++++ = >100 items.

Habitat Codes: A = Arable fields, Aq = aquatic, Aqs = aquatic, typically shallow water, As = acid soils, B = bog, Br = base-rich soil, Cg = cultivated ground, D = disturbed ground, Da = damp ground, G = grassland, M = meadow, Ma = marsh, N = nitrogen rich soil, T = typically, Ws = waterside, Wg = waste ground and Wo = woodland

Core number	**2**		**4**				**5**
Sample number	4.89-5.20m	4.58-4.89m	4.10-4.30m	4.34-4.62m	4.62-4.76m	4.76-5.00m	5.48-6.00m
Volume (L)	2	1.5	1	1.6	1	1	1
COLEOPTERA							
Amara spp.	-	-	-	1	-	1	-
Halididae							
Haliplus spp.	-	-	-	1	-	-	-
Dytiscidae							
Hydroporus spp.	1	-	-	-	1	-	-
Hydrophilidae							
Coelostoma orbiculare (F.)	-	-	-	1	1	-	-
Megasternum boletophagum (Marsh.)	-	-	-	-	-	1	-
Laccobius spp.	-	-	-	-	-	1	-
Enochrus spp.	-	1	-	-	1	-	-
Cymbiodyta marginella (F.)	-	-	-	-	-	1	-
Staphylinidae							
Olophrum spp.	-	-	1	-	-	-	-
Trogophloeus spp.	-	-	-	-	-	1	-
Oxytelus spp.	-	-	-	1	-	-	2
Stenus spp.	-	-	-	-	2	-	-
Stilicus orbiculatus (Payk.)	-	-	-	-	-	1	-
Xantholinus spp.	-	-	-	-	-	1	-
Elateridae							
Elateridae Gen. & spp. indet.	-	-	-	-	-	-	1
Helodidae							
Helodidae Gen. & spp. Indet.	-	1	-	-	2	-	-
Dryopidae							
Dryops spp.	-	-	-	-	-	1	-
Cryptophagidae							
Atomaria spp.	1	-	-	-	-	-	-
Scarabaeidae							
Onthophagus spp..	-	-	-	-	-	1	-
Aphodius spp.	-	-	1	1	-	1	-
Chyrsomelidae							
Donacia vulgaris Zschach	-	-	-	-	1	-	-
Prasocuris phellandrii	-	-	-	-	1	-	-

(L.)							
Phyllotreta spp.	-	-	-	1	-	-	-
Curculionidae							
Sitona spp.	-	-	-	-	1	-	-
Tanysphyrus lemnae (Payk.)	1	-	-	-	-	-	-
Notaris acridulus (L.)	-	-	-	1	-	1	1
Leiosoma deflexum (Panz.)	-	1	-	-	-	-	-
CHIRONOMIDAE Genus and spp. Indet.	5+	5+	5+	1	10+		20+

Table 4: *Sample details and the insect taxa recovered from Great Blakenham.*

Core	Pollen	Plant macrofossils	Beetles
Core 2	Poaceae Cyperaceae *Centaurea cyanus* Cereal indet. Open, disturbed and arable.	*Menyanthes trifoliata* Wet environment, edge of water body.	*Enochrus* and *Hydroporus* species Slow-flowing or still waters.
Core 4	Poaceae Cyperaceae Rosaceae Apiaceae *Filipendula* *Secale* Grassy meadow and damp bankside. Arable land also suggested from the occurrence of *Secale.*	(4.10-4.62) *Menyanthes trifoliata* *Ranunculus* spp. Waterside environment.	(4.10–4.30m, 4.34–4.62m and 4.76–5.00m) *Haliplus* species, the hydrophilids *Coelostoma orbiculare* and *Laccobius* spp. and the Helodidae species slow-flowing or stagnant water conditions.
		(4.62-4.76m) *Rumex* spp. with *Cirsuim* spp. and *Urtica dioica.* Grassy meadow.	(4.62-4.76m) *Donacia vulgaris* *Prasocuris phellandrii* *Onthophagus* *Aphodius* Waterside conditions and an indication of the presence of grazing animals or grassland.
		(4.76-5.00m) *Juncus* spp. *Ranunculus* spp. *Sambucus nigra* L. *Urtica dioica* Damp, meadow. The presence of *Sambucus nigra* L. and *Urtica dioica* in this deposit may provide limited evidence for manure.	
Core 5	*Cannabis*-type 'retting' of hemp on or very close to the sampling site.	*Menyanthes trifoliata* *Juncus* spp. Waterside environment.	*Notaris acridulus* Waterside environment.

Table 5: *Summary of the palaeoenvironmental record from Great Blakenham.*