ARCHAEOLOGICAL WATCHING BRIEF AT WILDEN MARSH AND MEADOWS SSSI, STOURPORT-ON-SEVERN, WORCESTERSHIRE

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Part 1 Project summary

An archaeological watching brief was undertaken at Wilden Marsh and Meadows SSSI, Stourport-on-Severn, Worcestershire (centred on NGR SO 827 737). It was undertaken on behalf of Jacobs Engineering acting on behalf of the Environment Agency, who intends to install new water management structures. The project aimed to determine if any significant archaeological or palaeoenvironmental remains were present and if so to indicate what its location, date and nature.

The investigation revealed predominantly post-medieval and modern finds and deposits due to the shallow nature of the intrusive works, although in the southern development area, deeper intrusive works occurred relating to the marsh outfall which revealed stratified alluvial and organic sequence. Environmental analysis of the organic clay and peat indicated a dynamic marshy/wetland landscape and comparison with earlier investigations indicate that these organic deposits are potentially of a Mesolithic date.

Part 2 Detailed report

1. Background

1.1 Reasons for the project

An archaeological watching brief was undertaken at Wilden Marsh and Meadows Site of Special Scientific Interest (SSSI), Stourport-on-Severn, Worcestershire (centred on NGR SO 827 737; Fig 1). It was undertaken on behalf of Jacobs Engineering acting on behalf of the Environment Agency, who intends to install new water management structures (two weirs and drainage structures).

1.2 Project parameters

The project conforms to the *Standard and guidance for an archaeological watching brief* (IfA 2008), *Standards and guidelines for archaeological projects in Worcestershire* (HEAS 2008) and *Environmental Archaeology: a guide to the theory and practice of methods, from sampling and recovery to post-excavation* (English Heritage 2002).

1.3 Aims

The aims of the watching brief were to locate archaeological deposits and determine, if present, their extent, state of preservation, date, type, vulnerability and documentation. The purpose of this was to establish their significance, since this would make it possible to recommend an appropriate treatment which may then be integrated with the proposed development programme.

2. Methods

2.1 Documentary search

Prior to fieldwork commencing a search was made of the Historic Environment Record (HER). In addition to the sources listed in the bibliography, the following were also consulted:

Cartographic sources

- 1838, Tithe Map for Hartlebury (Worcestershire Tithe and Inclosure Map Project)
- 1841, Tithe Map for Stone (Worcestershire Tithe and Inclosure Map Project)
- 1843-1893, 1st edition Ordnance Survey map, 1:1560
- 1891-1912, Ordnance Survey map, 1:1560
- 1904-1939, Ordnance Survey map, 1:1560
- 1919-1943, Ordnance Survey map, 1:1560

2.2 Fieldwork methodology

2.2.1 Fieldwork strategy

The project followed standard Service specifications and practices (CAS 1995).

Fieldwork was undertaken between 18 January and 22 March 2010. The site reference number and site code is WSM 42100.

Observation and recording of archaeological deposits was limited to areas of ground disturbance associated with the development and followed the progress of the construction team. The majority of the works observed involved the stripping of topsoil for temporary features such as access roads, hardstanding for plant and the site compound although deeper, more intrusive works such as for the pipe outfall were also monitored.

Deposits considered not to be significant were removed using a 360º tracked excavator, employing a toothless bucket and under archaeological supervision. Subsequent excavation was undertaken by hand. Clean surfaces were inspected and selected deposits were excavated to retrieve artefactual material and environmental samples, as well as to determine their nature. Deposits were recorded according to standard Service practice (CAS 1995).

2.2.2 Structural analysis

All fieldwork records were checked and cross-referenced. Analysis was effected through a combination of structural, artefactual and ecofactual evidence, allied to the information derived from other sources.

2.3 Artefact methodology

2.3.1 Artefact recovery policy

The artefact recovery policy conformed to standard Service practice (CAS 1995; appendix 2). This in principal determines that all finds, of whatever date, must be collected. However, in this case only a sample of the later material was collected from the spoil during machining. This comprised the majority of the finds recovered from the site.

2.3.2 Method of analysis

All hand retrieved finds were examined. They were identified, quantified and dated to period. A *terminus post quem* date was produced for each stratified context. The date was used for determining the broad date of phases defined for the site. All information was recorded on *pro forma* sheets.

Pottery fabrics are referenced to the fabric reference series maintained by the Service (Hurst 1994).

2.4 Environmental archaeology methodology, by Alan Clapham and Nick Daffern

The sampling during excavation and the environmental analysis conforms to relevant sections of the *Manual of Service practice: fieldwork recording manual* (CAS 1995), *Environmental Archaeology: a guide to the theory and practice of methods, from sampling and recovery to post-excavation* (English Heritage 2002) and *Environmental archaeology and archaeological evaluations* (Association for Environmental Archaeology 1995).

2.4.1 Sampling policy

The environmental sampling strategy conformed to standard Service practice (CAS 1995; appendix 4). Five samples were taken from peat and clay deposits exposed during the outflow works adjacent to the river at the southern site.

2.4.2 Macrofossil analysis

The samples were processed by the wash-over technique as follows. The sample was broken up in a bowl of water to separate the light organic remains from the mineral fraction and heavier reside. The water, with the light organic faction was decanted onto a 300mµ sieve and the residue washed through a 1mm sieve.

The residues were fully sorted by eye and the abundance of each category of environmental remains estimated. The flots were fully sorted using a low power EMT light microscope and remains identified using modern reference specimens housed at the Service.

2.4.3 Pollen analysis

The samples were submitted to the laboratories of the Department of Geography & Environment at the University of Aberdeen for chemical preparation following standard procedures as described by Barber (1976) and Moore *et al* (1991). The full methodology is described in Appendix 3.

Where preservation allowed, pollen grains were counted to a total of 150 land pollen grains (TLP) for assessment purposes using a GS binocular polarising microscope at x400 magnification, and identification was aided by using the pollen reference slide collection maintained by the Service, and the pollen reference manual by Moore *et al* (1991) and Grant-Smith (2000). Nomenclature for pollen follows Stace (1991, 1997) and Bennett (1994).

2.5 The methods in retrospect

The methods adopted allow a high degree of confidence that the aims of the project have been achieved.

3. Topographical and archaeological context

Extensive reports on the topography and historical/archaeological context of Wilden Marsh and Meadows SSSI have been undertaken previously (WSM 34765; Jacobs Babtie 2005; Rackham 2006; Environment Agency 2009).

4. Results

4.1 Structural analysis

The trenches and features recorded are shown in Fig 2, Plates 1-9. The results of the structural analysis are presented in Appendix 1.

4.2 Northern Site

4.2.1 Phase 1 Natural deposits

Natural deposits were identified in Trenches 1 and 2 during the machining for the site compound and eastern part of the access road. This consisted of orangish-red clayey sand with occasional sub-rounded to angular gravel (103) which is likely to represent the reworked/extreme upper surface of the Power House Terrace (Shotton and Coope, 1983) (Plate 2).

4.2.2 Phase 2 Modern Deposits

Trenches 2 and 3 both contained modern deposits with the most extensive being the brick/rubble deposit (201) acting as a surface for the track/path from Wilden Lane to the riverside (Plate 3). The date of deposition for this layer is unclear although the sheer quantity of modern brick would tend to suggest that it is recent in origin although the current landowner was unavailable to confirm this.

Context (300) exposed in Trench 3 was a much thicker top/subsoil deposit than exposed elsewhere and is likely to represent a portion of the alluvium that has been obtained from the dredging of the River Stour in the last 50 years, this is supported by the frequent recovery of modern litter i.e. crisp packets, from within the deposit (Plate 4).

4.2.3 Undated deposits

(101) and [102] encountered within Trench 1 (Plate 1) was an unexcavated and undated feature. Modern artefacts were recovered from the upper surface of (101) although it is unclear whether these were intrusive from the top and subsoil and/or transported during machining of the area. As the feature was not adversely affected by the compound or development, no intrusive works were undertaken upon the feature. Its linear nature would tend to indicate a silted/backfilled ditch or channel but without a section being excavated and/or a larger plan of the feature being revealed, this must remain speculative.

4.3 Southern Site

4.3.1 Phase 1 Natural deposits

Excavation of the outfall into the river at the western end of Trench 5 revealed the most extensive sequence of natural deposits exposed during all works (Fig 3, Plate 5). The uppermost deposit (505; possibly same as 601) was light orangish-yellow silty sand representing overbank deposits from the River Stour acting as the parent material of the overlying deposits (500, 501 and 600).

Underlying this at 1.75m below ground surface (24.78m AOD) was a mid-dark black humified silty peat indicating standing water/marshy conditions with acidic and/or anaerobic properties. The upper surface of the peat undulated, suggesting an unconformity (erosion of the upper surface). This peat is likely to represent an exposure/continuation of organics encountered by Shotton and Coope (1983), Brown (1988) and Rackham (2006) respectively.

Underlying this peat at a depth of *c* 2.02m (24.48m AOD) is light-mid grey, slightly organic silty clay (507). Both the peat and the clays were sampled for environmental assessment, the results of which are reported below (Section 6).

The base of the sequence was represented by yellowish-orange sand and sub-rounded to angular gravels (508) although only the upper surface was exposed and therefore further interpretation is limited although they are likely to be late glacial/early Holocene in date.

4.3.2 Phase 2 Modern Deposits

As with the northern area, apart from the top and subsoil, the most extensive modern deposit was (401); the brick/rubble layer that represents the surface of a modern track deposited to ease access to the riverside, similar in origin to (201) (see Section 4.2.2; Plate 6).

The other significant modern feature was [504] and its fills (502) and (503), which were identified in Trench 5 during the excavation for the outfall (Plate 7). These contexts represent the cut and backfill for a Severn Trent sewer rising main which emerges in the north of the area and crosses the river (Plate 8). Also identified in Trench 5 was (501) a light orangish-yellow silty sand containing modern CBM and clinker which is likely to represent a reworked version of (505).

A pink silty clay deposit (602) (Plate 9) which was identified in the most northerly excavation of Trench 6, the formation of which, although modern in date, appears to be natural, resulting from the gradual silting up of negative features i.e. ponds.

5. Artefact analysis

The artefactual assemblage consisted of glass, pottery and CBM (ceramic building material) which were identified during topsoil stripping and on the ground surface in disturbed locations where plant had been running.

The majority of the material retrieved dated to the 19th and 20th centuries and was therefore returned left on site as it bore no diagnostic value as it represented modern activity within the development area. The only exception to this was a single sherd of post-medieval sandy ware (fabric 78) which was dated to the 18th century (Laura Griffin, pers comm).

6. Environmental analysis, by Alan Clapham and Nick Daffern

The environmental tables are presented in Appendix 2. The samples were taken from Trench 5 (Figs 2 and 3; Plates 5 and 7).

6.1 Plant macrofossils, by Alan Clapham

Five samples, three from the peat layer (505) (top, middle and bottom) and two from the underlying clay (507) (top and bottom) were processed and analysed for waterlogged plant macrofossils. The samples provided for analysis were small in size, ranging from 100 ml to 50 ml. This may have limited the interpretation of the analysis but will provide a guideline to the preservation and general plant macrofossil content of the deposits. Nomenclature follows Stace (1997).

The peat samples were very humified suggesting that there had been some drying out in the past. This is reflected in the preservation and the quantities of plant macrofossils recovered from these samples.

6.1.1 Top of peat (506) (24.78m AOD)

The top of the peat was dominated by large numbers of willow (*Salix* sp) buds and bud scales. Also recovered from this sample were small numbers of sedge nutlets of glaucous sedge (*Carex flacca*) and pendulous sedge (*Carex pendula*). Some grass fruits were also recovered.

6.1.2 Middle of peat (506) (24.68m AOD)

From the middle sample of peat very little in the way of plant remains were found. During processing it was noticed that a large quantity of sand was present. The commonest find in this sample was the sclerotia of a soil fungus (*Cenococcum geophilum*).

6.1.3 Bottom of peat (506) (24.58m AOD)

The bottom of the peat consisted of remains of sedges (*Carex* spp) and bogbean (Menyanthes trifoliata) but only in small quantities. The peat itself was quite humified.

6.1.4 **Top of clay (507) (24.48m AOD)**

The top surface of the clay produced the richest of the samples in terms of plant macrofossils. Remains of fine-leaved water-dropwort (*Oenanthe aquatica*) and nutlets of yellow sedge (*Carex* cf *viridula*) and pendulous sedge were recovered in small quantities. The dominant find was that of achenes of a cinquefoil (*Potentilla* sp). Willow buds and bud scales were also recovered.

6.1.5 **Bottom of clay (507) (24.33m AOD)**

The sample from the bottom of the clay produced very little in the way of plant remains apart from a few nutlets of greater yellow-sedge (*Carex* cf *flava*) and common nettle seeds (*Urtica dioica*).

6.2 Discussion of plant macrofossil remains

The plant remains from all of the samples analysed were present in low numbers and in the majority of cases poorly preserved. But it is possible to interpret the possible course of events through time.

At the bottom of the clay, there is very little plant growth suggesting either a harsh environment or that very little was growing at this level, or that conditions were not conducive to the preservation of plant macrofossils. In contrast, the top of the clay shows evidence of a wet environment possibly a river's edge as indicated by the presence of the fine-leaved water-dropwort. Other plant remains indicate the possibility of damp woodland as indicated by the pendulous sedge remains. This woodland may have taken the form of willow carr as indicated by the presence of willow buds and bud scales. It is of interest that the presence of possible yellow sedge nutlets suggests that the conditions may have been base rich. Whether this derives from the clay itself or from the surface water is not certain. The dominance of cinquefoil achenes suggests that there was plenty of ground cover.

The bottom of the peat suggests that there was an increase in the water table permitting peat initiation. It is most likely that there was standing water present for most of the year and this is supported by the presence of bogbean and sedges. The middle of the peat has a high sand content suggesting either a drying out episode or possibly an influx of river sediment from a flooding episode. The presence of high numbers of *Cenococcum geophilum* sclerotia suggests the former scenario. *Cenococcum geophilum* is found in a wide range of soil types and can tolerate some flooding but it is usually taken to indicate some form of soil formation. The top of the peat again suggests that the high water table had returned as indicated by the presence of a large number of willow buds and bud scales and the presence of pendulous sedge. The presence of glaucous sedge nutlets and grass fruits may suggest that there were areas of damp grassland. Birch was also growing within the area.

Therefore, overall there is a trend through time to wetter conditions apart from a hiatus in the middle peat where conditions may have been temporarily drier but this was replaced by wet woodland dominated by willow.

6.3 Pollen analysis, by Nick Daffern

Five samples, three from the peat layer (top, middle and bottom) and two from the underlying clay (top and bottom) were processed and analysed for palynological material.

6.3.1 **Top of peat (506) (24.78m AOD)**

The upper sample from the sequence contained relatively high concentrations of tree and shrub pollen (62% TLP), the two dominant types being *Betula* (birch) (33% TLP) and *Salix* (willow) (21% TLP). Other tree and shrub species were identified at lower percentages (<5%

TLP) such as *Alnus glutinosa* (alder), *Corylus avellana*-type (hazel), *Ilex aquifolium* (holly), *Pinus sylvestris* (Scot's pine), *Quercus* (oak) and *Tilia cordata* (small-leaved lime).

Herbaceous species (38% TLP) were predominantly represented by Poaceae indet (grasses) (16% TLP) with remaining species such as *Filipendula* (dropwort/meadowsweet), Cyperaceae undiff (sedges), *Valeriana dioica* (marsh valerian), *Ranunculus acris*-type (meadow buttercup), *Rumex acetosella* (sheep sorrel) and *Urtica dioica* (stinging nettle) contributing less than 5% TLP. Despite this overall low contribution, the species diversity of herbaceous species was greater than that of tree and shrub species.

Spores and aquatics were represented by the solitary identifications of *Potamogeton natans*-type (pondweed) *Pteridium aquilinum* (bracken).

6.3.2 Middle of peat (506) (24.68m AOD)

This sample contained pollen in low concentration and in a poor state of preservation; due to this a full 150 grain count could not be achieved. *Salix* grains were the most frequently identified with single grains of *Pinus sylvestris* and *Betula* also present. Poaceae indet was the only herbaceous species identified.

6.3.3 Bottom of peat (506) (24.58m AOD)

This sample once again contained pollen in low concentrations and in a poor state of preservation resulting in a 150 assessment count not being completed. Similarly to the previous sample, grains of *Salix*, *Betula* and Poaceae indet were present with the sole addition of a grain of *Filipendula*.

6.3.4 Top of clay (507) (24.48m AOD)

Concentrations and preservation of pollen was much improved in this sample therefore allowing the assessment count to be undertaken.

Tree and shrub pollen dominated this sample representing 71% TLP with herbaceous types representing just 29 % TLP. *Salix* (65% TLP) was the greatest contributor with the remaining 6% of tree and shrub species contributed by *Alnus glutinosa*, *Betula* and *Quercus*.

Poaceae undiff (13% TLP) was the predominant herbaceous species recorded although a diverse quantity of other species at <5% TLP were also identified including *Filipendula*, *Plantago lanceolata* (ribwort plantain), Caryophyllaceae (pink/mouse-ear family), *Potentilla*-type), *Saxifraga granulata*-type (meadow saxifrage) and *Urtica dioica*.

Aquatics and spores were represented by a solitary grain of *Nymphaea alba* (white water-lily) and the spores of *Polypodium* (true ferns) and *Pteridium aquilinum*.

6.3.5 Bottom of clay (507) (24.33m AOD)

An assessment count could not be achieved on this final sample due to the low concentration and poor preservation of the polliniferous material. Two *Salix* grains were the solitary identification of a tree and shrub species with the remaining, albeit limited, identifications consisting of herbaceous types Poaceae indet, Apiaceae (carrot family), *Cichorium intybus*-type (chicory/dandelion) and Cyperaceae undiff.

The spores of *Pteridium aquilinum* and *Pteropsida* (mono) indet (ferns) were also identified.

6.4 Discussion of pollen analysis

As indicated in Section 6.3, there was extensive variability within the preservation and concentration of polliniferous material retrieved from the samples. It is evident from this variability that taphonomic processes have greatly impacted upon the deposits and this must be considered when interpreting the results and despite the poor preservation in three of the five samples, some comments can be made regarding the nature of the landscape and its vegetation.

The base of the sequence with its poor concentration and preservation of remains tends to indicate that conditions were not suitable for preservation or that vegetation was not abundant, both of which are possible given the possible early date due to its stratigraphic position directly overlying late Devensian gravels.

The sample from the top of the clay (24.48m AOD) indicates a relatively open (due to the variety of open ground herbaceous species) marsh/swamp landscape with localised willow carr. The domination of willow can be explained due to the observation of clumping of willow pollen grains. This often tends to suggest that the parent plant was part of the sediments which formed the deposit (Moore *et al* 1991, 90) and this proved to be the case with the presence of buds and bud scales in the plant macrofossil analysis (see Sections 6.1 and 6.2). It is unusual though that very little other tree or shrub pollen contributed to the sample thus suggesting that either there was no woodland established within the site catchment or conditions were not conducive to its preservation.

Due to the poor preservation and concentration of pollen within the two middle samples (24.58m and 24.68m AOD) few conclusions regarding the vegetation can be drawn although as peat formation has been initiated, it would tend to indicate that there is a change within the hydrology and depositional regime of the floodplain, possibly through channel migration, allowing the deposition of extensive organic material in suitable conditions for preservation.

The upper peat sample (24.78m AOD) indicated a change in environment with a fall in willow and an analogous increase in birch. The increase in first identification of herbaceous species such as grasses, meadow buttercup, marsh valerian, stinging nettle and sheep's sorrel tend to indicate that whilst conditions are still predominantly wet and marshy, there are areas that could be considered river meadows. The most interesting feature of this sample is the increase in tree/shrub species and in particular the identification of thermophilous species such as lime and holly possibly indicating a warming in climate although both species are insect pollinated which may equally explain their previous absence.

Despite the limited nature of the dataset, comparisons can be made with the high resolution sequence produced by Brown (1988) (Fig 4). It would appear that the sequence identified during the current work correlates with the top of Brown's zone WM1 (Brown 1988, 428-429) this is due to species composition i.e. willow and birch, and percentages of species identified. This hypothesis is strengthened by the overall lack of thermophilous species that only increase in quantity in the upper peat sample (24.78m AOD), the appearance of which is one of the features of the sequence used by Brown to identify the boundary between zones WM1 and WM2 (*ibid*).

The dating for the middle of WM1 is 9140 +/- 70 years BP (uncal) and the dating for the middle of WM2 is 8010 +/- 50 years BP (uncal) which if the earlier hypothesis is correct places the sequence identified within this assessment to the Mesolithic although this can only be confirmed through the submission of material for radiocarbon dating.

7. Synthesis

The site can be divided both spatial and chronologically although for the purpose of this synthesis, the latter has been chosen.

The earliest deposits have, by stratigraphical position and by cross referencing earlier works (Brown, 1988, Shotton and Coope, 1983 and Rackham, 2006), been assigned a Mesolithic date potentially lying between 9140 +/- 70 and 8010 +/- 50 years BP (uncalibrated). The landscape during this period is likely to have been a dynamic one with frequent fluctuations within the water table through channel migration and variation in seasonal climate as evidenced by the formation of peat, the variability in organic preservation and the types of remains encountered particularly within the plant macrofossil analysis (see section 6.2). The evolution of both the landscape and the vegetation throughout the post-glacial is illustrated in Fig 5, a model reproduced from Brown (1988).

The remaining chronological period represents the majority of the material encountered during the watching brief. It is of post-medieval or modern date and relates to the discard of unwanted domestic items (i.e. pottery), through manuring/spreading of midden material, or demolition material (CBM), through deposition as a track surface to consolidate wet/unstable ground.

No evidence of human occupation predating the post-medieval period was identified in either the environmental or archaeological record.

8. Recommendations

The following recommendations are made for further work on the environmental samples considered for this assessment:

- A programme of radiocarbon dating to establish the age of the deposits that have been assessed to confirm or reject the Mesolithic date that has been proposed. This would inform both the current project and any future investigations that occur to assist in the preservation of nationally important palaeoenvironmental deposits and to broaden our understanding of the development of Wilden Marsh, the wider Stour Valley and floodplains of the West Midlands as a whole.

9. Publication summary

The Service has a professional obligation to publish the results of archaeological projects within a reasonable period of time. To this end, the Service intends to use this summary as the basis for publication through local or regional journals. The client is requested to consider the content of this section as being acceptable for such publication.

An archaeological watching brief was undertaken on behalf of Jacobs Engineering acting on behalf of the Environment Agency at Wilden Marsh and Meadows SSSI, Stourport-on-Severn, Worcestershire (centred on NGR SO 82 73). The investigation revealed predominantly post-medieval and modern finds and deposits due to the shallow nature of the intrusive works although in the southern development area, deeper intrusive works occurred relating to the marsh outfall which revealed a stratified alluvial and organic sequence. Environmental analysis of the organic clay and peat indicated a dynamic marshy/wetland landscape and comparison with earlier investigations indicate that these organic deposits are potentially of a Mesolithic date.

10. Acknowledgements

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11. Personnel

The fieldwork and report preparation was led by Nick Daffern. The project manager responsible for the quality of the project was Tom Vaughan. Fieldwork was undertaken by Nick Daffern, finds analysis by Laura Griffin, environmental analysis by Nick Daffern and Alan Clapham and illustration by Claire Christiansen.

12. Bibliography

Association for Environmental Archaeology, 1995 *Environmental archaeology and archaeological evaluations: Recommendations concerning the environmental component of archaeological evaluations in England*, Working Papers of the Association for Environmental Archaeology **2**

Barber, K E, 1976 History of Vegetation, in S Chapman (ed) *Methods in Plant Ecology*. 49-52, Oxford: Blackwell Scientific Publications

Bennett, K D, 1994 *Annotated catalogue of pollen and pteridophyte spore types of the British Isles*, unpublished report, Department of Plant Sciences, University of Cambridge

Brown, A G, 1988 The palaeoecology of Alnus (alder) and the postglacial history of floodplain vegetation: pollen percentage and influx data from the West Midlands, UK, in *New Phytologist*, 110, 425-436

CAS, 1995 (as amended) *Manual of Service practice: fieldwork recording manual*, County Archaeological Service, Hereford and Worcester County Council, report, **399**

Environment Agency, 2009 *Wilden Marsh and Meadows SSSI Environment Repor*t, unpublished report

English Heritage, 2002 *Environmental Archaeology: a guide to the theory and practice of methods, from sampling and recovery to post-excavation*, Centre for Archaeology Guidelines

Godwin, H, 1975 *History of the British Flora – A factual basis for phytogeography 2nd edition*, Cambridge University Press, Cambridge

Grant-Smith, E, 2000 *Sampling and Identifying Allergenic Pollens and Molds: An Illustrated Identification Manual for Air Samplers*, San Antonio, Texas; Blewstone Press

HEAS, 2008 *Standards and guidelines for archaeological projects in Worcestershire,* Historic Environment and Archaeology Service, Worcestershire County Council

Hurst, J D, 1994 (as amended) *Pottery fabrics. A multi-period series for the County of Hereford and Worcester*, County Archaeological Service, Hereford and Worcester County Council, report, **445**

IfA, 2008 *Standard and guidance for an archaeological watching brief,* Institute for Archaeologists

Jacobs Babtie, 2005 *Wilden Marsh and Meadows SSSI Cultural Heritage Desk-Based Assessment: Worcestershire HER Number WSM34765*, unpublished report, Jacobs Babtie, Leeds

Moore, P D, Webb, J A, and Collinson, M E, 1991 *Pollen analysis*, (2nd edition), Oxford; Blackwell Scientific Publications

Rackham, J D, 2006 *Wilden Marsh and Meadows SSSI Desk-Based Palaeoenvironmental Assessment: Worcestershire HER Number WSM34765*, unpublished report number EAC30/2006, The Environmental Archaeology Consultancy, Sleaford

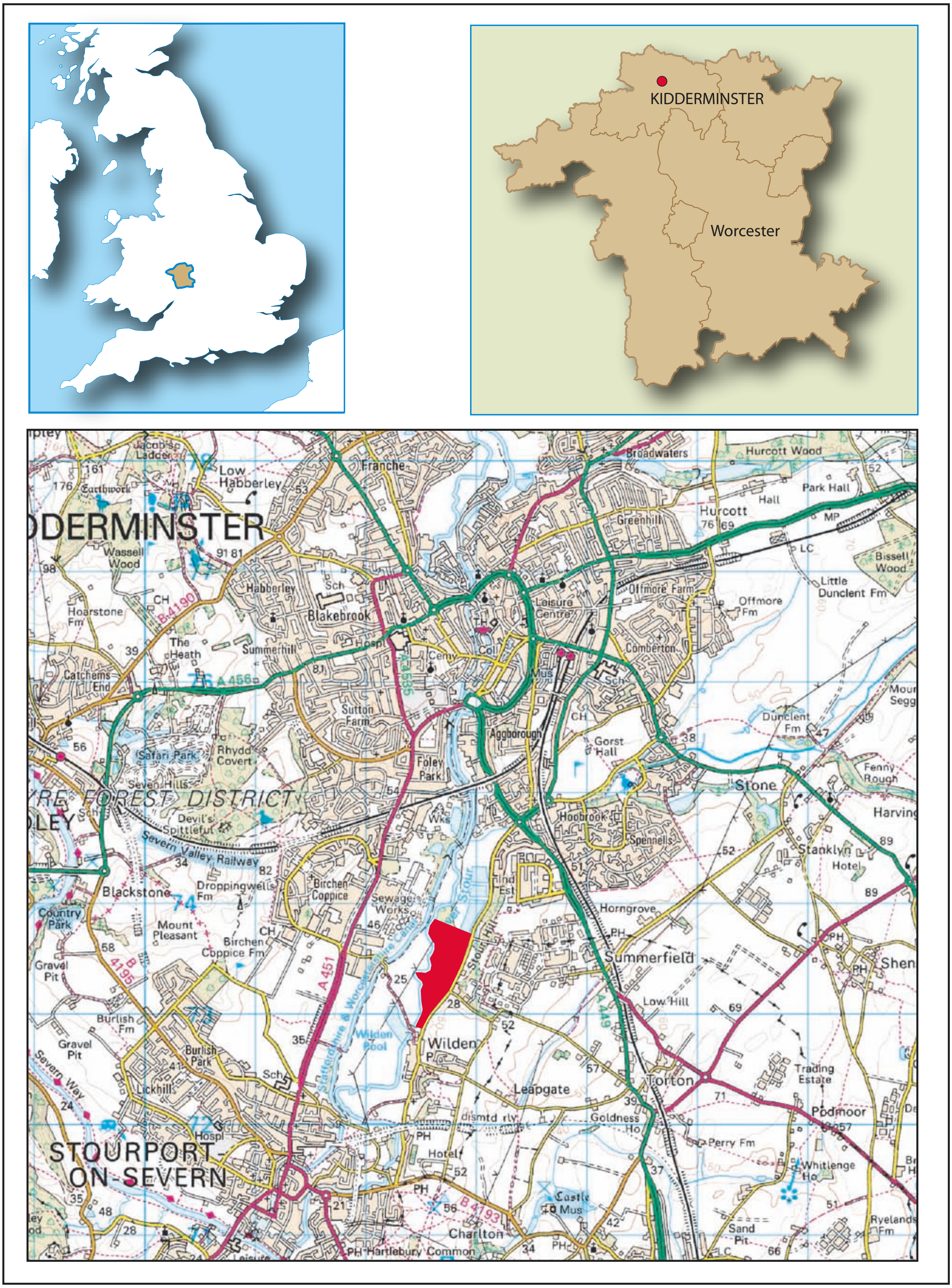
Shotton, F W and Coope, G R, 1983 Exposures in the Power House Terrace of the River Stour at Wilden, Worcestershire, England, *Proc. Geol. Ass*., **94** (1), 33-44

Stace, C, 1991 *New Flora of the British Isles*, Cambridge; Cambridge University Press

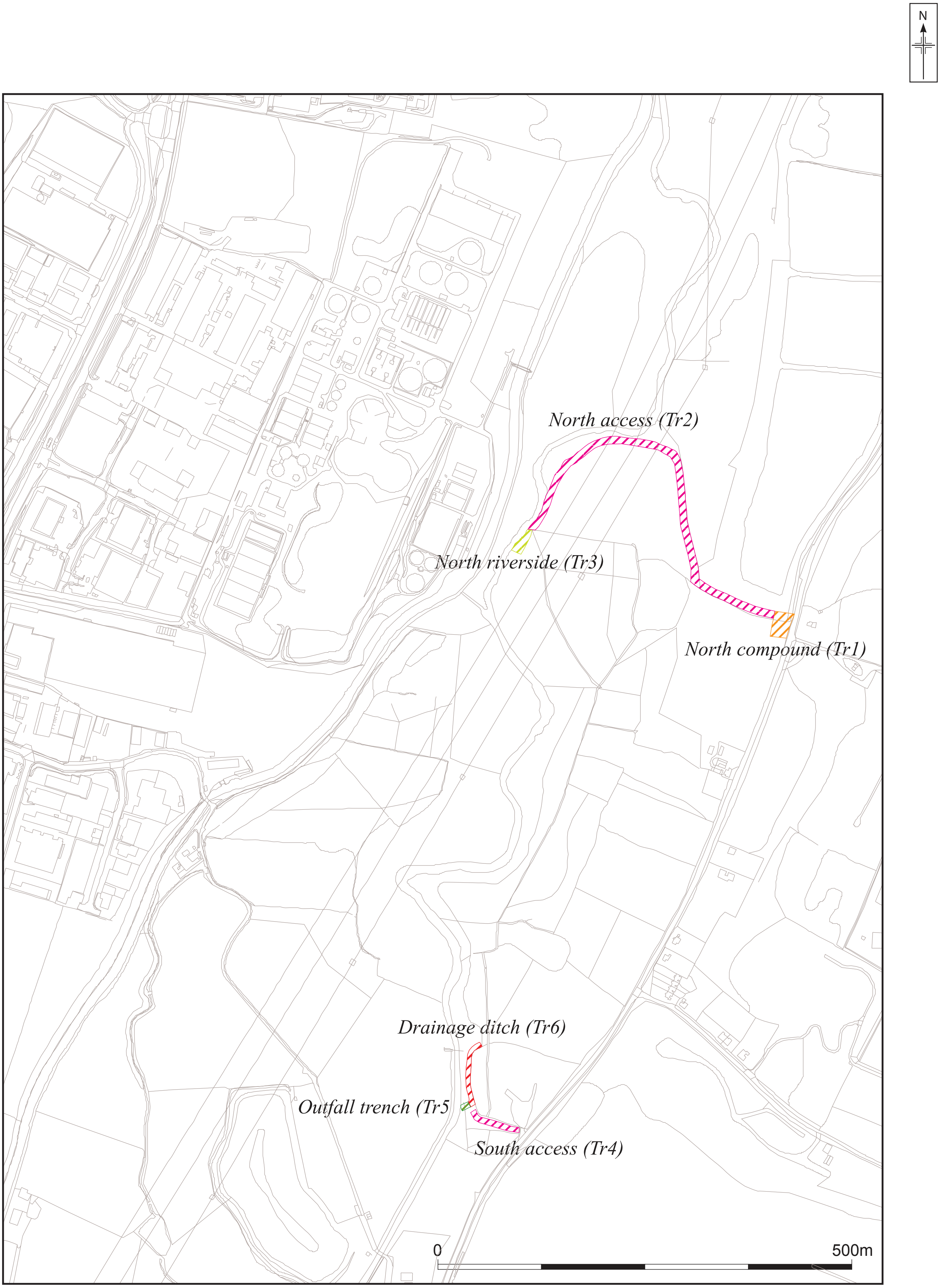
Stace, C, 1997 *New Flora of the British Isles (2nd edition)*, Cambridge; Cambridge University Press

Worcestershire Tithe and Inclosure Map Project**,** Worcestershire County Council, Available: http://www.worcestershire.gov.uk/cms/environment-and-planning/archaeology/information-and-advice/historic-environment-record/tithe-and-inclosure-map-project.aspx Accessed 12 March 2010

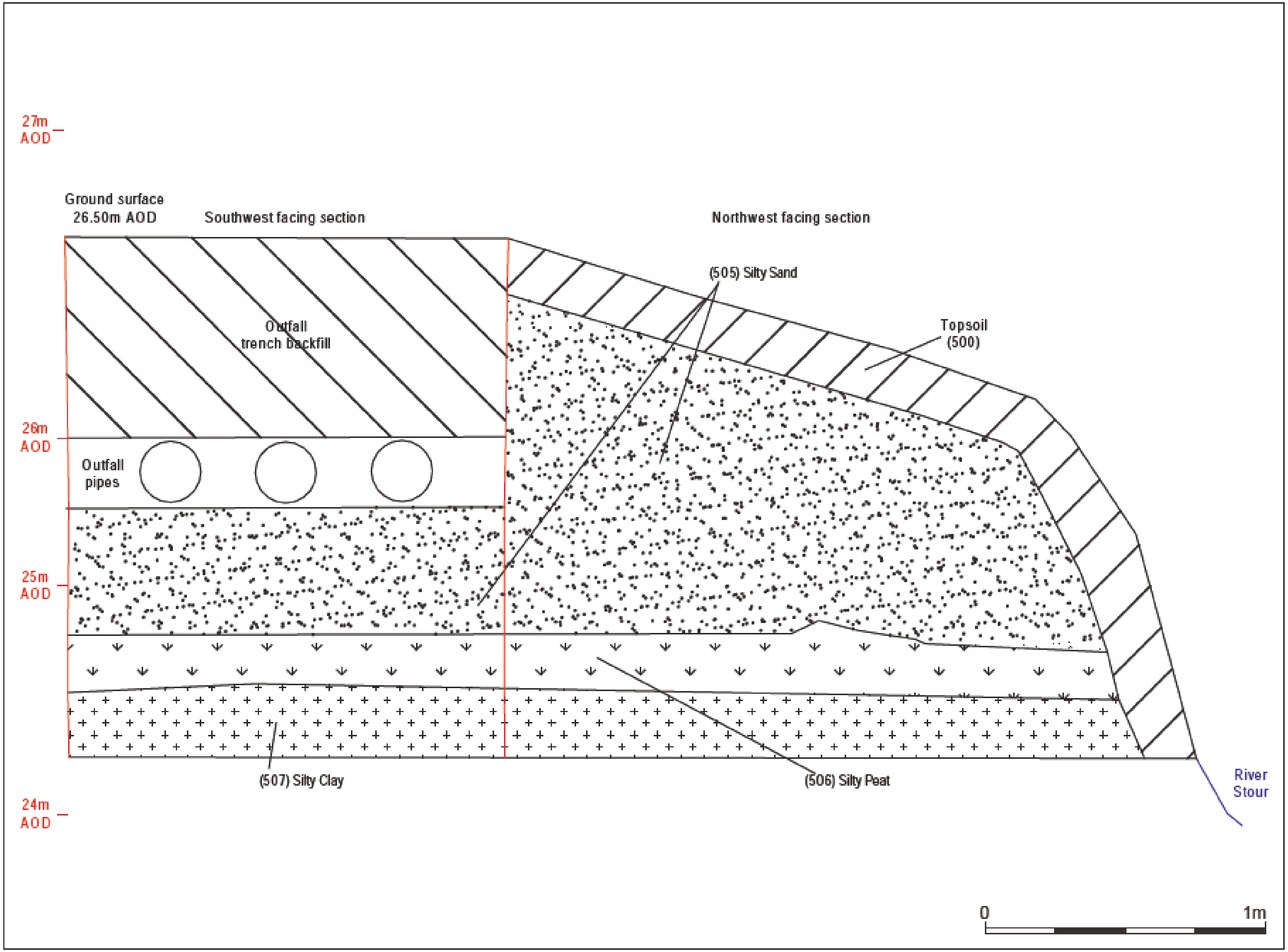
Figures



Location of the site *Figure 1*



Trench location plan *Figure 2*



Trench 5: Southwest and northwest facing sections *Figure 3*

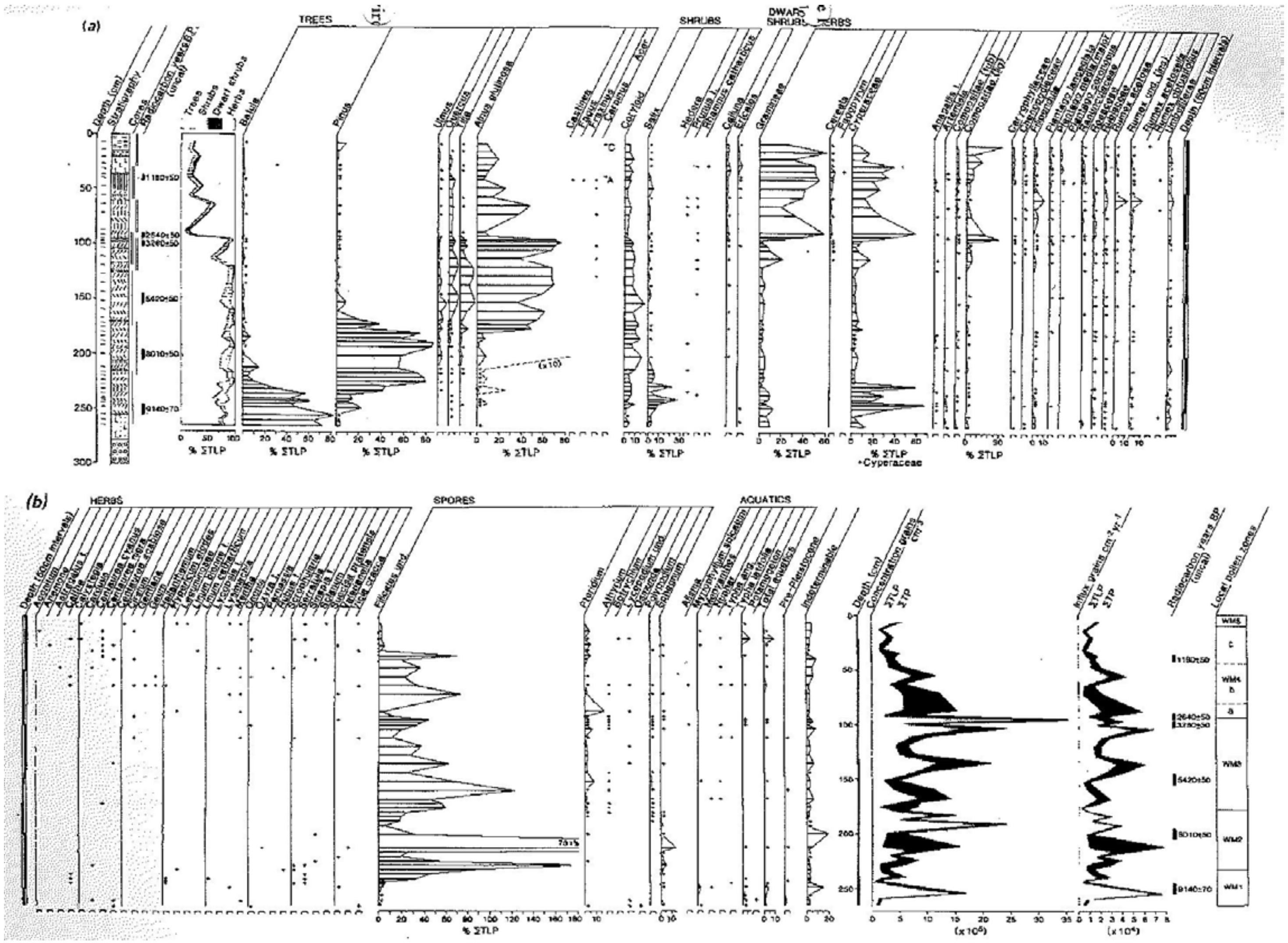


Figure 4 Wilden Marsh pollen diagram by Brown (1988)

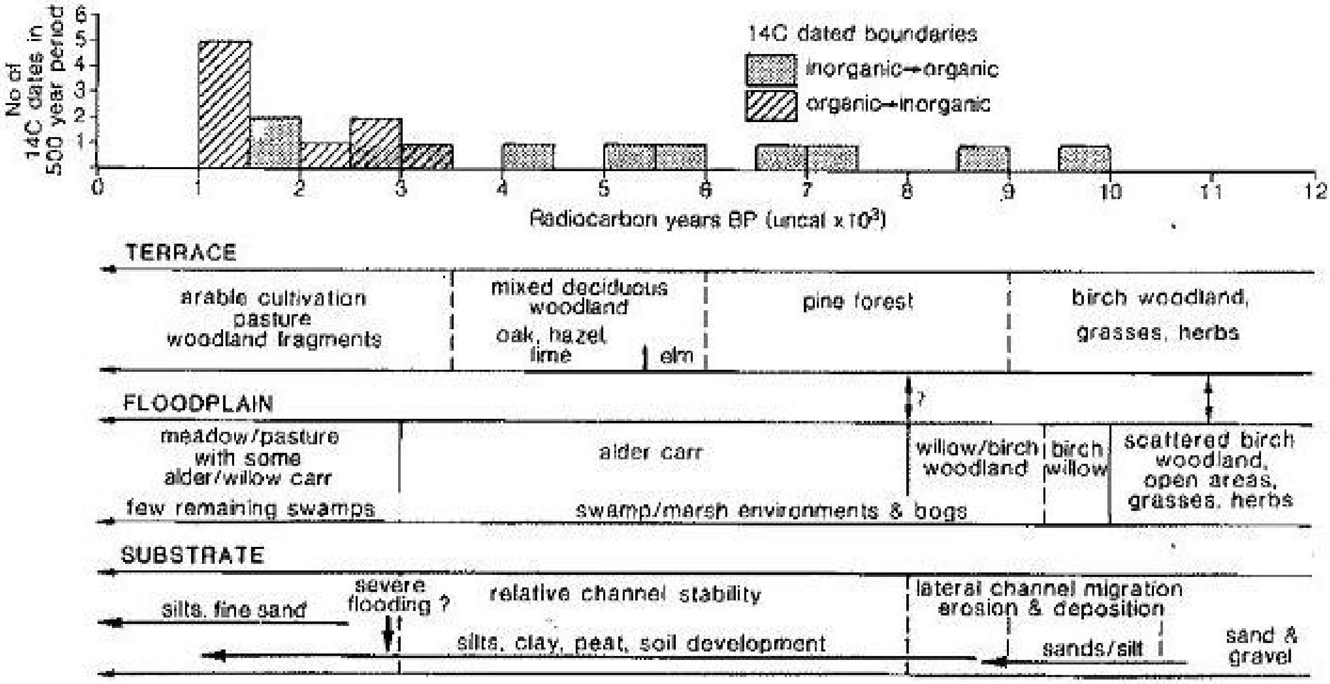


Figure 5 Simplified model of the post-glacial landscape evolution and vegetation succession of floodplains in the West Midlands. Originally published as Fig 8 in Brown (1988)

Plates

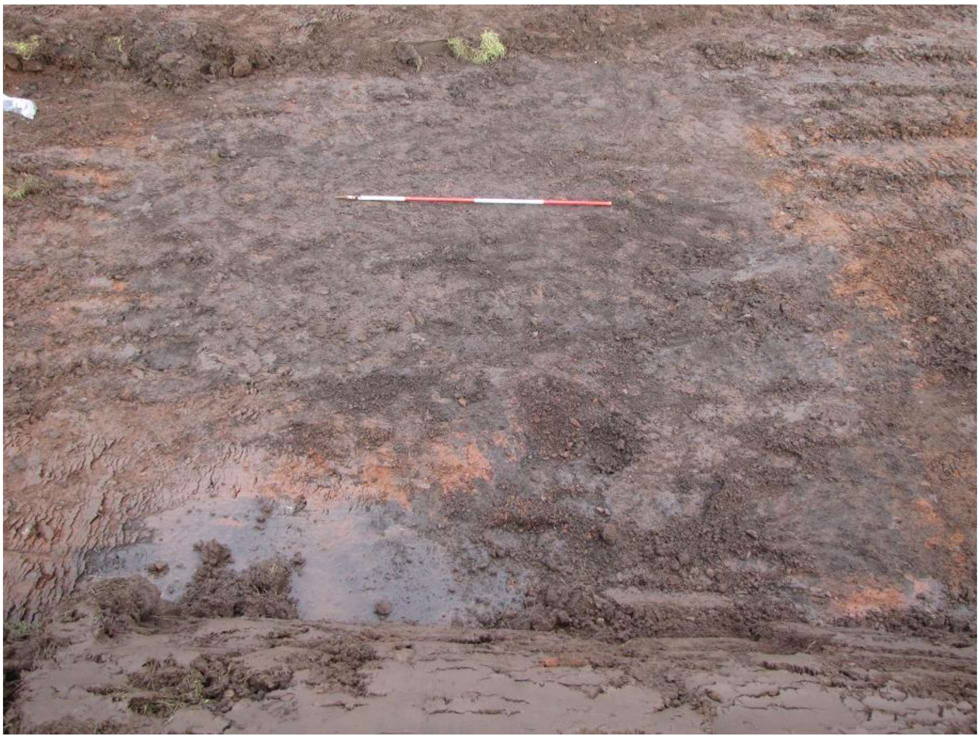


Plate 1 Undated ditch/palaeochannel (?) [102]; looking north-east

Plate 2 Natural clayey sand and gravel (103) in northern compound area (Trench 1); looking south-west

Plate 3 CBM/rubble deposit (201) exposed in northern access road strip (Trench 2); looking north-east

Plate 4 Top/subsoil (300) and orange alluvium (301) exposed in north-west facing section of Trench 3

Plate 5 Alluvial sequence (yellow sand (505), peat (506) and grey clay (507)) exposed in north-west facing section in Trench 5. Also see Fig 2 above

Plate 6 Southern Access road (Trench 4); looking west

Plate 7 Cut [504] and fill (502) of Severn Trent rising main exposed in Trench 5; looking south-east

Plate 8 Severn Trent rising main crossing the River Stour; looking north-west. N.B – The completed Weir 2 is shown in the foreground.

Plate 9 Pink silty clay (602) exposed in west facing section of drainage ditch (Trench 6)

Appendix 1 Trench descriptions

Trench 1

Site area: Northern Compound

Maximum dimensions: Length: 45.00m Width: 30.00m Depth: 0.20m

Orientation: NE - SW

Main deposit description

Context	Classification	Description	Depth below ground surface (b.g.s) – top and bottom of deposits
100	Topsoil and Subsoil	Mid brown homogenous silty sand. Extensively bioturbated	0.00-0.20m
101	Fill	Mid greyish brown silty sand. Fill of [102]	0.20->0.20m
102	Cut	Linear cut of wide ditch or possible disturbed palaeochannel	0.20->0.20m
103	Natural	Orangish red fine-medium clayey sand with occasional sub-rounded to angular gravel	0.20m+

Trench 2

Site area: Northern Access Road

Maximum dimensions: Length: >400m Width: *c* 5.00m Depth: 0.20m

Orientation: Variable

Main deposit description

Context	Classification	Description	Depth below ground surface (b.g.s) – top and bottom of deposits
200	Topsoil and Subsoil	Mid brown homogenous silty sand. Extensively bioturbated	0.00-0.30m
201	Layer	Brick and rubble mixed with 200. Modern trackway surface	0.05->0.05m
202	Natural	Orangish red fine-medium clayey sand with occasional sub-rounded to angular gravel	0.20m+

Trench 3

Site area: Northern riverside strip

Maximum dimensions: Length: 35.00m Width: 6.00m Depth: 0.20m

Orientation: NE - SW

Main deposit description

Context	Classification	Description	Depth below ground surface (b.g.s) – top and bottom of deposits
300	Topsoil and Subsoil	Mid-dark yellowish brown silty fine – medium sand. Extensively mixed and bioturbated.	0.00-0.50m
301	Layer	Light reddish orange fine-medium sand with frequent brown/black mottles. Rare, well rounded pebbles. Occasional bioturbation	0.50m+

Trench 4

Site area: Southern Access Road

Maximum dimensions: Length: 80.00m Width: 30.00m Depth: 0.20m

Orientation: E - W

Main deposit description

Context	Classification	Description	Depth below ground surface (b.g.s) – top and bottom of deposits
400	Topsoil and Subsoil	Mid brown homogenous silty sand. Extensively bioturbated	0.00-0.05m
401	Layer	Brick and rubble mixed with 400. Modern track surface	0.05m+

Trench 5

Site area: Southern outfall trench

Maximum dimensions: Length: 22.40m Width: 1.90m Depth: 2.28m

Orientation: NE - SW

Main deposit description

Context	Classification	Description	Depth below ground surface (b.g.s) – top and bottom of deposits
500	Topsoil and Subsoil	Mid brown homogenous silty sand. Extensively bioturbated	0.00-0.20m
501	Layer	Light orangish-yellow medium sand with frequent clinker and modern CBM. Probably same as (505) just with frequent disturbance and mixing	0.20-1.15m
502	Fill	Light grey fine sand with frequent darker streaks and mottles. Backfill of [504]	1.15-1.50m
503	Fill	Small, rounded pea gravel and grey sand (similar to 501). Fill of cut [504]	1.50-1.60m
504	Cut	Cut for Severn Trent Water sewer rising main (N-S)	1.15-1.60m
505	Layer	Light orangish-yellow medium silty sand (became lighter with depth, almost white)	1.15-1.75m
506	Peat deposit	Mid-dark black. Humified silty peat	1.75-2.02m
507	Layer	Light – mid grey silty clay. Occasional bioturbation from bankside.	2.02-2.28m
508	Natural	Light orangish-yellow sand and angular gravel	2.28m+

Trench 6

Site area: Drainage ditch north of south access

Maximum dimensions: Length: 70.00m Width: 2.50m Depth: 0.20m

Orientation: N - S

Main deposit description

Context	Classification	Description	Depth below ground surface (b.g.s) – top and bottom of deposits
600	Topsoil and Subsoil	Mid-dark blackish brown. Organic silty medium sand. Appears to be (601) but mixed/bioturbated and containing organic remains from the surrounding wetland vegetation	0.00-0.20m
601	Layer	Light orangish-yellow medium silty sand	0.20m+
602	Layer	Mid pink silty clay with occasional darker mottling. Only encountered in the most northern part of the trench	0.00m+

Appendix 2 Environmental data

Depth (m OD)			24.78	24.68	24.58	24.48	24.33
Description			top of peat	middle of peat	bottom of peat	top of clay	bottom of clay
Volume (ml)			100	100	100	50	50
Species	**Common name**	**Habitat**					
Urtica dioica	common nettle	ABCD					+
Betula sp	birch	C	+				
Salix sp buds	willow	C	++			+	
Potentilla sp	cinquefoils	BCDE				+++	
Oenanthe aquatica	fine-leaved water-dropwort	E				+	
Menyanthes trifoliata	bog bean	E			+		
Carex pendula	pendulous sedge	CD	+			+	
Carex flacca	glaucous sedge	DE	+				
Carex cf *flava*	large yellow-sedge	E					+
Carex cf *viridula*	yellow-sedge	E				+	
Carex sp	sedges	E			+		
Poaceae	grasses	AD	+				
Cenococcum geophilum	Soil fungus			+++			

Table 1 Waterlogged plant remains from the peat and clay deposits

Habitat	Quantity
A= cultivated ground	+ = 1 - 10
B= disturbed ground	++ = 11- 50
C= woodlands, hedgerows, scrub etc	+++ = 51 -100
D = grasslands, meadows and heathland	++++ = 101+
E = aquatic/wet habitats	
F = cultivar	

Key to Table 1

Latin Name	Family	Common Name(s)	24.78m AOD	24.68m AOD	24.58m AOD	24.48m AOD	24.33m AOD
Alnus glutinosa	Betulaceae	alder	3			2	
Betula	Betulaceae	birch	56	1	1	3	
Corylus avellana -type	Betulaceae	hazel	3				
Ilex aquifolium	Aquifoliaceae	holly	2				
Pinus sylvestris	Pinaceae	Scot's pine	2	1			
Quercus	Fagaceae	oak	2			3	
Salix	Salicaceae	willow	35	5	5	98	2
Tilia cordata	Tiliaceae	small-leaved lime	1				
Poaceae undiff	Poaceae	grass	27	2	3	20	3
Apiaceae	Apiaceae	carrot family					1
Aster -type	Asteraceae	daisy/aster	3			1	
Caryophyllaceae	Caryophyllaceae	pinks/ mouse ears	3			2	
Chenopodiaceae	Chenopodiaceae	goosefoot family	1			1	
Cichorium intybus -type	Lactuceae	chicory/dandelion					1
Cicuta virosa	Apiaceae	cowbane				1	
Cirsium -type	Asteraceae	thistle				1	
Cyperaceae undiff	Cyperaceae	sedge	3				1
Filipendula	Rosaceae	dropwort/ meadowsweet	5		1	6	
Plantago lanceolata	Plantaginaceae	ribwort plantain	3			3	
Plantago sp	Plantaginaceae	plantain	1				
Potentilla -type	Rosaceae	cinquefoil	1			2	
Ranunculus acris -type	Ranunculaceae	meadow buttercup	6			1	
Rosaceae	Rosaceae	rose family				1	
Rumex acetosella	Polygonaceae	sheeps sorrel	3				
Saxifraga granulata -type	Saxifragaceae	meadow saxifrage				2	
Silene vulgaris -type	Caryophyllaceae	bladder campion	1				
Valeriana dioica	Valerianaceae	marsh valerian	1				
Urtica dioica	Urticaceae	stinging nettle	7			3	
		Total land pollen grains counted	**169**	**9**	**10**	**150**	**8**
Nymphaea alba	Nymphaeaceae	white waterlily				1	
Polypodium	Polypodiaceae	true ferns				2	
Potamogeton	Potamogetonaceae	pondweed	1				
Pteridium aquilinum	Dennstaedtiaceae	bracken	1			4	1
Pteropsida (mono) indet		ferns					1

Table 2 Palynological remains from the peat and clay deposits at Wilden Marsh

Appendix 3 Pollen processing methodology (Tim Mighall, Department of Geography & Environment, University of Aberdeen)

ABSOLUTE POLLEN ANALYSIS: PREPARATION SCHEDULE

PRECAUTIONARY NOTES: All procedures, up to stage 25, should take place in the fume cupboard. Read precautionary notices on fume cupboard before starting. Ascertain whereabouts of First Aid equipment NOW. Please wear laboratory coat, gloves and goggles when dealing with all chemicals. Please organize fume cupboard carefully to maximize workspace. Use the containment trays provided. Always keep the fume cupboard door down as far as practically possible. Make sure the fume cupboard is switched on and functioning correctly.

A) SOLUTION OF HUMIC COMPOUNDS

1) Switch on hotplate to heat water bath. Prepare 12 to 16 samples concurrently.

HCl. is an irritant and can cause burns. Wear gloves. Wash with water if spilt on your skin.

Using a clean spatula, place a known volume or weight of sediment (c. 2cm^3) and one spore tablet in each 50ml centrifuge tube. Add a few cm^3 of distilled water (enough to cover the pellet and tablets) and a few drops of 2M HCl. Wait until effervescence ceases, then half fill tubes with 10% KOH; place in a boiling water bath for 15 minutes. Stir to break up sediment with clean glass rod. Return HCl and KOH bottles to the chemical cabinet.

2) Centrifuge at 3,000 rpm for 5-6 minutes, ensuring first that tubes are filled to the same level. This applies throughout the schedule (Mark 7 on centrifuge).

3) Carefully decant, i.e. pour away liquid from tube, retaining residue. Do it in one smooth action.

4) Disturb pellet using vortex mixer; add distilled water, centrifuge and decant.

5) Using a little distilled water, wash residue through a fine (180 micron) sieve sitting in filter funnel over a beaker. NB Be especially careful in keeping sieves, beakers and all tubes in correct number order. Wash residue on sieve mesh into petri dish and label the lid. If beaker contains mineral material, stir contents, wait four seconds, then decant into clean beaker, leaving larger mineral particles behind. Repeat if necessary. Clean centrifuge tube and refill with contents of beaker.

6) Centrifuge the tubes and decant.

B) HYDROFLUORIC ACID DIGESTION

***(Only required** if mineral material clearly still present. Otherwise, go to stage 13)*

NB Hydrofluoric acid is extremely corrosive and toxic; it can cause serious harm on contact with eyes and skin. Rubber gloves and mask/ goggles MUST be worn up to and including stage 11. Please fill sink with H_20; have $CaCo_3$ gel tablets ready. Place pollen tube rack into tray filled with sodium bicarbonate.

7) Disturb pellet with vortex mixer. Add one cm^3 of 2M HCl.

8) With the fume cupboard sash lowered between face and sample tubes, very carefully one-third fill tubes with concentrated HF (40%). Place tubes in water bath and simmer for 20 minutes.

9) Remove tubes from water bath, centrifuge and decant down fume cupboard sink, flushing copiously

with water.

10) Add 8cm^3 2H HCl to each tube. Place in water bath for 5 minutes. Do not boil HCl.

11) Remove tubes, centrifuge while still hot, and decant.

12) Disturb pellet, add distilled water, centrifuge and decant.

C) ACETYLATION

NB Acetic acid is highly corrosive and harmful on contact with skin. Wash with H_20 if spilt on skin.

13) Disturb pellet, add 10cm^3 glacial acetic acid, and centrifuge. Decant into fume cupboard sink with water running during and after.

14) Acetic Anhydride is anhydrous. Avoid contact with water. The acetylation mixture can cause severe burns if spilt on skin. Wash with water.

15) Make up 60cm^3 of acetylation mixture, just before it is required. Using a measuring cylinder; mix acetic anhydride and concentrated sulphuric acid in proportions 9:1 by volume. Measure out 54cm^3 acetic anhydride first, then add (dropwise) 6cm^3 concentrated H_2S0_4 carefully, stirring to prevent heat build—up. Stir again just before adding mixture to each tube.

Disturb pellet; then add 7cm^3 of the mixture to each sample.

16) Put in boiling water bath for 1-2 minutes. (Stirring is unnecessary—never leave glass rods in tubes as steam condenses on the rods and runs down into the mixture reacting violently). One minute is usually adequate; longer acetylation makes grains opaque. Switch off hot plate.

17) Centrifuge and decant all tubes into large (1,000ml) beaker of water in fume cupboard. Decant contents of beaker down fume cupboard sink.

18) Disturb pellet, add 10cm^3 glacial acetic acid, centrifuge and decant.

19) Disturb pellet, add distilled water and a few drops of 95% ethanol centrifuge and decant carefully.

D) DEHYDRATION, EXTRACTION AND MOUNTING IN SILICONE FLUID

20) Disturb pellet; add 10cm^3 95% ethanol, centrifuge and decant.

21) Disturb pellet; add 10cm^3 ethanol (Absolute alcohol), centrifuge and decant. Repeat.

22) Toluene is an irritant. Avoid fumes.

Disturb pellet; add about 8cm^3 toluene, centrifuge and decant carefully into 'WASTE TOLUENE' beaker in fume cupboard (leave beaker contents to evaporate overnight).

23) Disturb pellet; then using as little toluene as possible, pour into labelled specimen tube.

24) Add a few drops of silicone fluid - enough to cover sediment.

25) Leave in fume cupboard overnight, uncorked, with fan switched on. Write a note on the fume cupboard *'Leave fan on overnight - toluene evaporation',* and date it. Collect specimen tubes next morning and cork them. Turn off fan.

26) Using a cocktail stick, stir Contents and transfer one drop of material onto a clean glass slide and

cover with a cover slip (22mm x 22mm). Label the slide.

27) Wash and clean everything you have used. Wipe down the fume cupboard worktop. Remove water bath from fume cupboard if not needed by the next user. Refill bottles and replace them in chemical cabinets.

Appendix 4 Technical information

The archive

The archive consists of:

6	Trench records AS41
7	Fieldwork progress records AS2
2	Photographic records AS3
1	Sample number catalogue AS18
1	Scale drawings
5	Flot record sheet AS21
5	Pollen Scoresheets
5	Vials containing polliniferous material

The project archive is intended to be placed at:

Worcestershire County Museum
Hartlebury Castle
Hartlebury
Near Kidderminster
Worcestershire DY11 7XZ
Tel Hartlebury (01299) 250416

Summary of data for Worcestershire HER

Depth (m OD)			24.78	24.68	24.58	24.48	24.33
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Table 4 Palynological remains from the peat and clay deposits at Wilden Marsh