CHONAR FARM, WILMSLOW TO ALDERLEY EDGE PIPELINE, CHESHIRE EAST

Palaeoenvironmental Assessment

Oxford Archaeology North

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Prepared by:	Mairead Rutherford	
Position:	Project Officer	
Date:	October 2011	
Checked by:	Richard Gregory	PP Signed.....
Position:	Project Manager	
Date:	May 2012	
Approved by:	Alan Lupton	Signed.....
Position:	Operations Manager	
Date:	May 2012	

Oxford Archaeology North
Mill 3
Moor Lane Mills
Moor Lane
Lancaster
LA1 1GF
t: (0044) 01524 541000
f: (0044) 01524 848606

w: www.oxfordarch.co.uk
e: info@oxfordarch.co.uk

Janus House
Osney Mead
Oxford
OX2 0EA

t: (0044) 01865 263800
f: (0044) 01865 793496

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SUMMARY

In June 2010, OA North undertook a programme of palaeoenvironmental coring across a small peat basin located close to Chonar Farm, Wilmslow, Cheshire East (centred on NGR: SJ 85595 79622). The work was commissioned by United Utilities Ltd as part of a wider scheme of archaeological investigation connected with the construction of a water pipeline running between Wilmslow and Alderley Edge.

Two cores were subjected to pollen and plant macrofossil assessment, and also to radiometric dating. These studies indicated that the peat within the basin mire was formed prior to the Bronze Age, and that the mire contains an assemblage of pollen and plant macrofossils allowing for a partial reconstruction of the local environment. More specifically, these palaeoenvironmental remains are indicative of the transition from open plant communities, probably present in the early Mesolithic period, to mixed woodland, and a local development of alder carr, dating to the early Bronze Age.

ACKNOWLEDGEMENTS

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The palaeoenvironmental coring was undertaken by Denise Druce and Mairead Rutherford and the palaeoenvironmental assessment was completed by Mairead Rutherford. Mark Tidmarsh produced the illustrations. Alison Plummer managed the project, whilst the report was edited by Richard Gregory.

1. INTRODUCTION

1.1 CIRCUMSTANCES OF THE PROJECT

1.1.1 In June 2010, OA North undertook a programme of palaeoenvironmental coring across a small peat basin located close to Chonar Farm, Wilmslow, Cheshire (centred on NGR: SJ 85595 79622; Fig 1). The work was commissioned by United Utilities Ltd as part of a wider scheme of archaeological investigation connected with the construction of a water pipeline running between Wilmslow High Lifting Pumping Station and Alderley Edge Service Reservoir, Cheshire East (NGR: SJ 84974 81534 to SJ 85792 77757).

1.1.2 The peat basin was identified during an archaeological watching brief, which observed the stripping of the topsoil along the route of the pipeline (OA North 2011). The programme of palaeoenvironmental coring followed recommendations made by the Cheshire Archaeology Planning Advisory Service and the English Heritage Archaeological Science Advisor for North West England, and was designed to retrieve samples, which could then be subjected to pollen and plant macrofossil assessment, and also to radiometric dating.

1.2 LOCATION, GEOLOGY, AND TOPOGRAPHY

1.2.1 The peat basin is positioned immediately west of Chonar Farm, which lies at the junction of Hough Lane and Heyes Lane, and falls within an area that was designated as 'Field 19' during an earlier archaeological desk-based assessment (OA North 2009). The watching brief established that the peat basin lay in the eastern portion of the field (Pl 1), and that it was present as a thin layer of peat, positioned approximately 3m from the eastern side of the pipeline easement, which then became progressively deeper. Several tree trunks and roots were also observed within the peat (Pl 2).

Plate 1: view to the south in Field 19 looking towards the peat basin

Plate 2: Section of tree trunk and roots exposed in the peat basin

1.2.2 Across Field 19 the solid geology, as mapped by the British Geological Survey (1977), consists of the Wilmslow Sandstone Formation, dating to the Early Triassic Epoch, and the peat basin appears to have developed within a hollow contained within the overlying superficial geology, which comprises Devensian Till. Topographically, the peat basin resides at 85m above Ordnance Datum (aOD).

1.2.3 Historically, the peat basin did not exist in isolation, but lay directly adjacent to a former wetland area, known as Lifeless Moss (Leah *et al* 1997, 46-8). This mossland, although now completely reclaimed, is depicted on Burdett's 1777 map of Cheshire, and lay immediately west of the exposed peat basin, within an area bounded to the north by Big Brick Hill Farm, to the south by Hough Green Farm, to the east by Hough Lane, and to the west by Moss Farm (*op cit*, fig 29).

1.2.4 More generally, Lifeless Moss and the exposed peat basin at Chonar Farm are situated within Cheshire's 'Eastern Mosses' as defined by the North West Wetlands Survey (*op cit*, 45-95). This area of wetlands contains numerous small basin mires, such as that exposed at Chonar Farm, and also several large mosses, principally Danes Moss and Lindow Moss (*op cit*, 45).

2. METHODOLOGY

2.1 PALAEOENVIRONMENTAL CORING

2.1.1 Following the identification of the peat basin during the watching brief, six gouge cores were initially extracted along a short transect (<20m) running across the basin in order to establish the lithological sequence. These cores indicated that the lower part of the sequence comprised grey silts and clays, which were overlain by a homogenous deposit of black peat. This deposit, in turn, was sealed by a further deposit of peat, containing some moss peat, which then graded upwards into a woody peat.

2.1.2 Once the lithological sequence had been determined, a palaeoenvironmental core (WS-5) was extracted from the deepest area of peat identified along the line of the transect using a Russian core (WS-5). The Russian core collect a 0-2.40m-deep sample of peat, but, due to increasing silty lithologies, a gouge core had to be used to retrieve the section extending between the depths of 2.40m and 3.20m. A second Russian core (WS-2) was also collected from the transect, though it was suspected that this core might contain younger, more recent sediments.

2.2 PALAEOENVIRONMENTAL ASSESSMENT

2.2.1 ***Pollen assessment:*** the palaeoenvironmental cores were cleaned and described prior to sub-sampling. Sixteen sub-samples were taken from WS-5 and five sub-samples were taken from WS-2 (Tables 1 and 2). Two sub-samples were selected for AMS dating, one from the top of the Russian core (WS-5) at 0.04-0.05m and the second was taken from the base of the Russian core (WS-5) at 2.39-2.40m.

2.2.2 Volumetric samples were taken from the 21 samples and two tablets containing a known number of *Lycopodium* spores were added so that pollen concentrations could be calculated (Stockmarr 1971). The samples were prepared using a standard chemical procedure (method B of Berglund and Ralska-Jasiewiczowa 1986), using HCl, NaOH, sieving, HF, and Erdtman's acetolysis, to remove carbonates, humic acids, particles >170 microns, silicates, and cellulose, respectively.

2.2.3 The samples were then stained with safranin, dehydrated in tertiary butyl alcohol, and the residues mounted in 2000cs silicone oil. Slides were examined at a magnification of 400x by ten equally spaced traverses across at least two slides to reduce the possible effects of differential dispersal on the slides (Brooks and Thomas 1967), or at least 100 total land-pollen grains. Where abundant pollen was preserved, counts of 200 grains were achieved. Pollen identification was made following the keys of Moore *et al* (1991), Faegri and Iversen (1989), and a small modern reference collection held at OA North. Plant nomenclature follows Stace (1997) throughout. The preservation of the pollen was noted and an assessment was made of the potential for

further analysis. Fungal spore identification and interpretation followed van Geel (1978) and Blackford *et al* (in press).

2.2.4 ***Plant Macrofossils:*** 16 sub-samples for macrofossil plant remains were sampled from Russian cores WS-5 (11 sub-samples) and WS-2 (five sub-samples) (Tables 1 and 2). The samples were hand-floated and the flots were then collected on a 250 micron mesh and retained wet. A representative sample of each flot was scanned with a Leica MZ60 stereo microscope and the plant material was quantified and provisionally identified. Plant remains were scored on a scale of abundance of 1-4, where 1 is rare (up to 5 items) and 4 is abundant (>100 items). The components of the matrix were also noted.

Depth (m) of plant macro-fossil sub-samples	**Depth (m) of pollen sub-samples**	**Lithology of core**
0.05-0.10	0.09-0.1	0-0.2m Wet crumbly brown peat with common plant fragments 0.21-0.22m Thin pale grey silt layer
0.25-0.30, 0.40-0.45, 0.60-0.65	0.24-0.25, 0.39-0.40, 0.59-0.60	0.22-0.80m Wet brown silty peat with abundant plant remains. Charcoal 0.36-0.37m
0.95-1.00, 1.05-1.10, 1.30-1.35, 1.55-1.60, 1.75-1.80	0.89-0.9, 1.09-1.10, 1.29-1.30, 1.59-1.60, 1.79-1.80	0.80-1.80m Homogenous dark black/brown silty peat with wood fragments at 0.94-0.95m and 1.31-1.32m 1.80-2.00m Wet dark black/brown peat with common plant debris and moss peat in places
2.05-2.10, 2.30-2.35	2.09-2.10, 2.19-2.20, 2.29-2.30	2.00-2.40m Black/brown peat with abundant plant matter; some moss peat
	***** 2.54-2.55, 2.79-2.80	2.40-2.86m Homogenous black silty peat with abundant plant detritus
	***** 3.09-3.10	2.86-3.18m Black/brown silty peat
	***** 3.19-3.20	3.18-3.40m Blue/grey/yellow silts and clays

* indicates sample from gouge core. All other samples were taken with a Russian core.

Table 1: Lithology of core WS-5 and sub-sample depths selected for plant macrofossil and pollen

Depth (m) of plant macro-fossil sub-samples	**Depth (m) of pollen sub-samples**	**Lithology of core**
0.15-0.20, 0.40-0.45	0.15-0.16, 0.39-0.40	0.00-0.50 Crumbly humic silty peat becoming blacker with wood fragments and charcoal
0.55-0.60, 0.75-0.80,	0.54-0.55, 0.79-0.80	0.50-0.84 Humic dark brown silty peat with plant detritus
0.90-0.95	0.95-0.96	0.84-0.93m Light brown peat, mossy in places 0.93-1.00m Black/brown humic silty peat

Table 2: Lithology of core WS-2 and sub-sample depths selected for plant macrofossil and pollen assessment

3. RESULTS

3.1 RADIOMETRIC DATES

3.1.1 The two samples selected for radiometric dating were assayed using the accelerator mass spectrometry (AMS) technique, which allows small quantities of carbon to be dated. This was undertaken at the Scottish Universities Environmental Research Centre (SUERC) and the full details of methods and procedures can be obtained from Gordon Cook of SUERC. The radiocarbon dates were calibrated using the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal v3.10; Bronk Ramsey 2005), using atmospheric data from Reimer *et al* (2004). The results are presented in Table 3.

SUERC reference	Depths (m)	Date (BP)	Calibrated age	Period
34807	0.04-0.05	3700 ±35	*68.2% Probability* 2140-2030 cal BC *95.4% Probability* 2200-2010 cal BC (91.3%) 2000-1970 cal BC (4.1%)	Early Bronze Age
33849	2.39-2.40	3505 ±35	*68.2% Probability* 1890-1770 cal BC *95.4% Probability* 1930-1740 cal BC	Early Bronze Age *

*The lower anomalous date may be explained by contamination (see text)

Table 3: AMS dates from Russian core WS-5

3.2 POLLEN ASSESSMENT

3.2.1 The raw pollen counts are presented in *Appendix 1*.

3.2.2 Two of the sub-samples selected for pollen assessment proved unproductive, and these were both derived from core WS-5. These included the bottom sample (3.19-3.20m), which contained largely minerogenic sediments, and a sample from a depth of 2.19-2.20m. The unproductive nature of this latter sample may be an indication of rapid peat accumulation, and the occurrence of *Rhizopoda* (rhizopods) indicates a probably wet and boggy environment.

3.2.3 The productive sub-samples suggest a landscape evolving through the Mesolithic to the early Bronze Age period (3700±35 BP; SUERC-34807; Table 3). However, the assessment samples are spaced too far apart and insufficiently detailed to provide any reliable reflection of landscape evolution. At approximately 3.0m depth (Russian Core WS-5), sub-samples suggest organic deposition began in open-water environments above basal clays, indicated by the occurrence of *Myriophyllum alterniflorum* (Water Milfoil) and the freshwater algae *Pediastrum* spp., and *Botryococcus* spp. This assemblage appears typical of the early Mesolithic and potentially correlates

with Zone DM-1 of Birks (unpublished, in Leah *et al* 1997, fig 41). This assemblage has not been subjected to AMS dating as the samples from this lower section were collected using a gouge core.

3.2.4 Between approximately 3.10m and 2.50m, values for birch and then pine show an increase, as birch and pine open scrub vegetation attempts to develop, probably in response to drier soils. More generally, *Pinus sylvestris* (Scots Pine) is believed to have colonised large parts of the British Isles in response to post-glacial climatic amelioration from *c* 9500 BP (Huntley and Birks 1983). However, locally, wet environments are still in evidence, as indicated by reasonably high values for pollen of *Poaceae* (Grasses), *Filipendula* (Meadowsweet), *Salix* (willow), and *Equisetum* (Horsetails).

3.2.5 Between 2.30m and 2.10m, a transition to birch dominated woodland may be interpreted, although locally there is still evidence for wet environments. This is evidenced by the abundance of Rhizopods which inhabit the wet surfaces of boggy land. Although some alder pollen has been recorded within the interval 2.30-3.0m, the low values are roughly in line with the gradual rise in alder seen regionally (Birks unpublished, in Leah *et al* 1997, fig 41). A sub-sample of peat from 2.39-2.40m was dated to 1930-1740 cal BC at the 95.4% probability level (3505±35 BP; SUERC-33849; Table 3), but the absence of significant values of alder pollen suggest that the core may have been contaminated.

3.2.6 At 1.80m and 1.60m, woodland dominated by *Corylus* (Hazel) and birch, with some pine, was established. The rise of hazel is an event that has been dated at other locations in the northern England, and one potential correlation might be with the rise in hazel seen in Red Moss where the *Corylus-Pinus* Zone is dated to 8429-7588 cal BC (8880±170 BP; Q921) (Hibbert *et al* 1971). However, as a caveat to this, as the sub-samples from the Chonar Farm cores are widely spaced, and have only been subjected to an assessment, it is not possible to be certain that the recorded assemblages reflect the established Holocene pollen successions, as documented at other sites.

3.2.7 Between approximately 1.30m and 0.60m, pine becomes an important, sometimes dominant, tree type within a mixed woodland regime. Records for the Mesolithic distribution of *Pinus sylvestris* show that it appears to have been increasingly dominant in south Cheshire from about 8625 BP, and mosses from this region often have pine stumps towards the base of the moss (Lageard *et al* 1999). Pine is known to favour drier, sandy soils, such as the sandy outwash of Alderley Edge, near Wilmslow. Within the region, several episodes of pine development, rather than one discrete arboreal phase, have been identified at Lindow Moss (Leah *et al* 1997). Although a mixed woodland assemblage comprising dominantly pine and birch, with significant hazel, and consistent lower values for oak, elm and willow, is characteristic of a Mesolithic mixed forest, the assessment of relatively few samples is insufficient to be certain of the age of the Chonar Farm sediments.

3.2.8 A significant event within the cores is the dominance of *Alnus* (alder) at 0.39-0.40m suggesting the local development of alder carr communities. The rise of alder has been dated at Red Moss in Lancashire to 6596-6031 cal BC

(7460±150 BP; Q917) (Hibbert *et al* 1971). This tree-dominated phase of the Chonar Farm peat development is not superseded by the establishment of *Eriophorum-Calluna*-dominated vegetation, as seen in Lindow Moss and Danes Moss, which is generally linked to climatic change during the mid-late Iron Age (Leah *et al* 1997). Moreover, an AMS sample taken from the top of the Chonar Farm basin (WS-5; 0.04-0.05m) yielded an early Bronze Age date (3700±35 BP; SUERC-34807; Table 3).

3.2.9 Fewer sub-samples were assessed from the Russian core (WS-2), as it was unclear if it might include younger, more recent, sediments. The two lowermost sub-samples indicate wet local environments with *Equisetum* (horsetails) and *Menyanthes* (Bog Bean), and with birch and *Juniperus* (Juniper) favouring drier soils. The recorded assemblage suggests that the wider landscape was largely open, as it contained a reasonably diverse herb flora including *Poaceae* (Grasses), *Cyperaceae* (Sedges), *Filipendula* (Meadowsweet), *Rumex* (Dock) and *Potentilla* (Cinquefoil). The upper three sub-samples from WS-2 show development of mixed deciduous woodland, characterised by abundant alder and probable development of alder carr communities. It is possible that the position of WS-2 may be at the edge of a small basin, whereas sediments in WS-5 occupy a more central position.

3.3 PLANT MACROFOSSIL ASSESSMENT

3.3.1 The plant macrofossil data are presented in Tables 4 and 5.

Sample Depth (m)	Plant macrofossils
0.05-0.10	Amorphous matter (4); herbaceous fibrous detritus (1)
0.25-0.30	Herbaceous detritus (3), wood (3) charcoal (1)
0.40-0.45	Herbaceous detritus (3), wood (3)
0.60-0.65	Herbaceous detritus (4); wood (3)
0.95-1.00	Herbaceous detritus (4); amorphous matter (4), woody material (2)
1.05-1.10	Herbaceous detritus (4), amorphous matter (3), *Carex* spp. (1)
1.30-1.35	Herbaceous detritus (4); wood (3) charcoal (1)
1.55-1.60	Herbaceous detritus (4); *Sphagnum* leaves (2); other moss stems (?*Polytrichum*)
1.75-1.80	Herbaceous detritus (4); wood (3); *Carex* spp. (1)
2.05-2.10	Herbaceous detritus (4) stems and leaf; *Sphagnum* leaves (3); *Carex* spp. (1)
2.30-2.35	Herbaceous detritus (4); *Sphagnum* leaves (3-4); Amorphous matter (2)

Table 4: Details of plant macrofossil recovery from core WS-5

Sample Depth (m)	Plant macrofossils
0.15-0.20	Amorphous matter (4); herbaceous material (1)
0.40-0.45	Herbaceous material (4) including stems
0.55-0.60	Herbaceous material (4) plus stems; amorphous matter (3); *Sphagnum* leaves (1)
0.75-0.80	Herbaceous material (4); *Carex* spp. (1)
0.90-0.95	Herbaceous material (4); amorphous matter (3); *Carex* spp. (1)

Table 5: Details of plant macrofossil recovery from core WS-2

3.3.2 The plant macrofossil assessment records the leaves of *Sphagnum* spp. and stems from other mosses at deeper levels in both cores (Tables 4 and 5) and this is indicative of bog plant communities. The plant macrofossil assessment

confirms the lithological description of moss peat from the cores (Tables 1 and 2). The occurrence of *Carex* spp. or sedges infers wetter depositional environments in the lower parts of each core. Within the upper levels of Russian core WS-5, woody material is a significant component of the assemblages. The overall assemblages indicate a potential shift from wetter plant communities towards a more wooded landscape.

4. CONCLUSION

4.1 Within Cheshire, palaeoenvironmental data recovered from small basin mires is comparatively rare, particularly within the area surrounding Wilmslow and Alderley Edge (Leah *et al* 1997). This absence is, in some respects, due to the fact that the small basin mires are amongst the most threatened class of wetlands in the Cheshire region, and many have been obliterated, or severely truncated, through ploughing and peat cutting (*ibid*).

4.2 Significantly, small basin mires hold valuable localised palaeoenvironmental data, as their small surface area means that they often contain detailed palynological information from a small catchment (Jacobson and Bradshaw 1981). The peat basin exposed during the construction of the United Utilities pipeline is no exception to this, as it too appears to contain evidence relevant to the local environment, specifically that surrounding Chonar Farm. Although the AMS dates derived from this basin indicate that peat of post-early Bronze Age date has been stripped from the site, probably as a result of peat cutting, the surviving peat provides some insight into the early environment. The pollen and plant macrofossil assemblage from this basin indicates that in its immediate vicinity there was a transition from open plant communities to mixed woodland, and a local development of alder carr which appears to date between the early Mesolithic and early Bronze Age. This data, although temporally limited, will therefore prove of some value to other researchers, wishing to reconstruct the ancient environment of northern Cheshire.

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FIGURES

Figure 1: Approximate location of peat basin

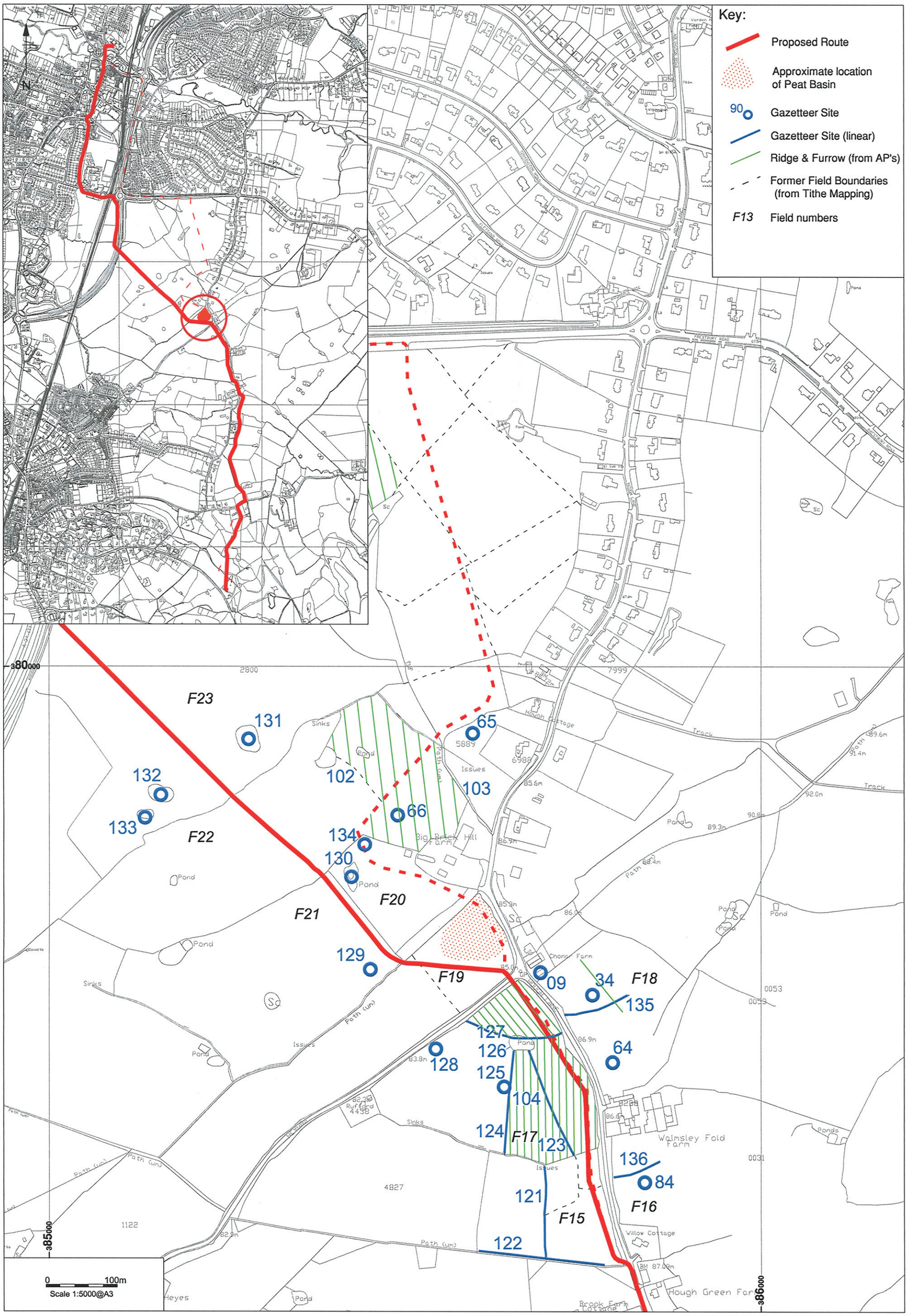

Figure 1: Approximate location of Peat Basin

APPENDIX 1: POLLEN COUNTS

Sample		WS-5	WS-5	WS-5	WS-5	WS-5	WS-5	WS-5	WS-5
Preservation		Good	Good	Good	Good	Good	Good	Good	Good
Potential		Good	Good	Good	Good	Good	Good	Good	Good
Depth (m)		0.09-0.1	0.24-0.25	0.39-0.40	0.59-0.60	0.89-0.90	1.09-1.10	1.29-1.30	1.59-1.60
Trees/Shrubs									
Alnus	Alder	56	117	105	1	0	3	11	5
Betula	Birch	100	58	43	42	70	64	26	62
Ulmus	Elm	1	1	3	0	2	3	2	3
Pinus	Pine	1	1	3	62	99	85	85	28
Quercus	Oak	27	15	29	1	2	8	6	1
Tilia	Lime	2	3	4					
Fraxinus	Ash	1							
Corylus	Hazel	10	17	28	97	39	30	61	103
Salix	Willow		1		3	3	3	6	2
Hedera	Ivy	1							
Ilex	Holly	1							
Calluna	Heather			2		1	1		
Juniperus	Juniper				1				
Herbs									
Apiaceae	Carrot family						1		
Aster type	Daisy-type								
Cyperaceae	Sedge				2		2	5	5
Filipendula	Meadowsweet			1					
Poaceae	Grass Family	1	1		2			1	3
Succisa pratensis	Devil's Bit Scabious					1			
Unknown herbs									
	Total land pollen	**202**	**214**	**218**	**211**	**217**	**200**	**203**	**212**
	Number of traverses	1	1	1	2	2	4	2	6
Ferns & Mosses									
Polypodium	Polypodies	1	3	3					
Pteridium	Bracken							1	
Pteropsida (monolete)	Undifferentiated fern spores	9	18	14		5	3	6	
Sphagnum	Bog moss spores	6	15	5	16	1	9	5	8
Equisetum	Horsetails						1		
Broken grains									
Concealed grains							2	1	
Corroded grains									
Crumpled grains						1			
Aquatics									
Potamogeton	Pondweeds								
Typha angustifolia	Lesser Bulrush								
Myriophyllum spicatum	Water Milfoil		1						
Charcoal		0	0	0	0	0	0	1	0
Fungal spores									
Type 4									2
Podospora									
Phragmothyrites									1

Sample		WS-5	WS-5	WS-5	WS-5	WS-5*	WS-5*	WS-5*	WS-5*
Preservation		Good	Good	Good	Good	Good	Good	Good	Good
Potential		Good	Good	Poor	Good	Good	Good	Poor	Good
Depth (m)		1.79-1.80	2.09-2.10	2.19-2.20	2.29-2.30	2.54-2.55	2.79-2.80	3.09-3.10	3.19-3.20
Trees/Shrubs									
Alnus	Alder	1	1		21	6	14	2	
Betula	Birch	89	191	12	65	19	57	32	3
Ulmus	Elm								
Pinus	Pine	6	3		3	12	18		1
Quercus	Oak					1	5	2	1
Tilia	Lime								
Fraxinus	Ash								
Corylus	Hazel	103	1			3	14	2	1
Salix	Willow	2	2	3	12	11	11	9	
Hedera	Ivy								
Ilex	Holly								
Calluna	Heather								
Juniperus	Juniper					2	1	6	
Empetrum	Crowberry					1			
Herbs									
Apiaceae	Carrot family							1	
Aster type	Daisy-type								
Cyperaceae	Sedge	3	3		2	15	11	20	
Filipendula	Meadowsweet		1	1		9	5	15	2
Poaceae	Grasses		5	1	3	23	10	26	3
Succisa pratensis	Devil's Bit Scabious						1		
Rumex	Docks		1		2				
Potentilla-type	Cinquefoil					1			
	Total land pollen	**204**	**208**	**17**	**112**	**103**	**147**	**115**	**11**
	Number of traverses	2	8	10	10	12	5	9	10
Ferns & Mosses									
Polypodium	Polypodies								
Pteridium	Bracken								
Pteropsida (monolete)	Undifferentiated fern spores	2	5	1	5		4	1	
Sphagnum	Bog moss spores	21	1		1	1	4		
Equisetum	Horsetails		2		2	18	4	10	
Aquatics									
Potamogeton	Pondweeds			1		1	5	2	
Typha angustifolia	Lesser Bulrush					11		9	1
Menyanthes	Bog Bean				1	1	1		
Myriopjyllum alterniflorum	Water Milfoil					11	6	21	65
Botryococcus	Alga					1		2	7
Pediastrum	Alga				1	1		2	3
Rhizopoda	Rhizopods		62	14	84		2		
Diatoms	Diatoms					6	2	78	
Charcoal	Charcoal >5um	0	0	0	0	0	0	0	0
Fungal spores									
Type 4									
Podospora		1							

*** Sampled from gouge core**

Sample		WS-2	WS-2	WS-2	WS-2	WS-2
Preservation		Good	Good	Good	Good	Good
Potential		Good	Good	Good	Good	Good
Depth (m)		0.15-0.16	0.39-0.40	0.54-0.55	0.79-0.80	0.95-0.96
Trees/Shrubs						
Alnus	Alder	153	145	57	1	1
Betula	Birch	3	24	53	27	30
Ulmus	Elm	1	2	2		
Pinus	Pine	5	1	7	2	3
Quercus	Oak	38	13	15	1	
Tilia	Lime	6	3	1		
Fraxinus	Ash		1			
Corylus	Hazel	34	7	54	1	
Salix	Willow			3	8	22
Lonicera	Honeysuckle		1			
Sorbus	Rose family		1			
Calluna	Heather			1	2	1
Juniperus	Juniper				5	3
Herbs						
Apiaceae	Carrot family			1		
Aster type	Daisy-type			1		
Cyperaceae	Sedge			3	8	26
Filipendula	Meadowsweet				1	2
Poaceae	Grasses			6	69	8
Rumex	Dock					4
Potentilla-type	Cinquefoil					1
	Total land pollen	**205**	**202**	**204**	**125**	**101**
	Number of traverses	1	1	2	8	10
Ferns & Mosses						
Polypodium	Polypodies	2	1	1		
Pteridium	Bracken				1	
Pteropsida (monolete)	Undifferentiated fern spores	5	4	10	4	
Sphagnum	Bog moss spores		3	17		
Equisetum	Horsetails					18
Aquatics						
Potamogeton	Pondweeds					11
Menyanthes	Bog Bean					6
Charcoal	Charcoal >5um	0	0	0	0	0

