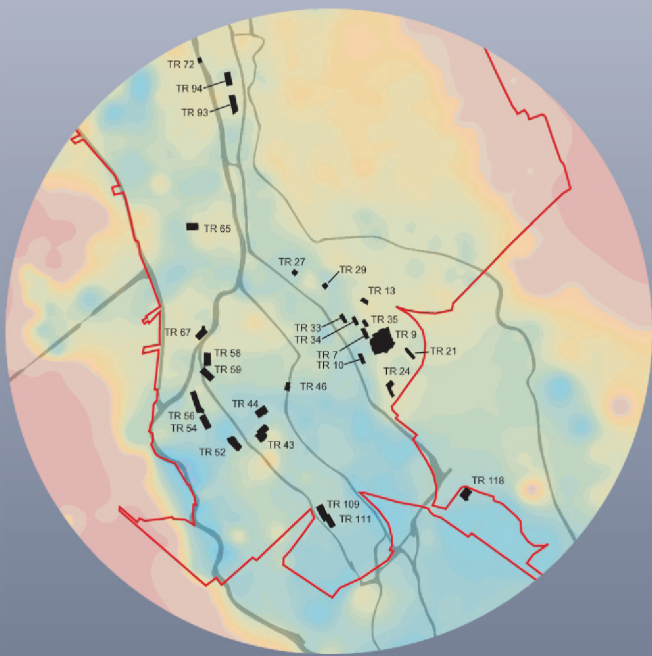
By River, Fields and Factories

The Making of the Lower Lea Valley
Archaeological and cultural heritage investigations on the site of the London 2012 Olympic and Paralympic Games

Palaeo-environmental

(Section 1)



by Michael J. Grant,
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Olympic Park

Palaeo-environmental Appendix

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Acknowledgments

Wessex Archaeology was commissioned to carry out the post-excavation analysis and publication by the Olympic Delivery Authority, and Russell Pottrill (Contract Manager, Atkins) and Janet Miller (Archaeological Advisor, Atkins) have provided considerable help and advice during the project. The assistance of numerous other staff of the ODA is also very gratefully acknowledged, in particular Dermot Doherty (Procurement Manager), Miriam Sanchez-Blanco (Technical and Content Lead), George Middleton and Julie King (External Relations), Alexandra Brown (Marketing Executive), Simon Knowles (Marketing Manager), Tim Daniels (Marketing Executive), Kate Moody (Marketing Executive), Indy Rihal (Marketing Manager), and Eskandarian Samsudin (Environmental Data Manager). Wessex Archaeology would like to acknowledge the collaborative support of the Greater London Archaeological Advisory Service of English Heritage, and in particular, David Divers, Rachel Ballantyne, Jen Heathcote, Jane Sidell and Rob Whytehead.

The report draws upon on the numerous fieldwork reports written by either by MoLAS-PCA, or by RPS Planning and Development and AOC Archaeology Group. Numerous other individuals have shown considerable assistance throughout the course of this project; most notably Jane Corcoran and Graham Spurr (Museum of London Archaeology), Tara Fidler (AOC) and Cath Maloney (London Archaeological Archives Resource Centre), and to whom grateful thanks are extended.

The project was managed for Wessex Archaeology by Pippa Bradley. The report was principally written by Michael J. Grant, David Norcott, and Chris J. Stevens. Specialist work was undertaken by David Norcott (geoarchaeologist), Michael J. Grant (pollen analysis), Chris J. Stevens (archaeobotany), John Russell (foraminifera and ostracods), Sarah F. Wyles (molluscs), Nigel Cameron (UCL; diatoms), Richard Macphail (UCL; micromorphology), David Smith (University of Birmingham; insects), and Nicola Mulhall (extraction of molluscs and processing). Pollen preparation was undertaken by Kevin Attree, Kingston University. OSL dating was undertaken by Philip Toms (Cheltenham) and radiocarbon dating provided by SUERC (UK), Rafter (New Zealand) and in previous phases of work by Beta-Analytic (USA). Illustrations were produced by Nigel Cameron, Michael J. Grant, and Karen Nichols; they were pepared for this report by Kitty Foster, Will Foster assisted by Linda Coleman. Figures 2, 9, 14, 19, 22, 27, 32, 35, 37, 41, 43, 46, 49, 51, and 54 are based on illustrations in various post-excavation assessment and evaluation reports written by MoLAS-PCA and RPS Planning and Development AOC.

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by the Olympic Delivery Authority (ODA) to undertake the processing, assessment, analysis and reporting on the geoarchaeological samples and data from the Olympic Park Site (Figure 1: hereafter known as the Site). This work forms a component of the overall archaeological framework of investigations being undertaken for the ODA across the Site.

1.1.2 The Archaeological and Cultural Heritage work at the Site comprises the following five phases:

- *Phase 1: Desk-based assessments of the Site, including formulation of Written Schemes of Investigation, Method Statements etc. for each of the 15 Planning Delivery Zones (PDZ) as necessary*
- *Phase 2: Original field evaluation, including built heritage recording and reporting*
- *Phase 3a: Archaeological mitigation, detailed sampling, analysis and reporting*
- *Phase 3b: Site-wide geoarchaeological/ environmental assessment and analysis report*
- *Phase 4: Development of a Site-Wide Integrated Post-Excavation Assessment (SWIPEA) and Updated Project Design (UPD)*
- *Phase 5: Analysis and publication*

1.2 Location

1.2.1 The Site, divided into 15 Planning Delivery Zones (PDZs) for the purposes of the Olympic Park development, occupies an area of approximately 246 ha at the southern end of the Lea Valley, *c.* 5 km east of central London within the London Boroughs of Hackney, Newham, Tower Hamlets and Waltham Forest. To the west are the neighbourhoods of Bow and Poplar and the south-eastern part of Hackney Wick; to the east are Stratford, West Ham and Leyton.

1.2.2 The Site extends *c.* 3.9km, from NGR 537106 186125 at the north-north-west to NGR 539129 182842 at the south-south-east. It is bounded to the west by the River Lea Navigation and to the north by the A12 (East Cross Route), the River Lea, Sherrin Road, the A106 (Ruckholt Road) and Temple Mill Lane. It is bounded to the east by the A112 (Leyton Road) and the North London Line railway, and to the south by the Liverpool Street to Ilford railway, the Waterworks River, the Greenway, Stratford High Street and the River Lea. The southern part of the Site is bounded by the A118 (Stratford High Street), Rick Roberts Way, Gay Lane and the Greenway.

1.3 Content of this report

1.3.1 The purpose of this report is to present the individual specialist reporting from the palaeoenvironmental and geoarchaeological investigations carried out in 29 Trenches from across the Olympic Park site as part of Phase 3b (Site-Wide Geoarchaeological/Environmental assessment and analysis) and Phase 5 (analysis and publication). The reader is refered to the academic monograph (Powell 2012, Chapter 8) for integrated interpretations of each sequence. Previous phases of assessment carried out during Phases 2 and 3a are refered to but in many cases have been superseded by the analysis phase presented in this report.

2 METHODOLOGIES

Sediment description and micromorphology

2.1.1 Where more detailed assessment and/ or analysis of the sediments was undertaken, the relevant monoliths samples were described according to Hodgson (1997). Interpretations regarding mode of deposition, formation processes, likely environments represented and potential for palaeoenvironmental analysis were then made, and decisions taken regarding subsampling.

2.1.2 Soil micromorphology was undertaken on samples from Trench 24 to understand the formation process of the soil associated with Middle Bronze Age archaeological features. Monolith subsamples were impregnated with a clear polyester resin-acetone mixture prior to curing and slabbing for very rapid 75 x 50mm size thin section manufacture (Goldberg and Macphail, 2006; Murphy, 1986). The thin sections were described, ascribed soil microfabric types and microfacies types, and counted according to established methods (Bullock *et al*. 1985; Courty 2001; Courty *et al*. 1989; Goldberg and Macphail 2006; Macphail and Cruise 2001; Stoops 2003).

Waterlogged plant remains

2.1.3 Samples of five litres were processed by laboratory flotation, with the flots and residues retained on 0.25mm mesh sieves. Waterlogged plant macrofossils were identified following the nomenclature of Stace (1997), quantified, and the results tabulated. Where absolute counts were not possible within particularly rich samples, a general scale of abundance has been applied.

Insects/beetles

2.1.4 Selected samples were subject to paraffin flotation as outlined in Kenward *et al.* (1980). Insect fragments were identified with reference to modern entomological collections, and the results tabulated. Taxonomy follows that of Lucht (1987).

Molluscs

2.1.5 Five-litre waterlogged samples were examined for mollusc remains, following standard methods. Nomenclature follows Kerney (1999). Results were tabulated and displayed in histograms. Some species were grouped upon the histogram, while *Vallonia pulchella/ excentrica* were classified within the marsh species group rather than with the open country species. The ratio of *Bithynia* apices to opercula was also plotted. Ecological preferences follow Evans (1972), Kerney (1999) and Davies (2008).

Pollen

2.1.6 Pollen preparation followed standard methods (Moore *et al*. 1991) with *Lycopodium* tablets (Stockmarr 1971) added to calculate pollen concentration, and silicone oil used as the mounting medium. Pollen and pteridophyte spores were identified using the reference collection held at Wessex Archaeology. Nomenclature follows Bennett (1994) for pollen/ spores, whereas Poaceae were classified according to Küster (1988). Plant nomenclature follows Stace (1997). Initial assessment was based on a Total Land Pollen (TLP) sum of a minimum of 100 grains excluding pteridophytes and obligate aquatics (calculated as a percentage of TLP + Group), with counting extended up to 400 TLP (where possible) for analysis. Pollen and spore data are presented using TILIA 1.7.16 (Grimm 2011), with pollen zonation produced using

CONISS (Grimm 1987), resulting in a series of local pollen assemblage zones (LPAZ).

Diatoms

2.1.7 Diatom preparation, counting and analysis followed standard techniques (Battarbee *et al*. 2001). Diatom floras and taxonomic publications were consulted to assist with diatom identification; these include Hendey (1964), Werff and Huls (1957–1974), Hartley *et al*. (1996) and Krammer and Lange-Bertalot (1986; 1988; 1991a; 1991b). Diatom species' salinity preferences are discussed using the classification data in Denys (1992), Vos and de Wolf (1988; 1993) and the halobian groups of Hustedt (1953; 1957): *Polyhalobian: >30g* l^{-1}*, Mesohalobian: 0.2–30g, Oligohalobian – Halophilous, Oligohalobian – Indifferent, Halophobous and Unknown.*

Ostracods

2.1.8 Sample preparation followed standard techniques. Up to 20cm^3 of sediment was wet sieved through a 63µm sieve to extract the coarser fraction. The fine sediment was dried and then sieved through 500µm, 250µm, 125µm sieves. Foraminifera were also noted and identified. Where possible a minimum of 50 ostracods were counted per sample. Identification and ecological interpretation followed Athersuch *et al.* (1989), Meisch (2000) and Whittaker and Hart (2009).

Quartz Optically-Stimulated Luminescence (OSL) Dating

2.1.9 This was undertaken on samples from a series of sandy contexts in Trench 118 (Toms 2008). In total six samples were collected in daylight from sections by means using opaque plastic tubing (150 x 45mm) forced into each face. The results of OSL dating are shown in Table 157. Sample GL08012 produced a limited quantity of datable material, restricting the range of diagnostic measurements. Full details of preparation, measurement and evaluation are given in Toms (2008) and Howell and Spurr (2009).

Radiocarbon Dating

2.1.10 A full discussion of the radiocarbon dating undertaken at the Site is given in the monograph (Powell 2012, Chapter 8) and the reader is referred to that document. As a result of problems encountered with some parts of the radiocarbon dating strategy undertaken, each radiocarbon date has been assessed with respect to its reliability, based upon correlation with trench stratigraphies, archaeological phasing, nature of the radiocarbon method employed and samples selected for dating, and correlations with other sequences excavated and within the wider area. The reliability of each radiocarbon date is noted using a scale of 1–3 (1 = reliable; 2 = questionable (cautious acceptance); 3 = problematic/ rejected); # = unreliability of dates on bone based on C:N ratios above 3.5.

2.1.11 Conventional radiocarbon dates are reported in terms of years before present (BP; AD 1950) and are calibrated using the recommended curve for terrestrial samples, IntCal09 Northern Hemisphere (Reimer *et al.* 2009). Radiocarbon dates were calibrated using the program OxCal 4.1 (Bronk Ramsey 1995; 2001) and quoted as years AD/ BC using the 2σ confidence range (95.4%) with the end points rounded outwards to 10 years (Mook 1986). Dates older than 15,000 BP are rounded to the nearest 50 years following the data spacing of the IntCal09 dataset (Reimer *et al*. 2009). All radiocarbon dates are presented in Appendix 1: Radiocarbon Dates, and commented on accordingly (as stated above) where concerns may exist over the reliability of a date. All radiocarbon dates produced during previous phases of site investigation have been cross-checked against the original laboratory reports and are quoted correctly.

3 RESULTS BY SEQUENCE

3.1 Trench 7 (PDZ1 1.10)

Introduction

3.1.1 Trench 7 is located on the edge of the north/ south channel shown by the deposit modelling and equated with the proto-River Lea. The sequence was selected due to its potential to provide information on the alluvial regime, and also to provide a palaeoenvironmental sequence to depth (0.5m OD) of possible contemporary date with the nearby archaeological deposits.

3.1.2 The sampled section is presented in Figure 2.

Sediments

3.1.3 Sediment descriptions and interpretations are given in Table 1.

Table 1: Sediment descriptions for Monolith <43>, Trench 7

Level (m OD)	Context	Sediment description	Interpretation
2.34 to 2.19	1.63	10YR 3/ 1 very dark grey clay, very small brick fragments. Very hard/ concreted but clear granular structure. Clear boundary.	Relatively modern topsoil
2.19 to 1.92	164	5Y 4/ 1 olive grey silty clay, massive, occasional small sharp iron stain mottle/ concretions around rootholes (c. 2%). Clear boundary	Overbank alluvium (silty clay)
1.92 to 1.70	165	10YR 3/ 2 very dark greyish brown clay loam, organic, some small vertical rootlets but also subtle slight lamination of fine organics. Not quite a peat, probably formed in relatively shallow slow moving well vegetated water	Organic alluvium
1.70 to 1.59	165	10YR 3/ 3 dark brown silty clay, massive, slight reddish tinge (iron staining rather than reduced organics as colour is stable) Clear boundary	Alluvium (silty clay) ?overbank
1.59 to 1.11	166 & 168	Upper 6cm is mineralogenic and 10YR 4/ 1 dark grey, below this (merging over 2cm) is organic 10YR 3/ 2 very dark greyish brown silty clay loam. Massive, occasional vertical roots, subtle lamination in places and appear to be very small organics horizontally layered in places. Sand inwash at 1.27-1.22m OD (in M3 this is very 90% sandy; in M4 in same spot is only 10% sand. Sand lenses must be very laterally variable. Sand is light grey with small (sand sized) shell fragments – sharp boundaries. Sharp boundary,	Organic alluvium with sand inwash
1.11 to 1.07	166	Sand inwash as at 1.27m OD; light grey/ greyish brown sand with sharp boundary	Sand inwash (alluvial)
1.07 to 0.89	169	10YR 3/ 2 very dark greyish brown silt loam/ silty clay loam (high organic content makes texture difficult), highly organic, laminated, recognisable plant remains including quite common horiz laminated at base, quite common freshwater molluscs especially at 1.02-1.05m OD. Sandy inwash as above at 1.08-1.09m OD. Sharp to clear boundary in top of gravel	Organic alluvium with sand inwash and freshwater molluscs
0.89 to 0.84	167	Gravel 10-30mm diameter, rounded – subrounded. Very little sand.	Fluvial gravel

3.1.4 Underlying gravels of probable Late Pleistocene date to 0.89m OD were overlain by highly organic alluvium to 1.59m OD, which contained horizontally layered plant remains, freshwater molluscs and evidence of sandy in-wash events. This is very likely to represent a channel-edge environment.

3.1.5 Above this the sediments fluctuated to mineralogenic, organic and back again to 2.19m OD; this probably represents fluctuations in channel influence.

Dating

3.1.6 Four radiocarbon dates have been obtained, three from Monolith <43> and one from context (167) (Table 2).

Table 2: Radiocarbon dates from Trench 7

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<43> (165)	1.87	Bulk sediment	SUERC-25623	1505±40	-28.0	cal AD 430 - 650	2
<43> (169)	1.05	Wood/stem: indet. stem	SUERC-25622	1500±40	-29.2	cal AD 430 - 650	2
<43> (169)	0.94	Wood/stem: indet. roundwood	SUERC-25621	1605±40	-29.3	cal AD 350 - 560	2
<49+50> (167)	0.52 to 0.94	Seeds: 8 x *Oenanthe* sp.	SUERC-31558	1415±30	-29.1	cal AD 580 - 670	1

3.1.7 The dates suggest that the formation of this sequence occurred during the late Romano-British to mid Saxon period. The two basal dates of cal AD 350-560 (SUERC-25621, 1605±40 BP) at 0.94m OD (context 169) and cal AD 580-670 (SUERC-31558, 1415±30 BP) at 0.52-0.94m OD (context 167), and the uppermost date at the top of context (165) (1.87m OD) of cal AD 430 – 650 (SUERC-25623, 1505±40 BP), indicate the main period of sediment accumulation was very rapid and within the Early Saxon period.

Plant Macrofossils

3.1.8 Nine samples were taken and examined from Trench 7. The samples were processed and initially quickly assessed by MoLAS (Bazley *et al.* 2008, 44-6).

3.1.9 For most of the samples full counts of seeds and other waterlogged taxa, as well as wood charcoal, Bryozoa and caddis fly larvae were made. In some cases however, where numerous seeds were present, relative abundances were given instead.

3.1.10 The date of the deposits ranged potentially between the late Romano-British period at the base and the Middle Saxon period (mid 7th century) towards the top of the deposit. However, a date on seeds of probable river water-droplet (*Oenanthe fluviatilis*) from 0.52-0.94m OD at the base of the sequence, cal AD 580-670 (SUERC-31558, 1415±30 BP), would suggest that the majority of material therefore relates to the environment of the Early to Middle Anglo-Saxon period spanning the late 6th to late 7th century.

3.1.11 The results are presented in Table 3 and Table 4. Waterlogged material was absent from the uppermost deposit (163) at 2.19-2.34m OD and generally poorly represented in the deposits down to 1.33m OD. The samples were all broadly similar and dominated by species of wet grassland, marshes and aquatic environments. Leaf stems of mosses were also present in a few of the samples.

3.1.12 Gametes of stonewort (*Chara* sp.), indicative of shallow still to slow flowing water, were present in the lowest samples, along with a few seeds of yellow water-lily (*Nuphar lutea*). In the samples above, pondweed (*Potamogeton* sp.) and quite a few seeds of water-crowfoot (*Ranunculus* subgenus *Batrachium*) and arrowhead (*Sagittifolia sagittifolia*) were present. Water-starwort (*Callitriche* sp.) is also indicative of such places along with muddier edges to water bodies.

3.1.13 Buttercup (*Ranunculus* sp.), probable marsh-marigold (*Caltha palustris*), common meadow-rue (*Thalictrum flavum*), small water-pepper (*Persicaria minor*), ragged-robin (*Lychnis flos-cuculi*), meadowsweet (*Filipendula ulmaria*), willowherb (*Epilobium* sp.), cowbane (*Cicuta virosa*) and yellow-iris (*Iris pseudacorus*) are all indicative of wet grazed pastures, long grassland and meadows.

3.1.14 Seeds of celery-leaved buttercup (*Ranunculus sceleratus*), water dock (*Rumex hydrolapathum*), wild celery (*Apium graveolens*), fool's watercress (*Apium nodiflorum*), bogbean (*Menyanthes trifoliata*), gypsywort (*Lycopus europaeus*), mint

(*Mentha* sp.), water-milfoil (*Myriophyllum* sp.) and those of rushes (*Juncus* sp.), club-rush (*Schoenoplectus* sp.), bur-reed (*Sparganium erectum*) and sedges (*Carex* sp.) all indicate more marshy grassland and areas of standing water probably on the channel edge.

3.1.15 A few seeds of fat-hen (*Chenopodium album*), fig-leaved goosefoot (*Chenopodium ficifolium*), orache (*Atriplex* sp.) and stitchwort (*Stellaria media*) are usually associated with nitrogen rich, disturbed soils, but would certainly grow in areas that were regularly grazed and trampled by animals. Similarly common nettle (*Urtica dioica*) is also associated with probable rough grazing and animal trampling, being both indicative of nitrogen rich soils and areas of disturbance.

3.1.16 Other species associated with more disturbed soils and disturbed grazed, often wet, grassland included knotweed (*Polygonum aviculare*), dock (*Rumex* sp.), hemlock (*Conium maculatum*), woundwort (*Stachys* sp.), thistles (*Carduus/ Cirsium* sp.) and silverweed/tormentil (*Potentilla* sp.). Stinking mayweed (*Anthemis cotula*) is a common component of arable fields, especially within Saxon and medieval charred cereal assemblages, although only a single waterlogged seed was present.

3.1.17 A single seed of maple-leaved goosefoot (*Chenopodium hybridum*) was an unusual find. The seeds are very distinctive and unlike any of the other *Chenopodium's* in surface texture. The plant grows in waste and arable ground, but is rarely found in archaeobotanical deposits and thought therefore to be a possible introduction or Roman reintroduction (Godwin 1984, 157). Although undated the seed comes from a relatively low context and the find would at least ascertain to its probable presence in Saxon south-east England.

3.1.18 A few finds of alder (*Alnus glutinosa*) were present in the lowest samples and probably testify to occasional trees within the immediate vicinity. The few fragments of hazelnut (*Corylus avellana*), elder (*Sambucus nigra*) and buds of willow (*Salix* sp.) in the same samples also indicate probable occasional trees growing close to the river, while seeds of bramble (*Rubus* sp.) and probable thorns, along with occasional fragments of stones of sloe (*Prunus spinosa*), can be associated with areas of overgrown woody shrub. Similarly winter-cress (*Barbarea vulgaris*) also tends to be commoner on damp to wet soils close to hedgerows and waste scrubland.

Table 3: Waterlogged plant macrofossils from Trench 7 (upper)

Sample		**<46>**	**<47>**	**<480>**	**<51>**
Context		**(163)**	**(164)**	**(165)**	**(168)**
Depth top (m OD)		**2.34**	**2.19**	**1.92**	**1.59**
Depth bottom (m OD)		**2.19**	**1.92**	**1.59**	**1.33**
Date				**E-M Sax**	**E-M Sax**
Sample Size (litres)		**5**	**5**	**10**	**5**
Bryophyta (leaf stem)	mosses	-	-	+	-
Ranunculus subg. *Ranunculus* (arb)	buttercup	-	-	12	-
Ranunculus lingua	greater spearwort	-	-	1	-
Ranunculus subg. *Batrachium*	water-crowfoots	-	-	-	1
Thalictrum flavum	common meadow-rue	-	-	5	-
Urtica dioica	common nettle	-	-	1	1
Stellaria sp.	stitchwort	-	1	-	-
Lychnis flos-cuculi	ragged-robin	-	cf.1	-	-
Rumex sp.	dock	-	-	-	1

Sample		**<46>**	**<47>**	**<480>**	**<51>**
Context		**(163)**	**(164)**	**(165)**	**(168)**
Depth top (m OD)		**2.34**	**2.19**	**1.92**	**1.59**
Depth bottom (m OD)		**2.19**	**1.92**	**1.59**	**1.33**
Date				**E-M Sax**	**E-M Sax**
Sample Size (litres)		**5**	**5**	**10**	**5**
Rumex hydrolapathum	water dock	-	-	1	-
Oenanthe aquatica/ fluviatilis (type)	fine-leaved water-dropwort	-	-	1	cf.1
Cicuta virosa	cowbane	-	-	1	-
Myosotis sp.	Forget-me-nots	-	-	2	-
Ballota nigra	black horehound	-	-	1	-
Mentha sp.	mint	-	cf.1	-	3
Callitriche sp.	water-starwort	-	-	2	-
Small Asteraceae		-	-	cf.1	-
Eupatorium cannabinum	hemp agrimony	-	-	-	1
Sagittifolia sagittifolia	arrowhead	-	1	-	-
Alisma plantago-aquatica	water-plantain	-	2	3	-
Juncus sp.	rush	-	1	-	-
Schoenoplectus lacustris	common club-rush	-	-	2	1
Eleocharis palustris	common spike-rush	-	-	1	-
Carex sp. (trigonous)	sedge (trigonous)	-	1	2	1fr
Carex sp. (flat)	sedge (lenticular)	-	-	1	-
Iris pseudacorus	yellow iris	-	-	1	-
Worm cocoons		-	+	++	-

+C – denotes material that was preserved by charring. cf. compares with. fr=whole fruit. fg=fragment. Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more

Table 4: Waterlogged plant macrofossils from Trench 7 (lower)

Sample		**<48>**	**<490>**	**<52>**	**<49>**	**<50>**
Context		**(166)**	**(166)**	**(169)**	**(167)**	**(167)**
Depth top (m OD)		**1.33**	**1.11**	**1.07**	**0.94**	**0.94**
Depth bottom (m OD)		**1.11**	**1.07**	**1.89**	**0.52**	**0.52**
Date		**E-M Sax**	**E-M Sax**	**LRB-ESax**	**E-M SAX**	**LRB-ESax**
Sample Size (litres)		**5**	**10**	**5**	**5**	**5**
Chara (gametes)	stonewort	-	-	-	-	5
Bryophyta (leaf stem)	mosses	-	-	++	+	-
Nuphar lutea	yellow water-lily	-	2	2	cf.1	-
Caltha palustris	marsh-marigold	-	cf.2	-	-	-
Ranunculus subg. *Ranunculus* (arb)	buttercup	3	9	7	11	1
Ranunculus sceleratus	celery-leaved buttercup	1	9	1	6	2
Ranunculus subg. *Batrachium*	water-crowfoots	1	3	12	13	-
Thalictrum flavum	common meadow-rue	-	3	2	-	-
Urtica dioica	common nettle	4	-	1	16	6
Alnus glutinosa (female catkins)	female catkins/ cones	-	-	-	1	-
Alnus glutinosa (male catkins)	alder male catkins	-	-	2f	-	-
Corylus avellana	hazelnut	-	-	-	1+1fg	-
Chenopodium hybridum	maple-leaved goosefoot	-	-	1	-	-

Sample		**<48>**	**<490>**	**<52>**	**<49>**	**<50>**
Context		**(166)**	**(166)**	**(169)**	**(167)**	**(167)**
Depth top (m OD)		**1.33**	**1.11**	**1.07**	**0.94**	**0.94**
Depth bottom (m OD)		**1.11**	**1.07**	**1.89**	**0.52**	**0.52**
Date		**E-M Sax**	**E-M Sax**	**LRB-ESax**	**E-M SAX**	**LRB-ESax**
Sample Size (litres)		**5**	**10**	**5**	**5**	**5**
Chenopodium album	fat-hen	-	1	3	1	-
Chenopodium ficifolium	fig-leaved goosefoot	-	-	-	1	-
Atriplex sp.	orache	-	2	1	-	-
Stellaria sp.	stitchwort	-	-	1	1	-
Lychnis flos-cuculi	ragged-robin	-	-	2	-	-
Persicaria minor	small water-pepper	1	1	4	1	1
Polygonum aviculare	knotgrass	-	1	-	-	2
Rumex sp.	dock	-	-	6fr	5	1
Rumex hydrolapathum	water dock	-	8	-	1	-
Salix catkin bud scale	willow bud scale	-	-	1	-	-
Barbarea vulgaris	winter-cress	-	-	-	1	-
Rorippa cf. *nasturtium-aquaticum*	narrow-fruited watercress	-	-	-	cf.1	-
Filipendula ulmaria	meadowsweet	-	1	-	-	-
Rubus sp.	bramble	-	-	3	2	1
Rosaceae thorns	bramble/rose type thorns	-	-	1	-	-
Potentilla anserina	silverweed	1	-	-	-	-
Potentilla erecta/reptans	tormentil/creeping cinquefoil	-	-	1	1	-
Potentilla sp.	cinquefoil/tormentil	-	-	1	-	-
Prunus spinosa	sloe	-	-	-	1	-
Myriophyllum sp.	water-milfoil	-	1	-	-	-
Epilobium sp.	willowherb	1	-	2	1	-
Linum usitatissimum (seed)	flax seeds	1	-	-	-	1
Linum usitatissimum (capsule + seed)	flax capsule + seeds	1	-	-	-	-
Linum usitatissimum (capsule)	flax capsule	1	-	-	2f	1f
Oenanthe cf. *fistulosa/silaifolia*	water-droplets	-	-	1	-	-
Oenanthe aquatica/fluviatilis (type)	fine-leaved water-dropwort	15	100	105	60	21
Conium maculatum	hemlock	-	1	-	-	-
Apium graveolens	wild celery	++	1	11	12	4
Apium nodiflorum	fool's watercress	++	cf.2	3	-	-
Cicuta virosa	cowbane	-	3	-	-	-
Solanum nigrum	black nightshade	-	-	-	1	1
Menyanthes trifoliata	bog-bean	-	5	-	-	-
Myosotis sp.	forget-me-nots	-	-	cf.1	-	-
Stachys sp.	woundwort/claries	3	2	2	3	-
Lycopus europaeus	gypsywort	1	3	1	1	-
Mentha sp.	mint	++	7	1	11	2
Callitriche sp.	water-starwort	1	4	-	3	-
Sambucus nigra	elder	-	-	2	3	-
Carduus/ Cirsium sp.	thistle	-	1	1	-	-
Sonchus asper type	prickly sow-thistle	1	-	-	4	-
Anthemis cotula	stinking chamomile	-	-	-	1	-

Sample		<48>	<490>	<52>	<49>	<50>
Context		**(166)**	**(166)**	**(169)**	**(167)**	**(167)**
Depth top (m OD)		**1.33**	**1.11**	**1.07**	**0.94**	**0.94**
Depth bottom (m OD)		**1.11**	**1.07**	**1.89**	**0.52**	**0.52**
Date		**E-M Sax**	**E-M Sax**	**LRB-ESax**	**E-M SAX**	**LRB-ESax**
Sample Size (litres)		**5**	**10**	**5**	**5**	**5**
Bidens sp.	bur-marigold	-	-	1	-	-
Eupatorium cannabinum.	hemp agrimony	1	-	-	1	-
Sagittifolia sagittifolia	arrowhead	1	8	4	6	2
Alisma plantago-aquatica	water-plantain	1	32	2	9	2
Potamogeton sp.	pondweeds	1	1	-	3	1
Juncus sp.	rush	-	-	-	+	2
Schoenoplectus lacustris	common club-rush	2	65	47	28	1
Poaceae (large culm node)	grass seed	-	-	cf.1	-	-
Phragmites australis (culms)	common reed	-	cf.5	-	-	-
Eleocharis palustris	common spike-rush	-	1	-	-	-
Carex sp. (trigonous)	sedge (trigonous)	-	37+6fr	40	15	2
Carex cf. *nigra.* (flat whole fruit)	sedge (lenticular)	+	7	-	-	-
Carex sp. (flat)	sedge (lenticular)	+	11	-	4	-
Glyceria/ Molina sp.	sweet-grasses	-	-	-	cf.1	-
Sparganium erectum (embryo)	branched bur-reed	2	4	34	14	7
Sparganium erectum (fruit/ achene)	branched bur-reed	2	4	13	6	1
Iris pseudacorus	yellow iris	1	2	-	2f	-
Leaf laminar abscission	leaf stem node	-	++	5		-
Leaf fragments		-	-	+	+	-
Wood and twigs indet.	wood twigs and fragments	-	+	++	-	-
Worm cocoons		+	++	1	-	-
Charcoal	charred wood indet.	-	+	+	+	-
(K) *Plumatella*-type	freshwater bryozoa	-	+	+	+	-
Trichoptera, membrane of pupal case	Caddis Fly pupal case	-	+	++	-	-

$^{+}$C – denotes material that was preserved by charring. cf. compares with. fr=whole fruit. fg=fragment. Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more

3.1.19 Of some interest were the remains of flax (*Linum usitatissimum*) including both seeds and capsule fragments. These were present in several of the samples, including context (166) (1.33 to 1.11m OD) and (167) (0.94-0.52m OD), and would tend to suggest that this 0.5-1m of alluvium was deposited over a fairly short period within the Saxon period.

3.1.20 As stated above the similarities between samples would tend to suggest that the sediments were deposited relatively quickly, as seen from the radiocarbon dating.

3.1.21 The general impression is one of meadows and grazed pasture/ long grassland with evidence for probable trampling by animals along the river edge. The presence of flax is particularly of interest in that it provides one of the few strands of evidence for the use of the riverine environment for activities other than grazing during the Anglo-Saxon period. It is unlikely that flax would have been grown on the wet soils adjacent to the river and the most likely explanation for the presence of seed and capsule fragments is the use of the river shallows or ditches around the river for flax retting.

Broadly contemporary, but potentially slightly later, directly dated evidence was also available from Trench 27 where a large number of capsules were dated to cal AD 640-770 (SUERC-31390, 1335±30 BP).

3.1.22 The general evidence is one of the use of the drier clay valley sides for arable crops and the lower lying valley floor for pasture and grazing. There is some evidence for scrub and possibly hedgerows, but generally the plant macrofossil remains indicate a broadly open environment.

Pollen

3.1.23 Pollen assessment was carried out on eight samples from monolith <43> in Trench 7, with results shown in Figure 3. The pollen diagram has been split into three local pollen assemblage zones (LPAZ), using the prefix Tr7- to identify each one – see Table 5 for zone descriptions.

3.1.24 Pollen preservation was found to generally be good within all eight samples, though concentrations were low in the uppermost sample (2.10m OD). The pollen assemblage is dominated by Poaceae (grasses; 17-46%) and Cyperaceae (sedge; 19-59%), with *Corylus avellana*-type (hazel; 1-10%), *Quercus* (oak; up to 7%), Apiaceae (carrot family; 1-9%) and *Sparganium emersum*-type (bur-reed; 2-8% TLP + aquatics) also important components of the assemblage. *Alnus glutinosa* (alder) is high in LPAZ Tr7-1 (28% TLP) then reduces to lower values for the remainder of the sequence (1-5% TLP). *Equisetum* (horsetail) increases towards the top of context (165) (LPAZ Tr7-3) at 1.88m OD reaching 8% (TLP + pteridophytes).

3.1.25 Tree and shrub/ climber pollen attain a maximum of 32% TLP at the base of the sequence, but reduce throughout the remainder to just 7% at the top. *Betula* (birch; up to 2%), *Fagus sylvatica* (beech; up to 2%) and *Salix* (willow; 1-2%) are present throughout much of the sequence. *Pinus sylvestris* (pine) is present at low values (1-2%) which is unlikely to indicate a local presence.

3.1.26 Dwarf shrub/ herb taxa accounts for 68-95% TLP, with taxa present including *Ranunculus acris*-type (buttercup; 1-8%), Chenopodiaceae (goosefoots and oraches; up to 1%) *Polygonum* (knotgrass; up to 1%), Brassicaceae (cabbage and mustard family; up to 3%), *Filipendula* (meadowsweet; up to 1%), *Solanum dulcamara* (bittersweet; up to 3%), *Prunella vulgaris*-type (selfheal; up to 1%), *Mentha*-type (mint; up to 1%), *Plantago lanceolata* (ribwort plantain; up to 3%), *Cichorium intybus*-type (dandelion/ chicory; up to 4%), *Solidago virgaurea*-type (daises/ goldenrods; 1-2%) and *Glyceria*-type (sweet-grasses; up to 4%).

3.1.27 In addition to *Sparganium emersum*-type, a number of other aquatic plants are recorded throughout the sequence indicating slow moving or still water. These include *Nuphar* (yellow pond-lily; up to 0.5% TLP + aquatics), *Myriophyllum verticillatum* (whorled water-milfoil; up to 0.5% TLP + aquatics), cf. *Stratiotes aloides* (water soldier; up to 1% TLP + aquatics), *Potamogeton natans*-type (pondweed; up to 1% TLP + aquatics), *Lemna* (duckweed; up to 0.5% TLP + aquatics), *Typha latifolia* (bulrush; 1-3% TLP + aquatics) and *Iris* (iris; up to 0.5% TLP + aquatics). Pteropsida (monolete) indet. (fern spores; 1-6% TLP + pteridophytes) and *Pteridium aquilinum* (bracken; up to 1% TLP + pteridophytes) are also present.

3.1.28 The pollen assemblage can be interpreted as indicating a largely open floodplain environment with a limited local presence of trees and/ or woodland. The high values of *Alnus glutinosa* in the basal sample suggests that it was present on-site, though in overlying samples this was probably reduced to either single occurrences if located close to the sample site, or else found at a greater distance away elsewhere upon the floodplain in denser stands. A similar distribution of *Salix* is also envisaged. Other tree taxa recorded, including *Quercus* and *Corylus avellana*-type, may also be found upon the floodplain, notably on drier areas of raised ground, though these are unlikely to be dense stands of woodland. The presence of *Fagus sylvatica* is likely to also be sourced from the dry land. In Epping Forest, to the north of the Site, the expansion of *Fagus sylvatica* has been dated to the Romano-British period (Grant and Dark 2006), which is contemporary with the radiocarbon dates obtained from this sequence suggesting that it was deposited during the late Romano-British to mid Anglo-Saxon period.

Table 5: Pollen zone descriptions for Trench 7, Monolith <43>

Zone	Depth (m OD)	Description
Tr7-3	2.10-1.1815	Dominated by Cyperaceae (37-59%) and Poaceae (17-44%).*Pinus sylvestris* (1%), *Betula* (1-2%), *Corylus avellana*-type (1-4%) and *Salix* (1-2%) are recorded throughout the zone, with *Fagus sylvatica* (0.5%), *Castanea* (1%), *Quercus* (5%) and *Alnus glutinosa* (1%) also present. Dwarf shrub/ herb taxa include *Ranunculus acris*-type (1%), Brassicaceae (1%), Apiaceae undiff. (1-2%), *Solidago virgaurea*-type (1-2%) and *Glyceria*-type (1-4%), with occurrences of other taxa including *Chelidonium majus* (0.5%), *Prunella vulgaris*-type (0.5%) and *Plantago lanceolata* (%). Aquatic pollen types include *Sparganium emersum*-type (2-6% TLP + aquatics) and *Typha latifolia* (1% TLP + aquatics). A continuous presence of Pteropsida (monolete) indet. (1-6% TLP + pteridophytes) is recorded, with occurrences of *Selaginella selaginoides* (0.5% TLP + pteridophytes) and *Equisetum* (up to 8% TLP + pteridophytes). Pollen concentrations decrease from 450280 to 22628 grains cm^{-3}.
Tr7-2	1.815 – 1.04	Dominated by Cyperaceae (10-34%) and Poaceae (39-46%), with *Quercus* (%), *Corylus avellana*-type (1-10%) and Apiaceae undiff. (1-8%). *Pinus sylvestris* (1-2%), *Fagus sylvatica* (up to 2%), *Alnus glutinosa* (1-5%) and *Salix* (1-2%) are recorded throughout the zone. Dwarf shrub/ herb taxa include *Ranunculus acris*-type (1-8%), *Chelidonium majus* (0.5%), *Filipendula* (up to 1%), *Solanum dulcamara* (up to 3%), *Plantago lanceolata* (1-3%), *Centaurea cyans* (0.5%), *Cichorium intybus*-type (1-4%), *Solidago virgaurea*-type (1-2%) and *Glyceria* –type (up to 2%). Aquatic pollen types are dominated by *Sparganium emersum*-type (3-8% TLP + aquatics) and *Typha latifolia* (1-2% TLP + aquatics). A continuous presence of Pteropsida (monolete) indet. (2-5% TLP + pteridophytes) is recorded, with with occurrences of *Equisetum* (up to 1% TLP + pteridophytes) and *Pteridium aquilinum* (up to 2% TLP + pteridophytes). Pollen concentrations vary between 89198 and 378629 grains cm^{-3}.
Tr7-1	1.04 – 0.93	Dominated by *Alnus glutinosa* (28%) and Poaceae (38%), with Apicaeae undiff. (9%) and Cyperaceae (9%). *Quercus* (1%), *Fraxinus excelsior* (1%) and *Corylus avellana*-type (2%) are also present. Dwarf shrub/herb taxa include *Ranunculus acris*-type (3%), *Plantago lanceolata* (3%), *Cichorium intybus*-type (1%) and *Solidago virgaurea*-type (1%). Aquatic pollen types are represented by *Sparganium emersum*-type (1% TLP + Aquatics) and *Typha latifolia* (1% TLP + aquatics). Pteropsida (monolete) indet. (1% TLP + pteridophytes) and *Pteridium aquilinum* (0.5% TLP + pteridophytes) are also present. Pollen concentration is 202457 grains cm^{-3}.

3.1.29 The dominance of Poaceae suggests that the floodplain was largely open grassland, which is supported by the presence of *Prunella vulgaris*-type and *Valeriana officinalis* (valerian). Taxa indicative of waste/ disturbed ground are also present including *Urtica dioica*, *Cirsium*-type (thistle), *Cichorium intybus*-type and *Solidago virgaurea*-type. Areas of disturbed ground are also evident with the presence of *Rumex acetosella* (sheep's sorrel), *Rumex acetosa* (common sorrel), *Plantago media* (hoary plantain), *Plantago lanceolata* and *Pteridium aquilinum*, probably associated with pastoral activity upon the floodplain itself.

3.1.30 The presence of *Chelidonium majus* (greater celandine), *Polygonum* and *Centaurea cyanus* (cornflower) may indicate some arable activity within the sample site vicinity; however no Cerealia-type pollen grains were found. *Polygonum*, often implied as an agricultural weed and indicating arable activity, is also present in natural habitats such as along river banks (Godwin 1975, 230). For this reason any interpretation of arable activity must be treated with caution and it is more likely that the pollen assemblage is instead recording a floodplain environment with pastoral activity rather than arable cultivation.

3.1.31 Local wetland vegetation is indicated by the presence of Cyperaceae with the aquatic pollen types indicating slow moving or still water. Other taxa probably associated with the wetland vegetation include *Ranunculus acris*-type, *Filipendula* (meadowsweet) and *Equesetum*. Poaceae grains in the uppermost samples were notable for an abundance of grains of a small size which is often indicative of the presence of *Phragmites australis* (common reed).

3.1.32 In conclusion, the pollen assemblage from this trench indicates a slow or still water environment with diverse wetland vegetation, consisting of *Alnus glutinosa*, giving way to a highly vegetated sedge-reed wetland community as the basal water level continues to rise along with increased overbank flooding. Woodland is represented, either existing as small patches located upon dry areas of the floodplain, or the more distant dryland. The floodplain environment was largely open and is likely to have been subject to pastoral activity. The deposition of overbank alluvium coincided with a strengthening of the wetland signal.

Diatoms

3.1.33 Eight samples were prepared from Trench 7, Monolith <43> (Figure 4). Diatoms are absent from the four samples at 1.64, 1.88, 1.75 and 2.10m OD. The exceptions are a dissolved edge fragment of a diatom valve, possibly *Ellerbeckia arenaria*, at 1.75m OD, and two small striate fragments, possibly from *Pinnularia* sp., at 1.64m OD. The diatom concentration, quality of preservation and diversity of the assemblages has allowed diatom counting to be carried out for the four samples from 0.93 to 1.51m OD. These sediments are from context (166) and (169), both interpreted as organic alluvium with sand in-wash.

3.1.34 The diatom assemblages are dominated by freshwater non-planktonic taxa. The mesohalobous to halophilous planktonic species *Cyclotella meneghiniana* comprises a maximum of about 2% of the total diatoms at 0.93m OD. The diatom flora is dominated by attached and benthic species that represent shallow water habitats, such as *Amphora libyca, Amphora pediculus, Achnanthes lanceolata, Cocconeis pediculus, Fragilaria brevistriata, Fragilaria pinnata, Gomphonema angustatum, Gyrosigma attenuatum, Gyrosigma acuminatum* and *Synedra ulna*. Epipsammic diatoms consistent with the sand in-wash are also present, such as *Achnanthes kolbei, Achnanthes clevei* and *Ellerbeckia arenaria*.

3.1.35 There is a peak of halophilous diatoms (*Gomphonema olivaceum* and *Melosira varians*) at 1.32m OD. The latter is also associated with flowing water.

Ostracods and Foraminifera

3.1.36 The full results detailing the ostracod content of the four samples is given in Table 6. Ostracods were recovered from the samples at 0.92, 1.10 and 1.35m OD but not from 2.05m OD. *Candona candida* and *Candona neglecta* were the most common taxa recovered with 45 valves of *Candona neglecta* recovered from the sample at 0.92m OD. Other species present within the samples included *Candonopsis kingsleyi* (at 1.10m OD), *Cyclocypris laevis* (at 1.10m OD), *Darwinula stevensoni* (at 0.92, 1.10, 1.35m OD), *Eucypris* sp. (at 1.10m OD), *Fabaeformiscandona* sp. (at 1.10 and 1.35m OD), *Ilyocypris gibba* (at 1.35m OD) and *Pseudocandona albicans* (at 1.10m OD).

3.1.37 Two foraminifera were also recovered from the sample at 0.92m OD, one Rotaliid and one fossil planktonic Hedbergellid. Plant remains, including seeds, plant stems and charcoal, were recovered from the samples at 0.92, 1.10 and 1.35m OD. Radiate diatoms (at 0.92, 1.10 and 1.35m OD) and pennate diatoms (1.35m OD) were particularly abundant where present. Rhizomes were noted at 0.92 and 1.10m OD. Animal remains including *Bithynia* opercula (0.92 and 1.35m OD), *Pisidium* (at 0.92 and 1.10m OD), Planorbids (1.10m OD) and sponge spicules (1.35m OD) were recovered.

3.1.38 The numbers of ostracods recovered from the lower three samples at 0.92, 1.10 and 1.35m OD are sufficient to make some environmental interpretations based on their ostracod content.

Table 6: Microfaunal content of ostracod/ foraminifera samples from Trench 7

Sample number	**<43>**	**<43>**	**<43>**	**<43>**
Depth (m OD)	**0.92**	**1.1**	**1.35**	**2.05**
Ostracoda				
Candona candida	xx	xx	xx	
Candona neglecta	xx	xx	xx	
Candonopsis kingsleyi		x		
Cyclocypris laevis		x		
Darwinula stevensoni	x	x	x	
Eucypris sp.		x		
Fabaeformiscandona sp.		x	x	
Ilyocypris gibba			x	
Pseudocandona albicans		x		
Foraminifera				
Rotaliid	x			
Planktonic fossil ?Hedbergellid	x			
Other remains				
Bithynia opercula	x		x	
Pisidium	x	x		
Planorbid		x		
Insect remains	x			
Radiate diatoms	xxx	xxx	xxxx	
Pennate diatoms			xxxx	
Sponge spicules			xxxx	
Rhizomes	xx	xx		
Seeds	xx			
Sedge	x			
Plant stems/ remains	x		x	
Charcoal	x	x	x	

Abundance: x = 1 to 9 specimens; xx = 10 to 50 specimens; xxx = over 50 specimens

3.1.39 The Candoniid ostracods which dominate the samples at 0.92, 1.10 and 1.35m OD have been noted in other samples at the Sites. In this case, however, their numbers are great and represented by united carapaces, adults and instars indicative of a thanatocenosis. The two numerically dominant taxa (*Candona candida* and *Candona neglecta*) are known to inhabit a wide range of environments including springs, brooks, wells, ponds and ditches. They are known from the littoral and profundal zones of lakes. Both are also known to be tolerant of slightly brackish waters. *Candona candida* and *Candona neglecta* are not uncommon in the Baltic Sea (Meisch 2000) with a maximum recorded salinity tolerance of 16‰ for *Candona neglecta* and 5.77‰ for *Candona candida* (Hiller 1972). Despite this these taxa are indicative of non-marine "freshwater" environments, confirmed in this case by the absence of any commonly occurring brackish water taxa. *Candona candida* and *Candona neglecta* are both usually found in permanent water-bodies although the juveniles of *Candona candida* and the eggs, juveniles and adults of *Candona neglecta* are desiccation resistant. These taxa are often indicative of colder water and a "*candida* fauna" is often found in post-glacial sediments of small European water-bodies (Boomer 2002). The desiccation resistance of these taxa and parthenogenesis reproductive cycle of *Candona candida* make them suitable for pioneer colonisation of habitats.

3.1.40 *Candonopsis kingsleyi* prefers the littoral zone of lakes and small permanent water-bodies such as [fish] ponds and swamps, including those with a boggy substrate. It is only recorded from shallow waters with a maximum depth of 12m for living specimens (Kempf and Scharf 1981). It has also been reported from ditches and pools and within open fields and woodlands. It can tolerate salinities of up to 5‰ (Meisch 2000). *Cyclocypris laevis* is found currently in a wide range of habitats and although it prefers ponds and pools, it is also found in springs and streams and the littoral and profundal zone of lakes, and even reported from a tree cavity. It can tolerate slight increases in salinity (up to 8.4‰) and NaCl enriched springwaters (Meisch 2000).

3.1.41 *Darwinula stevensoni* occurred in all three productive samples and is a cosmopolitan taxon which prefers ponds, lakes and slow streams. It can tolerate increases in salinity up to 15‰ and has been recorded in water depths up to 12m (Meisch 2000). *Ilyocypris gibba*, recovered from the sample at 1.35m OD, prefers small and shallow permanent water-bodies with clayey fine mudded or sandy substrates. The taxon has also been recorded from temporary pools, spring, brooks, slightly salty waters and rice fields (Meisch 2000). *Pseudocandona albicans*, recovered also from the sample at 1.10m OD, prefers stagnant and slow flowing waters with a muddy substrate, including shallow littoral zone of lakes and peaty waters. It can tolerate slight increases in salinity, up to 5.5‰ (Meish 2000).

3.1.42 The ostracods (at 0.92, 1.10 and 1.35m OD) are together indicative of deposition within a shallow, still or very slow moving “freshwater” body, possibly an oxbow lake. Although the taxa are all tolerant of slight increases in salinity, no estuarine taxa (some of which can also tolerate low salinities) were recovered.

3.1.43 The two foraminifera recovered are most likely reworked from older deposits, the Hedbergellid probably being an upper Cretaceous chalk fossil. The only published record of foraminifera recovered from Holocene deposits in the Lea Valley (from the “marsh clay above the peat” at Broxbourne) also reached a similar conclusion (Warren *et al.* 1934). In this study four Rotaliid foraminifera were recovered and though to be derived.

3.1.44 The other remains within these samples including molluscs at 0.92, 1.10 and 1.35m OD comprising *Bithynia* opercula, *Pisidium* sp. and Planorbids confirm the interpretation of a freshwater environment.

Insects

3.1.45 The insect taxa recovered are listed in Table 7**.** The majority of the taxa present are beetles (Coleoptera) though the cases and head capsules of both cased and caseless caddis flies (Tricoptera) were seem in several samples.

3.1.46 The insect faunas recovered were small, fragmented and poorly preserved, though do contain a few species that suggest that the area contained slow flowing water, bank side vegetation, and grazing land. The faunas therefore have a limited role in terms of archaeological interpretation and should only be used to confirm and supplement the results from other proxy environmental data.

3.1.47 Given the frequently poor preservation and limited potential of these insect faunas, it was recommended that further analysis of these deposits should only occur if the analysis of the plant and pollen from these sites suggests it is warranted.

Table 7: Insect assemblage from Trench 7

Sample number	**<52>**	**<51>**
Context number	**(169)**	**(168)**
Depth (m OD)	**0.89-1.07**	**1.33-1.47**
Coleoptera		
Carabidae		
Pterostichus spp.	+	+
Hydraenidae		
Octhebius spp.	-	+
Helophorus spp.	+	+
Staphylinidae		
Oxytelus spp.	+	-
Scarabaeidae		
Aphodius spp.	+	-
Chrysomelidae		
Donacia spp.	+	-
Curculionidae		
Bagous spp.	+	-
Degree of preservation	fragmented, eroded, also contained modern wasps	fragmented, eroded, also contained modern wasps
Comparative size of faunas	small	small
Water conditions	*Bagous* suggests slow flowing	*Bagous* suggests slow flowing
Landscape	*Aphodius* dung beetle may suggest grazing in area. *Donacia* may indicate stands of water side vegetation	*Donacia* may indicate stands of water side vegetation
Overall potential of this location	poor	poor

+ = 1-2 individuals, ++ = 2-5 individuals, +++= 5-10 individuals

3.2 Trench 9 (PDZ1 1.12)

Introduction

3.2.1 This trench contained a number of different sedimentary features that were directly associated with archaeology found within this trench indicating settlement (notably Bronze Age, Iron Age and Romano-British). The features are discussed in turn, and locations are shown in Figure 5.

Sediments

3.2.2 Sediment descriptions and interpretations are given in Table 8 and Table 9.

3.2.3 Monolith <21> sampled an alluvial sequence of probable later Prehistoric to Romano-British date. The basal part of the sequence is probable channel-edge alluvium, with the rest of the sequence interpreted as overbank flooding deposits.

3.2.4 Monolith <668> sampled a ditch section of Iron Age date date, with a basal primary fill of silting/ trample and a humic secondary fill indicting moist well vegetated conditions within the ditch.

Table 8: Sediment descriptions for Monolith <21>, Trench 9

Level (m OD)	Context	Sediment description	Interpretation
2.87 to 2.51	83	Firm 10YR 4/ 2 very dark grayish brown slightly silty CLAY with occasional medium to fine subangular gravel especially at base of deposit some Fe staining. Contact graded.	?overbank alluvium
2.51 to 2.33	74	Firm, 10YR 4/ 3 brown SILTY CLAY becoming mottled reddish dark greyish brown and more sandy with common fine subangular gravels. Contact graded.	?overbank alluvium
2.33 to 2.20	80	Firm, 10YR 4/ 2 dark grayish brown SILTY CLAY becoming mottled reddish dark greyish brown and more sandy with occasional fine subangular gravels towards base. Contact graded.	?overbank alluvium
2.20 to 2.03	81	10YR 4/ 3 brown silty clay loam with some fine sand	Alluvium, likely channel edge

Table 9: Sediment descriptions for Monolith <668>, Trench 9

Level (m OD)	Context	Sediment description	Interpretation
2.15 to 1.89	2182	10YR 3/ 2 very dark greyish brown silt loam, slightly gritty, rare very small subangular gravel. ?Clear boundary (obscured by sampling)	Tertiary fill
1.89 to 1.64	2181	10YR 3/ 1 very dark grey silt loam, occasional small charcoal lumps, slightly gritty with occ small gravel throughout and common small gravel at 1.78-1.83m OD. Clear boundary.	Secondary fill
1.64 to 1.48	2205	10YR 4/ 2 dark greyish brown silt loam, fine well sorted silt, occasional grit with gravel in basal 5cm (subangular). Looks a little mixed, large (10mm diameter) waterlogged root subhorizontal. Sharp boundary.	Humic silts / secondary fill
1.48 to 1.29	2221	10YR 3/ 1 very dark grey silt loam, charcoal lumps up to 20mm, basal 5cm looks mixed (likely trampling)	Primary fill and humic silting
1.29 to 1.25		Orangey brown sandy gravel	Gravel

Dating

3.2.5 Thirty radiocarbon dates were obtained from Trench 9, of which only those associated with the two monolith sequences discussed below are given in Table 10. For a full listing of all radiocarbon dates see Appendix 1: Radiocarbon Dates.

Table 10: Selected Radiocarbon dates from Trench 9

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4% , 2σ range)	Reliability of Date
<21> (80)	2.2	Sediment (acid wash)	Beta-254059	2380±40	-25.6	750–380 cal BC	2
<21> (74)	2.5	Sediment (acid wash)	Beta-254060	1710±40	-26.1	cal AD 240–420	2
<668> (2221)	1.29	Sediment (acid–alkali-acid wash)	Beta-254067	2180±40	-26.6	380–110 cal BC	1
<668> (2181)	1.9	Sediment (acid wash)	Beta-254068	2350±40	-26	730–260 cal BC	1

Plant macrofossils

3.2.6 A number of waterlogged samples were examined from Middle Iron Age ditch fills (Features 1705, 1929, 1660, 1668, 1679 and 2120) and a possible Bronze Age pit 1730, listed in Table 11.

3.2.7 The ditches indicated a high degree of elements associated with hedges, trees and scrub, which included those of alder (*Alnus glutinosa*), oak (*Quercus* sp.), hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna*), sloe (*Prunus spinosa*), bramble (*Rubus* sp.), willow (*Salix* sp.) and elder (*Sambucus nigra*). Seeds of species associated with nitrogen enriched disturbed settlement soils were, as might be expected, also well represented and included common nettle (*Urtica dioica*), orache (*Atriplex* sp.), fat-hen (*Chenopodium album*), henbane (*Hyoscyamus niger*) and fig-leaved goosefoot (*Chenopodium ficifolium*).

3.2.8 Other species of general cultivation or disturbed soils were well represented and included dock (*Rumex* sp.), black bindweed (*Fallopia convolvulus*), knotgrass (*Polygonum aviculare*), fumitory (*Fumaria* sp.), field penny-cress (*Thlaspi arvense*), redshank/ pale persicaria (*Persicaria maculosa/ lapathifolium*) and scarlet pimpernel (*Anagallis arvensis*). Some of these species of disturbance, along with others more indicative of disturbed grassland and rough pasture, such as buttercup (*Ranunculus* sp.), prickly sow-thistle (*Sonchus asper* type) and thistles (*Carduus/ Cirsium* sp.), can be associated with relatively open conditions beyond the ditches and the probable presence of disturbance by human activity and animals.

3.2.9 The lack of aquatic species or those associated with standing water may indicate that permanent standing water was absent from most of the ditches. However, a major exception to this were large numbers of statoblasts and ephippium of water-flea, along with seeds of water-plantain (*Alisma plantago-aquatica*) and club-rush (*Schoenoplectus* sp.), in ditch 1923, cut (1679, 1696), which are all characteristic of more permanent standing water. This context is an obvious anomaly given that no such evidence for more permanently standing water was seen from any of the other enclosure ditches or contexts from ditch 1923. Ditch 1923 was thought to be part of an earlier ditch, following the same line as the Early Romano-British ditch 1212, which runs across the enclosure. As such it is quite possible that this context or ditch is part of this later Roman ditch possibly marking a transition to more permanently wet conditions upon the site.

3.2.10 While seeds of aquatic species may have been absent from the samples in the enclosure ditch, some plants are distinctive of general wet ground and temporary standing water in the ditches, such as fool's watercress (*Apium nodiflorum*), rushes (*Juncus* sp.), gypsywort (*Lycopus europaeus*) and sedge, which were common in all the features.

Table 11: Waterlogged plant remains from Iron Age ditches and a Bronze Age pit at Trench 9. c=charred f=fragments.

Sample		<583>	<643>	<590>	<597>	<598>	<558>	<568>	<593>	<595>	<649>	<586>
Context		(1704)	(1926)	(1724)	(1724)	(1723)	(1666)	(1680)	(1696)	(1700)	(2119)	(1729)
Group		1213	1213	1384	1384	1384	1385	1923	1923	1923	2298	BA pit
Feature		1705	1929	1660	1660	1660	1668	1679	1679	1679	2120	1730
Sample Size (litres)		5	5	5	5	5	5	5	5	5	5	5
Flot size (ml)		400	300	190	400	50	400	300	50	80	20	30
Bryophyta (leaf stem)	mosses	-	++	-	-	-	-	-	-	-	+	-
Bryophyta (capsule with calyptra)	mosses	-	-	-	-	-	-	1	-	-	-	-
Ceratophyllum demersum	rigid hornwort	-	-	1	-	-	-	-	-	-	-	-
Ranunculus acris/ repens	buttercup	+	++	+	5+	2	3	2	++	+++	+	-
Ranunculus sceleratus	celery-leaved buttercup	+	+	-	-	1	-	-	+	+	-	-
Ranunculus subg. *Batrachium*	water-crowfoots	-	-	-	-	1	-	-	-	-	-	-
Fumaria sp.	fumitory	-	2	2	3	4	-	1	1	-	-	-
Papaver cf. *rhoeas/dubium*	poppy	-	-	-	-	-	-	-	-	1	-	-
Urtica dioica	common nettle	+++	-	+++	++	+++	++	+	++++	+++	++	1
Quercus sp. (immature acorns)	oak	-	-	-	-	-	3	-	-	-	-	-
Quercus sp. (buds)	oak	-	-	-	-	-	-	-	-	-	-	-
Alnus glutinosa (fruits)	alder fruits	4	+	-	-	-	1	+	-	-	-	-
Alnus glutinosa (female catkins)	female catkins/ cones	-	-	-	-	-	1	4	-	-	-	-
Alnus glutinosa (male catkins)	alder male catkins	-	-	-	-	-	5	3	-	-	-	-
Corylus avellana	hazelnut	-	-	cf.1	-	-	1f.	1	-	-	-	-
Chenopodium rubrum	red goosefoot	-	-	-	-	-	-	cf.1	-	-	-	-
Chenopodium polyspermum	many-seeded goosefoot	-	-	-	-	-	-	-	1	-	+	-
Chenopodium ficifolium	fig-leaved goosefoot	++	++	-	-	1	-	++	+	+++	-	-
Chenopodium album	fat-hen	+++	-	+	2	1	4	+++	+	++	-	1
Atriplex sp.	orache	+++	+++	-	4	1	2	+++	+++	+++	+	-
Atriplex (probably prostrata)	orache	-	-	-	-	-	-	++	-	+	-	-
Montia fontana ssp. *chondrosperma*	blinks	+	+	+	-	2	-	-	-	+	-	-
Stellaria palustris	marsh/ lesser stitchwort	1	-	-	-	-	-	-	-	-	-	-
Stellaria media/ nemorum	common/ wood stitchwort	++	+++	++	-	+	10+	-	2	-	+	-
Silene sp.	campions	+	-	-	-	-	-	1	1	+	-	-
Persicaria maculosa/ lapathifolium	redshank/ pale persicaria	+	++	-	1	-	-	+++	+	++	+	-
Persicaria hydropiper	water-pepper	+	-	-	-	-	2	-	++	+	-	-
Persicaria mitis	tasteless water-pepper	-	3	-	-	-	-	1	++	+++	-	-

Sample		<583>	<643>	<590>	<597>	<598>	<558>	<568>	<593>	<595>	<649>	<586>
Context		(1704)	(1926)	(1724)	(1724)	(1723)	(1666)	(1680)	(1696)	(1700)	(2119)	(1729)
Group		1213	1213	1384	1384	1384	1385	1923	1923	1923	2298	BA pit
Feature		1705	1929	1660	1660	1660	1668	1679	1679	1679	2120	1730
Sample Size (litres)		5	5	5	5	5	5	5	5	5	5	5
Flot size (ml)		400	300	190	400	50	400	300	50	80	20	30
Polygonum aviculare	knotgrass	+	1	-	-	-	1	1	-	+++	+	-
Fallopia convolvulus	black bindweed	1	-	-	-	-	-	1	-	-	-	-
Rumex sp.	dock	+	-	-	3	1	1	+	-	+	-	-
Rumex acetosella group	sheep's sorrel	1	2	-	-	-	-	-	-	-	-	-
Rumex acetosa (whole fruit)	Scottish dock	-	-	-	-	-	-	2	-	1	-	-
Rumex conglomeratus (whole fruit)	clustered dock	2	-	-	-	-	-	-	+	-	-	-
Malva sp. L.	mallow	1	-	-	-	-	-	2	-	-	-	-
Viola odorata/ hirta	sweet/ hairy violet	1	-	-	1	-	-	1	-	-	-	-
Salix sp. (catkin bud scale)	willow	-	-	-	-	-	-	+	+	-	-	-
Salix sp. (catkin + bud)	willow	-	-	-	-	-	-	-	1	-	-	-
Brassicaceae	Brassicaceae 1-2mm	+	-	-	-	-	-	-	-	-	-	-
Rorippa palustris	marsh yellow-cress	-	-	-	-	-	-	++	-	+	-	-
Thlaspi arvense	field-penny cress	++	-	-	-	-	-	1	-	1	-	-
Brassica cf. *nigra*	black mustard	1	-	-	-	-	-	2	-	-	-	-
Anagallis arvensis	scarlet pimpernel	-	-	-	-	-	-	-	1	-	-	-
Rubus sp.	bramble	2	1	++	6+	6	50+	++	++	+	-	-
Rubus/ Rosa type sp. (thorn)	bramble/ rose type thorns	-	-	+	5	-	60+	-	+	-	-	-
Potentilla sp.	cinquefoil/ tormentil	-	1	-	1	-	-	-	-	+	-	-
Potentilla anserina	silverweed	1	+	+	-	-	cf.1c	-	-	1	-	-
Agrimonia eupatoria/ procera	agrimony	-	-	-	-	-	cf.1c	-	-	-	-	-
Aphanes arvensis	parsley-piert	-	1	-	-	-	-	-	-	-	-	-
Prunus spinosa	sloe	2f.	1	1	-	-	4f.	4f.	-	-	-	-
P. spinosa/ C. monogyna (thorns)	hawthorn/ slow thorns	2	++	1	-	-	1	6	-	35+	-	-
Crataegus monogyna (fruit stones)	hawthorn berries	1	-	-	-	-	3	4	-	1	-	-
Vicia/ Lathyrus sp.	vetch/ pea	-	-	-	-	1c	-	-	-	-	-	-
Trifolium sp.	clover	-	-	-	1c	-	-	-	-	-	-	-
Myriophyllum spicatum	spiked water-milfoil	-	-	-	-	-	-	-	2	-	-	-
Linum usitatissimum	flax seeds	-	-	-	-	-	1	-	-	-	-	-
Aethusa cynapium	fool's parsley	2	-	-	1	-	-	-	cf.1	-	-	-

Sample		<583>	<643>	<590>	<597>	<598>	<558>	<568>	<593>	<595>	<649>	<586>
Context		(1704)	(1926)	(1724)	(1724)	(1723)	(1666)	(1680)	(1696)	(1700)	(2119)	(1729)
Group		1213	1213	1384	1384	1384	1385	1923	1923	1923	2298	BA pit
Feature		1705	1929	1660	1660	1660	1668	1679	1679	1679	2120	1730
Sample Size (litres)		5	5	5	5	5	5	5	5	5	5	5
Flot size (ml)		400	300	190	400	50	400	300	50	80	20	30
Conium maculatum	hemlock	-	-	-	-	-	1	-	1	-	-	-
Apium nodiflorum	fool's watercress	+	-	+++	50+	11	-	-	++	-	-	-
Torilis arvensis/ japonica	hedge parsley	1	-	-	1	1	1	++	+	++	-	-
Hyoscyamus niger	henbane	++	+++	-	-	1	1	+	++	+++	+	1
Solanum nigrum	black nightshade	+	++	-	3	5	-	++	+	-	-	-
Stachys cf. *arvensis*	hedge woundwort	+	-	-	1	-	-	-	+	-	-	-
Lamium sp.	dead nettle	+++	+	-	-	-	-	-	-	+	-	-
Galeopsis sp.	hemp-nettle	5	-	-	-	-	1	+	1	2	-	-
Glechoma hederacea	ground-ivy	-	-	-	-	-	-	+	1	+	-	-
Prunella vulgaris	self-heal	-	cf.1	-	-	-	-	-	-	-	-	-
Clinopodium acinos	basil thyme	1	-	-	-	-	1	-	-	+	-	1
Lycopus europaeus	gypsywort	+++	++	++	6	7	1	+	+++	++	-	-
Mentha sp.	mint	+	-	-	-	-	-	-	+	-	-	-
Lamium album	white dead-nettle	+	-	-	-	-	-	-	cf.1	-	-	-
Callitriche sp.	water-starwort	-	-	-	-	-	-	-	+	-	-	-
Plantago major	greater plantain	-	-	-	-	-	-	-	+	-	-	-
Galium sp.	cleavers	-	-	-	-	-	-	1	+	-	-	-
Sambucus nigra	elder	3	1	+	4	1	200+	1	++	2	+++	++
Valerianella locusta	corn salad	-	-	-	-	-	-	-	cf.2	-	-	-
Arctium cf. *lappa*	greater burdock	-	1	-	-	-	1	9	-	5	-	-
Arctium cf. *minus*	lesser burdock	-	-	-	-	-	2	-	-	-	-	-
Carduus/ Cirsium sp.	thistle	++	+	+	10+	12	20+	1	++	1	+	-
Leontodon sp.	hawkbit	1	-	-	1	-	-	-	-	-	-	-
Sonchus asper type	prickly sow-thistle	++	-	++	3	2	+	++	+++	++	-	-
Sagittifolia sagittifolia	arrowhead	1	-	-	-	-	-	-	-	-	-	-
Baldellia ranunculoides	lesser water plantain	-	-	-	cf.1	1	-	-	-	-	-	-
Alisma plantago-aquatica	water-plantain	-	-	-	-	2	-	-	+++	-	-	-
Juncus sp.	rush	+	+++	++	-	+	-	-	+	-	-	-
Eleocharis sp.	spike-rush	1	1	-	1	-	2	+	+	2	-	-

Sample		<583>	<643>	<590>	<597>	<598>	<558>	<568>	<593>	<595>	<649>	<586>
Context		(1704)	(1926)	(1724)	(1724)	(1723)	(1666)	(1680)	(1696)	(1700)	(2119)	(1729)
Group		1213	1213	1384	1384	1384	1385	1923	1923	1923	2298	BA pit
Feature		1705	1929	1660	1660	1660	1668	1679	1679	1679	2120	1730
Sample Size (litres)		5	5	5	5	5	5	5	5	5	5	5
Flot size (ml)		400	300	190	400	50	400	300	50	80	20	30
Schoenoplectus sp.	club rushes	-	-	-	-	-	-	-	++	-	-	-
Isolepis setacea	bristle club-rush	-	-	-	-	1	-	-	-	-	-	-
Carex sp. (flat)	sedge (lenticular)	++	-	-	2	-	1	-	++	2	-	-
Carex sp. (trigonous)	sedge (trigonous)	1	2	1	3	2	1	+	++	2	++	3
Large Poaceae/ cereal (culm node)	large grass/ cereal	-	11+1c	-	-	-	-	-	-	-	-	-
Glyceria sp.	sweet-grasses	-	-	-	-	-	-	-	++	-	-	-
Avena sp. L. (grain)	oat grain	-	-	-	-	-	1c	-	-	1c.	-	-
Bromus sp.		-	1c	-	-	-	-	1c	-	4c	-	-
Cereal grain indet.	cereal grain indet.	-	-	-	-	-	-	-	-	1	-	-
Triticum dicoccum/ spelta (grain)	hulled wheat	-	-	-	-	-	-	-	1c	-	-	1
T. dicoccum/ spelta (spikelet fork)	emmer wheat	-	-	-	-	-	-	-	-	-	-	-
T. dicoccum/ spelta (glume base)	emmer wheat	-	1+1c	-	-	-	-	1c	-	4c	2c	-
T. dicoccum (glume base)	emmer wheat	1c	1c	-	-	-	cf.1c	1+3c	1c	+	2c	-
T. dicoccum (spikelet fork)	emmer wheat	1c	1c	-	-	-	-	-	-	1c	-	-
T. spelta (glume base)	spelt wheat	-	1c	-	-	-	-	-	-	2c	1	1
Sparganium erectum (fruit/ achene)	branched bur-reed	-	-	-	-	-	1	-	-	-	-	-
Sparganium erectum (inner embryo)	branched bur-reed	1	-	-	-	-	-	-	-	-	-	-
Iris pseudacorus	yellow iris	1f.	-	1	-	-	-	-	1	cf.1	-	-
Wood twigs		++	++	+	+	-	++	++	-	-	-	-
Wood		-	+	-	-	-	-	-	-	-	-	-
Leaf frgs		-	-	-	-	-	+	-	-	-	-	-
Capsule indet 4mm		-	-	+	2	-	-	-	-	+	+	-
Worm cocoons		-	+	-	2	-	30+	5	-	+	-	+
Buds		++	+	+	+	-	-	++	-	-	+	-
Other		-	-	-	-	-	-	-	-	-	-	-
charcoal		-	-	-	-	-	-	1	1	-	-	-
Caddis fly case		-	-	-	1	-	-	-	+	-	-	-
Daphnia sp. (Ephippium)	water flea	+	-	-	-	-	-	-	+	3	+	-
Lophopus crystallinus (Statoblasts)	Freshwater bryozoan	-	-	1	-	-	-	-	+++	-	-	-

Sample		<583>	<643>	<590>	<597>	<598>	<558>	<568>	<593>	<595>	<649>	<586>
Context		(1704)	(1926)	(1724)	(1724)	(1723)	(1666)	(1680)	(1696)	(1700)	(2119)	(1729)
Group		1213	1213	1384	1384	1384	1385	1923	1923	1923	2298	BA pit
Feature		1705	1929	1660	1660	1660	1668	1679	1679	1679	2120	1730
Sample Size (litres)		5	5	5	5	5	5	5	5	5	5	5
Flot size (ml)		400	300	190	400	50	400	300	50	80	20	30
Acari	mites	-	-	-	-	-	-	-	1	-	-	-

Pollen

3.2.11 Pollen sequences were examined from ditch segment 2222 (monolith <668>), and through layers of alluvium (81, 80, 74 and 83) (monolith <21>) recorded during the evaluation. Context (80) was radiocarbon dated on bulk sediments to the Early Iron Age (Beta-254059 and Beta-254060), but the date of this alluvium is potentially problematic, as it is possibly cut by a Middle Bronze Age ditch. It should be noted, however, that this relationship is very unclear, and the ditch may be entirely overlain by the alluvium. For this reason, and combined with the general evidence for the date of alluviation of this type on these gravels, this sequence of alluvium (80) has been treated as broadly Iron Age to Romano-British in date.

3.2.12 Radiocarbon dates from monolith <668> show an age inversion (Beta-254067 and Beta-254068). However, the lowermost date of 380-110 cal BC (Beta-254067, 2180±40 BP) correlates with other radiocarbon dates from adjoining ditches within the Trench, supporting a Middle Iron Age date.

MONOLITH <668> (FIGURE 6)

3.2.13 The pollen assemblage is dominated by Poaceae (46-69%) with Cyperaceae (3-14%) and Lactuceae undiff. (4-12%). Tree and shrub taxa are only present in low amounts, including *Alnus glutinosa* (1-7%), *Fraxinus excelsior* (up to 1%), *Corylus avellana*-type (up to 3%) and *Sorbus*-type (up to 2%). Dwarf shrub and herb taxa include *Ranunculus acris*-type (up to 4%), Chenopodiaceae (1-6%), *Cerastium*-type (up to 1%), *Polygonum* (up to 3%), Apiaceae undiff. (up to 2%), *Plantago lanceolata* (2-4%) and *Solidago virgaurea*-type (1-4%). Some *Cerealia*-type (up to 2%) pollen grains were also present, in addition to other wild grasses including *Glyceria*-type (up to 2%) and *Arrhenatherum*-type (up to 1%). *Sparganium emersum*-type (up to 5% TLP + aquatics) was also present at the top of the sequence, with *Pteridium aquilinum* (up to 2% TLP + pteridophytes) and Pteropsida (monolete.) indet. (up to 2% TLP + pteridophytes). Pollen concentrations vary between 77435 and 180186 grains cm^{-3}.

MONOLITH <21> (FIGURE 7)

3.2.14 The pollen assemblage is dominated by Poaceae (40-56%) with Cyperaceae (12-31%) and Lactuceae undiff. (9-21%). Tree and shrub taxa are only present in low amounts, including *Alnus glutinosa* (up to 7%) and *Corylus avellana*-type (up to 2%). Dwarf shrub and herb taxa include Chenopodiaceae (up to 7%), Brassicaceae (up to 2%), *Trifolium*-type (up to 1%) and *Plantago lanceolata* (up to 1%), with a single occurrence of a *Cerealia*-type at 2.75m OD. *Sparganium emersum*-type (1-6% TLP + aquatics) was present throughout the sequence, with *Osmunda regalis* (up to 3% TLP + pteridophytes), *Polypodium* (up to 1% TLP + pteridophytes), *Pteridium aquilinum* (up to 4% TLP + pteridophytes) and Pteropsida (monolete.) indet. (3-8% TLP + pteridophytes). Pollen concentrations increase towards the top of the sequence, from 6058 to 42673 grains cm^{-3}.

DISCUSSION

3.2.15 The pollen assemblage from both of these sequences can be interpreted as indicating a largely open environment with limited woodland cover. High amounts of Lactuceae undiff. may be a reflection of some differential pollen preservation, particularly in the sequence from monolith <21>. However, the consistent presence of Chenopodiaceae along with *Polygonum* [in monolith <668>] reflects the plant macrofossil record indicating general disturbance and wasteland, with some nitrogen-rich disturbed soils. This is supported by the presence of *Plantago lanceolata*, *P. media* and *Pteridium aquilinum*, with *Trifolium*-type also recorded. The local vegetation of the ditch and alluvium are shown to be dominated by wetland/ damp ground taxa including Cyperaceae, *Ranunculus acris*-type, *Mentha*-type, *Glyceria*-type and *Sparganium emersum*-type. Some *Cerealia*-type pollen were also recorded, which is supported by the presence of a number of charred cereal remains within ditch segment 2222, although whether this indicates nearby cultivation or simply on-site processing is unclear.

3.2.16 In conclusion, the pollen assemblage from the two locations in this trench indicates an open environment with evidence of local disturbance, which is to be expected from a settlement site. Some evidence of cereals is found, notably in monolith <668> though the origin is unclear.

Diatoms

3.2.17 Two samples from Trench 9, previously assessed for diatoms (Payne and Spurr 2009), have been taken to the analysis stage. These samples were taken from monolith <668> at 1.51m OD (context 2201) and 1.73m OD (context 2205). The results of diatom analysis are shown in Figure 8.

3.2.18 In the lower sample (1.51m OD) there is a high percentage of mesohalobous (*Navicula halophila*) and halophilous (*Amphora veneta* and *Navicula cincta*) species that indicate elevated salinity levels. However, there are no allochthonous marine and estuarine taxa which would show direct contact with tidal water. The flora is of relatively low diversity and about 20% of the assemblage is of the freshwater species *Gomphonema parvulum*, a species which has optimal growth in relatively high nutrient concentrations and is indicative of eutrophication. The aerophillic species *Hantzschia amphioxys* (>10%), *Navicula cincta* and *Navicula atomus* are also present. The flora is composed entirely of shallow water, non-planktonic diatoms.

3.2.19 In the top sample (1.73m OD) the dominant taxa (*Navicula halophila, Amphora veneta* and *Gomphonema parvulum* found in the lower sample (11) are absent. The dominant taxa in this sample are *Nitzschia* spp. such as *Nitzchia palea* and *Nitzschia perminuta*. The poor quality of preservation is reflected in the relatively high percentage (c.15%) of undifferentiated *Nitzschia* sp. recorded in the sample. These diatoms suggest that, as for the underlying sample, there were elevated aquatic nutrient levels. Aerophillic diatoms also form a significant component of the diatom assemblage. Aerophilous diatoms include *Hantzschia amphioxys, Pinnularia brebissonii* and *Navicula cincta*. The presence of these diatoms reflects erosion of bank sediments or drying out of the water body. Other non-planktonic oligohalobous indifferent diatoms present are *Achnanthes lanceolata, Achnanthes minutissima, Amphora libyca, Gomphonema angustatum, Fragilaria* spp. and *Cocconeis placentula*.

Insects

3.2.20 The terrestrial insect faunas recovered from six mid Iron Age ditches from Trench 9 (Table 12) are dominated by taxa which are associated either with grassland and pasture or with herbivore dung. Grassland is directly indicated by a number of taxa such as the ‘soldier beetle’ *Cantharis* spp., and a range of crysomelid ‘leaf beetles’ and curculionid ‘weevils’ which feed on grassland plants typical in meadows and grazing land such as docks (Rumex spp.), thistles (*Carduus* spp. and *Cirsum* spp.), clover (*Trifolium* spp.), shepherd’s purse (*Capsella bursa-pastoris*) and plantain (*Plantago lanceolata*) (see Koch 1992). Several species, such as *Brachypterus urticae, Apion urticarium, Ceutorhynchus pollinarius* and *Cidnorhinus quadrimaculatus* are associated with stinging nettle (*Urtica dioica*) suggesting that stands of this plant also occurred around these ditches. Many of the carabid ‘ground beetles’ recovered, such as *Leistus fulvibarbis, Bembidion lampros, B. guttula,* *Pterostichus melanarius, Calathus fuscipes, Platynus dorsalis* and *Syntomus truncatellus,* are often associated with open rough grassland, waste areas or arable/ ploughed land (Lindroth 1974).

Table 12: Insect assemblage from Trench 9

Sample number		**<583>**	**<643>**	**<597>**	**<558>**	**<593>**	**<595>**	**Phytophage plant hosts (nomenclature follows that of Stace 1997)**
Context number		**(1704)**	**(1926)**	**(1724)**	**(1666)**	**(1696)**	**(1700)**	
(s) group			**1213**	**1384**	**1385**	**1923**	**1923**	
Feature number		**1705**	**1929**	**1660**	**1668**	**1679**	**1679**	
Feature type		**Ditch**	**Ditch**	**Ditch**	**Ditch**	**Ditch**	**Ditch**	
Date		**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	
Volume (l.)		**1**	**5**	**1.5**	**5**	**4.5**	**1.25**	
HEMIPTERA								
Family, genus and spp. Indet.		-	-	1	-	1	-	
COLEOPTERA								
Carabidae								
Leistus fulvibarbis Dej.		-	-	-	1	-	-	
Notiophilus aquaticus (L.)		-	-	-	1	-	-	
Notiophilus palustris (Duft.)		-	-	1	-	-	-	
Loricera pilicornis (F.)		-	-	-	1	-	-	
Clivina fossor (L.)		1	-	1	-	1	1	
Dyschirius globosus (Hbst.)		-	-	-	-	1	-	
Trechus quadristriatus (Schrk)		-	-	-	-	1	-	
T. quadristriatus (Schrk)/ *T. obtusus* (Er.)		-	-	-	1	-	-	
Bembidion lampros (Hbst.)		-	1	-	2	-	-	
B. guttula (F.)		1	-	-	1	-	-	
Bembidion spp.		1	3	1	4	2	-	
Asaphidion flavipes (L.)	ws	-	-	-	1	-	-	
Harpalus spp.		-	-	-	-	1	1	
Acupalpus spp.		-	1	-	1	1	-	
Poecilus kugelanni (Panz.)		-	-	-	1	-	-	
Pterostichus melanarius (Ill.)		-	-	-	2	-	-	
Pterostichus spp.		-	1	-	-	-	-	
Calathus fuscipes (Goeze)		-	2	-	-	1	1	
Platynus ruficornis (Goeze) / *A. albipes* (F.)		-	-	-	5	-	-	
Amara spp.		1	-	-	-	2	1	
Dromius linearis (Ol.)	ws	-	1	-	-	-	-	
Syntomus truncatellus (L.)		-	-	-	1	1	-	
Halididae								
Haliplus spp.	a	-	-	1	1	1	-	
Dytiscidae								
Hygrotus decoratus (Gyll.)	a	-	-	-	-	1	-	
Hydroporus spp.	a	-	-	2	-	1	-	
Colymbetes fuscus L.	a	-	-	-	-	1	-	
Agabus bipustulatus (L.)	a	-	-	-	-	1	-	
Agabus spp.	a	-	-	-	1	2	-	
Gyrinidae								
Gyrinus spp.	a	-	-	-	-	1	-	
Hydraenidae								
Hydraena testacea (Curt.)	a	-	-	-	-	1	-	

Sample number		<583>	<643>	<597>	<558>	<593>	<595>	Phytophage plant hosts (nomenclature follows that of Stace 1997)
Context number		(1704)	(1926)	(1724)	(1666)	(1696)	(1700)	
(s) group			1213	1384	1385	1923	1923	
Feature number		1705	1929	1660	1668	1679	1679	
Feature type		Ditch	Ditch	Ditch	Ditch	Ditch	Ditch	
Date		Mid Iron Age	Mid Iron Age	Mid Iron Age	Mid Iron Age	Mid Iron Age	Mid Iron Age	
Volume (l.)		1	5	1.5	5	4.5	1.25	
Hydraena spp.	a	-	-	-	1	-	-	
Ochthebius minimus (F.)	a	2	5	-	2	-	-	
Ochthebius spp.	a	1	10	-	5	5	-	
Limnebius spp.	a	-	-	-	1	1	-	
Helophorus porculus (Bedel)	a	-	-	-	1	-	-	
Helophorus grandis (Ill.)	a	-	-	-	2	1	2	
Helophorus spp.	a	1	5	-	4	3	-	
Hydrophilidae								
Coelostoma orbiculare (F.)	a	-	-	-	-	1	-	
Sphaeridium scarabaeoides (L.)	df	-	-	-	-	1	-	
Sphaeridium lunatum F.	df	-	2	-	-	-	-	
Cercyon ustulatus (Preyssl.)	a	1	1	-	-	-	-	
Cercyon impressus (Sturm)	df	-	-	-	-	1	-	
Cercyon atricapillus (Marsh.)	df	-	-	1	-	-	-	
Cercyon analis (Payk.)		2	3	-	5	-	1	
Cercyon spp. (aquatic)		-	-	-	-	1	-	
Megasternum boletophagum (Marsh.)		-	-	2	18	5	2	
Cryptopleurum minutum (F.)	df	1	-	-	-	1	-	
Hydrobius fuscipes (L.)	a	-	1	-	1	-	-	
Laccobius spp.	a	-	-	-	-	1	-	
Enochrus spp.	a	-	-	1	-	1	1	
Cymbiodyta marginella (F.)	a	-	-	-	-	-	1	
Histeridae								
Onthophilus striatus (Forst.)	df	-	-	-	-	1	-	
Acritus nigricornis (Hoffm.)	df	1	3	-	1	1	1	
Atholus bimaculatus (L.)	df	-	-	-	1	-	-	
Atholus duodecimstriatus (Schrk.)	df	-	3	-	3	-	-	
Catopidae								
Catops spp.		-	-	-	1	1	-	
Clamdidae								
Clambus spp.		-	-	-	-	1	-	
Orthoperidae								
Orthoperus spp.	ws	-	1	1	-	1	-	
Ptiliidae								
Ptilidae Genus & spp. indet.		-	-	2	-	-	-	
Staphylinidae								
Metopsia gallica (Koch)		-	-	-	1	-	-	
Proteinus ovalis (Steph.)		-	-	-	1	-	-	
Phyllodrepa floralis (Payk.)		-	-	-	1	-	-	
Omalium rivulare (Payk.)		-	-	-	3	-	-	

Sample number		**<583>**	**<643>**	**<597>**	**<558>**	**<593>**	**<595>**	**Phytophage plant hosts (nomenclature follows that of Stace 1997)**
Context number		**(1704)**	**(1926)**	**(1724)**	**(1666)**	**(1696)**	**(1700)**	
(s) group			**1213**	**1384**	**1385**	**1923**	**1923**	
Feature number		**1705**	**1929**	**1660**	**1668**	**1679**	**1679**	
Feature type		**Ditch**	**Ditch**	**Ditch**	**Ditch**	**Ditch**	**Ditch**	
Date		**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	
Volume (l.)		**1**	**5**	**1.5**	**5**	**4.5**	**1.25**	
Omalium spp.		-	1	-	-	-	-	
Lesteva longelytrata (Goeze)	ws	-	-	1	5	-	-	
Lesteva spp.	ws	-	-	-	-	1	-	
Trogophloeus bilineatus (Steph.)	ws	-	-	1	1	2	1	
Trogophloeus spp.		1	2	-	2	1	-	
Oxytelus sculptus (Grav.)	df	1	2	1	-	-	-	
Oxytelus rugosus (F.)	df	1	-	-	1	-	-	
Oxytelus sculpturatus (Grav.)	df	-	-	-	1	2	-	
Oxytelus nitidulus (Grav.)	df	-	6	3	5	1	2	
Platystethus arenarius (Fourc.)	df	-	4	-	-	-	-	
Platystethus cf. *arenarius* (Fourc.)	df	-	-	-	2	-	-	
Platystethus cornutus (Grav.)	ws	2	7	-	-	1	-	
Platystethus nitens (Sahlb.)	ws	-	5	-	1	1	1	
Stenus spp.		1	3	2	2	3	-	
Paederus spp.		-	-	-	1	-	-	
Stilicus orbiculatus (Payk.)		-	-	1	-	-	1	
Stilicus spp.		-	-	-	-	1	-	
Lithocharis spp.		-	-	-	-	1	-	
Lathrobium spp.		-	-	-	2	1	1	
Leptacinus spp.		-	-	1	-	-	-	
Gyrohypnus fracticornis (Müll.)		-	-	-	2	-	-	
Xantholinus spp.		-	3	1	2	1	1	
Neobisnius spp.		-	1	-	-	-	-	
Philonthus spp.		-	-	1	2	2	1	
Tachyporus spp.		-	-	1	-	-	-	
Tachinus rufipes (Geer.)		-	-	-	2	-	-	
Tachinus spp.		-	-	-	2	-	-	
Drusilla canaliculata (F.)					1			
Aleocharinidae Gen. & spp. indet.		1	-	1	10	1	-	
Pselaphidae								
Brachygluta spp.	-	-	-	-	1	1	-	
Cantharidae								
Cantharis sp.	oa	1	-	-	-	-	-	
Elateridae								
Adelocera murina (L.)	p	-	-	-	-	1	-	
Melanotus rufipes (Hbst.) (*M. erythropus* (Gmel.) in Brit. Cat.)	p	-	-	-	1	1	-	
Throscidae								
Throscus spp.	ws	-	-	-	-	1	-	
Helodidae								
Helodidae Gen. & spp.	a	-	-	-	-	2	-	

Sample number		<583>	<643>	<597>	<558>	<593>	<595>	Phytophage plant hosts (nomenclature follows that of Stace 1997)
Context number		**(1704)**	**(1926)**	**(1724)**	**(1666)**	**(1696)**	**(1700)**	
(s) group			**1213**	**1384**	**1385**	**1923**	**1923**	
Feature number		**1705**	**1929**	**1660**	**1668**	**1679**	**1679**	
Feature type		**Ditch**	**Ditch**	**Ditch**	**Ditch**	**Ditch**	**Ditch**	
Date		**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	
Volume (l.)		**1**	**5**	**1.5**	**5**	**4.5**	**1.25**	
indet.								
Dryopidae								
Dryops spp.	a	-	1	-	-	-	-	
Nitidulidae								
Cateretes spp.		-	1	-	1	-	-	
Brachypterus urticae (F.)	p	1	-	3	4	-	1	*Urtica dioica* L. (stinging nettle)
Cucujidae								
Monotoma spp.	s	-	-	-	3	-	-	
Cryptophagidae								
Cryptophagus spp.	s	-	-	-	3	-	-	
Atomaria spp.	s	-	-	-	1	-	-	
Phalacridae								
Phalacrus cf. *caricis* (Sturm)	ws	-	-	-	-	2	-	
Phalacrus spp.	ws	1	-	-	-	-	-	
Olibrus sp.	ws	-	-	-	-	1	-	
Lathridiidae								
Enicmus minutus (Group)	s	-	-	2	5	1	-	
Coccinellidae								
Coccidula rufa (Hbst.)		-	-	-	-	1	-	
Thea vigintiduopunctata (L.)		-	-	-	1	-	-	
Anobiidae								
Anobium punctatum (Geer)	l	-	-	1	-	-	-	
Ptinidae								
Ptinidae Gen. & spp. indet		-	-	1	-	-	-	
Anthicidae								
Anthicus antherinus (L.)		-	-	-	-	1	-	
Scarabaeidae								
Trox scaber (L.)	df	-	-	-	1	-	-	
Geotrupes spp.	df	-	1	-	1	-	-	
Onthophagus spp.	df	-	-	-	-	-	1	
Oxyomus silvestris (Scop.)	df	-	-	-	1	1	-	
Aphodius rufipes (L.)	df	1	1	-	-	-	-	
Aphodius sphacelatus (Panz.) or *A. prodromus* (Brahm)	df	1	1	-	11	7	4	
Aphodius ater (Geer)	df	-	-	-	1	-	-	
Aphodius granarius (L.)	df	3	5	-	7	-	3	
Aphodius spp.	df	-	-	2	-	-	-	
Melolontha melolontha (L.)	p	-	-	-	1	-	-	
Cerambycidae								
Leiopus nebulosus (L.)	l	-	1	-	-	-	-	

Sample number		<583>	<643>	<597>	<558>	<593>	<595>	Phytophage plant hosts (nomenclature follows that of Stace 1997)
Context number		**(1704)**	**(1926)**	**(1724)**	**(1666)**	**(1696)**	**(1700)**	
(s) group			**1213**	**1384**	**1385**	**1923**	**1923**	
Feature number		**1705**	**1929**	**1660**	**1668**	**1679**	**1679**	
Feature type		**Ditch**	**Ditch**	**Ditch**	**Ditch**	**Ditch**	**Ditch**	
Date		**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	
Volume (l.)		**1**	**5**	**1.5**	**5**	**4.5**	**1.25**	
Chyrsomelidae								
Gastroidea viridula (Geer)	p	1	1					On dock (*Rumex* spp.)
Phaedon spp.	p	-	-	-	-	1	-	
Phyllodecta spp.	ws	-	-	-	1	-	-	
Agelastica alni (L.)	l	-	-	-	-	-	-	On *Alnus* spp. (alder)
Phyllotreta spp.		-	3	2	-	5	-	
Haltica spp.	l	-	1	-	-	-	-	
Chaetocnema concinna (Marsh.)	p	1	2	-	2	-	-	
Chaetocnema cf. *subcoerulea* (Kutsch.)	p	-	6	-	-	-	-	
Chaetocnema spp.		1	-	-	-	-	-	
Psylliodes sp.	p	-	1	-	-	-	-	
Curculionidae								
Apion urticarium (Hbst.)	p	-	-	-	1	-	1	*Urtica dioica* L. (stinging nettle)
Apion carduorum (Kirby)	p	-	-	-	3	-	-	On *Carduus* spp. and *Cirsium* spp. (thistle)
Apion spp.	p	1	-	2	6	5	-	
Phyllobius sp.	p	-	-	-	-	1	-	
Sitona flavescens (Marsh.)	p	-	1	-	-	-	-	*Trifolium* species (Clover)
Bagous spp.	ws	-	1	-	-	-	-	
Tanysphyrus lemnae (Payk.)	a	-	-	-	-	1	-	*Lemna* spp. (duckweed)
Notaris acridulus (L.)	ws	-	1	-	1	2	-	Often on *Glyceria maxima* (Hartm.) Holmb. (reed sweet-grass) and other *Glyceria* species (sweet-grasses)
Curculio spp.	l	-	-	-	-	1	-	
Alophus triguttatus (F.)	p	-	-	1	-	-	-	
Hypera spp.	p	-	-	-	1	-	-	Mainly *Trifolium* spp. (clover)
Rhyncolus spp.	l	-	1	-	-	-	-	
Ceutorhynchus contractus (Marsh.)	p	-	1	-	-	-	-	Usually associated with Resedaceae and Papaveraceae (migonettes and poppies)
Ceutorhynchus erysimi (F.)	p	-	1	-	1	-	-	On *Capsella bursa-pastoris* (L.) Medik. (shepherd's purse)
Ceutorhynchus pollinarius (Forst.)	p	-	-	-	1	-	-	*Urtica dioica* L. (stinging nettle)
Ceutorhynchus spp.	p	-	-	-	-	1	-	
Cidnorhinus quadrimaculatus (L.)	p	-	-	-	1	-	1	*Urtica dioica* L. (stinging nettle)
Gymnetron pascuorum (Gyll.)	p	-	-	-	1	1	-	*Plantago lanceolata* L. (ribwort plantain)
Gymnetron spp.	p	-	-	-	1	2	-	*Plantago lanceolata* L. ribwort (plantain)
Rhynchaenus sp.	l	-	-	-	-	1	1	
SIPHONAPTERA								
Ceratophyllidae								
Nosopsyllus fasciatus (Bosc)		-	3	-	-	-	-	
DIPTERA								
SUBORDER CYCLORRHAPHA								

Sample number		**<583>**	**<643>**	**<597>**	**<558>**	**<593>**	**<595>**	**Phytophage plant hosts (nomenclature follows that of Stace 1997)**
Context number		**(1704)**	**(1926)**	**(1724)**	**(1666)**	**(1696)**	**(1700)**	
(s) group			**1213**	**1384**	**1385**	**1923**	**1923**	
Feature number		**1705**	**1929**	**1660**	**1668**	**1679**	**1679**	
Feature type		**Ditch**	**Ditch**	**Ditch**	**Ditch**	**Ditch**	**Ditch**	
Date		**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	**Mid Iron Age**	
Volume (l.)		**1**	**5**	**1.5**	**5**	**4.5**	**1.25**	
Family, Gen. & spp. indet.		-	-	1	20	10	-	
Total number of individuals		32	108	42	184	107	32	
Total number of taxa		27	45	30	80	71	24	
% aquatic (a)		-	21.3	-	10.3	23.4	-	
% aquatic fast flowing (aff)		-	0.0	-	0.0	0.0	-	
% waterside (ws)		-	14.8	-	5.4	11.2	-	
% dung/ foul (df)		-	40.6	-	23.2	22.	-	
% woodland/ dead wood (l)		-	4.3	-	0.0	2.9	-	
% pasture (p)		-	18.8	-	15.5	18.6	-	
% synanthropic (s)		-	0.0	-	7.7	1.4	-	

Key to ecological groupings used
a= aquatic water beetles
aff= aquatic taxa normally associated with faster flowing waters
ws = waterside taxa often associated with emergent vegetation
df = taxa often associated with dung
p= taxa associated with grassland and open areas
l= taxa associated with trees
s= taxa normally associated with human settlement

3.2.21 The presence of grazing animals, probably cattle, is indicated by the numbers of dung beetles recovered, such as the ‘dor beetle’ *Geotrupes* and the ‘dung beetles’ *Onthophagus* spp.*, Aphodius rufipes, A. sphacelatus, A. prodromus, A. ater* and *A. granarius*, all of which are usually associated with herbivore dung lying in the open (Jessop 1986). A number of other taxa recovered are also sometimes associated with dung pats, for example several of the histerid ‘pill beetles’ and some the staphylind ‘rove beetles’ such as *Onthophilus striatus, Atholus bimaculatus* and *A. duodecimstriatus* (see Halstead 1963), several of the *Oxytelus* spp. and *Platystethus arenarius* (Tottenham 1954).

3.2.22 Comparatively few of the insects recovered are associated with trees or woodland suggesting that the landscape was essentially free of woodland, particularly as the species recorded are either very general foliage feeders such as *Rhynchaenus* or, like *Rhamphus fasciatus*, are associated with waterside trees such as willow rather than dense woodland.

3.2.23 The water beetles recovered indicate that the ditches were filled with slow flowing, standing or stagnant water, with *Hygrotus decoratus, Colymbetes fuscus, Agabus bipustulatus, Hydraena testacea, Ochthebius minimus, Coelostoma orbiculare, Cercyon ustulatus* and *Cymbiodyta marginella* being typical of such water conditions (see Nilsson and Holmen 1995 and Hansen 1987). The ditches seem to have been relatively clear of waterside vegetation or reed bed, with only limited numbers of *Notaris acridulus* and *Tanysphyrus lemnae* which feed on reed sweet grass (*Glyceria maxima*) and duckweed (*Lemna* spp.) respectively.

3.3 Trench 10 (PDZ1 1.13)

Introduction

3.3.1 This sequence is unsampled by monolith, but plant macrofossils have been examined due to being one of the few instances of a high presence of *Alnus glutinosa* (alder) noted during assessment.

Dating

3.3.2 A single radiocarbon date has been obtained from Bulk Sample <26> (Table 13).

Table 13: Radiocarbon dates from Trench 10

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (%)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<26> (134)	0.86 to 1.04	Waterlogged plant material: 10 x *Alnus glutinosa* cones	NZA-32947	2484±35	-28.1	780 - 410 cal. BC	1

3.3.3 Radiocarbon dating of alder cones from this sample yielded a Late Bronze Age/ Early Iron Age date (780-410 cal BC; NZA-32947, 2484±35 BP) indicating that alder carr woodland persisted in this area of the Lea Valley until at least this period.

Plant macrofossils

3.3.4 While no monolith sequences were taken during the evaluation of Trench 10, the assessment report noted large amounts of alder (Bazley *et al.* 2008, 45) within the waterlogged sample from (134), such evidence often absent from other trenches at the Site. The sample came from a red-brown peaty sandy silt around 0.18m OD at its maximum thickness (Bazley *et al.* 2008, 26).

3.3.5 A single sample <26> was examined from context (134), with results shown in Table 14. The sample was rich in remains of alder (*Alnus glutinosa*) that included many fruits, female catkins/ cones, occasional fragments of male catkins and more unusually a fragment of alder root showing the distinctive nodules of the nitrogen fixing bacteria *Frankia* sp.

3.3.6 Other remains largely comprised other woodland or scrub elements such as a few fragments of oak acorn cups (*Quercus* sp.) and seeds of bramble (*Rubus* sp.). Two seed fragments of *Viola* sp. were quite large in size, 2.2 to 3.5mm, which might suggest sweet and/ or hairy violet (*Viola odorata*/ *hirta*) as noted by (Godwin 1984, 137), although given the high dominance of alder might also suggest two slightly smaller species, common and/ or early dog-violet (*Viola riviniana*/ *reichenbachiana*) would seem more likely.

3.3.7 At least one large whole fruit of dock could be seen to be probably of sharp or clustered dock (*Rumex conglomeratus*) and it seems likely the remaining seeds of dock may be of this same species. This species is found mainly in wet grassland, marshes and riversides but is also found in woods. Seeds of woundwort/ claries (*Stachys*/ *Salvia* sp.) could be of grassland or shrub species.

3.3.8 Seeds of species also indicative of alder carr and general marshland included gypsywort (*Lycopus europaeus*). Other water and wetland elements included those of celery-leaved buttercup (*Ranunculus sceleratus*), water-crowfoot (*Ranunculus* subgenus *Batrachium*), mint (*Mentha* sp.) and sedge (*Carex* sp.).

Table 14: Waterlogged plant macrofossils data from Trench 10

Sample		**<26>**
Context		**(134)**
Depth top (m OD)		**1.04**
Depth bottom (m OD)		**0.86**
Sediment Type		**peat**
Sample Size (litres)		**5**
Flot size (ml)		**300**
Ranunculus sceleratus	celery-leaved buttercup	1
Ranunculus subg. *Batrachium*	water-crowfoots	+
Quercus sp. (acorn cups)	oak	3frgs
Alnus glutinosa (fruits)	alder fruits	+++ (200+)
Alnus glutinosa (female catkins/ cones)	female catkins/ cones	60
Alnus glutinosa roots with *Frankia* sp	Bacteria nodules on alder roots	1
Alnus glutinosa (male catkins)	alder male catkins	10frgs
Rumex sp.	dock	+
Rumex conglomeratus (whole fruit)	clustered dock	cf.1fr
Viola riviniana/ reichenbachiana	sweet/ hairy violet	2
Rubus sp.	bramble	2
Stachys/ Salvia sp.	woundwort/ claries	?1
Lycopus europaeus	gypsywort	+
Mentha sp.	mint	+
Carex sp. (trigonous)	sedge (trigonous)	+
Wood and twigs indet.	wood twigs and fragments	+++

+C – denotes material that was preserved by charring; cf. compares with; where abundant material was present +=10-50 ++=50-100 +++=100-500 or more

3.3.9 The assemblage suggests that the immediate environment during the formation of the deposit was dominated by alder carr with small patches of wet sedge grassland/ marsh probably in flooded areas close to the riverside.

3.3.10 Such rich alder dominated deposits have been recorded from Temple Mills Depot (Bates and Stafford in press), Stratford Box (Barnett *et al.* 2011), Victoria Dock (Barnett *et al.* 2010), and Silvertown Fort Street (Crockett *et al.* 2002). At Silvertown Fort Street, Temple Mills Depot and Victoria Dock these deposits were dated from the Early to Late Neolithic, and it seemed likely that the deposits in Trench 10 would be of similar date. However, radiocarbon dating of alder cones from this sample have yielded a Late Bronze Age/ Early Iron Age date (780–410 cal BC; NZA-32947, 2484±35 BP) indicating that alder carr woodland persisted in this area of the Lea Valley until at least this period. This date is confirmed by a radiocarbon date on a sample containing an alder cone from the adjacent Trench 35 of 760–410 cal BC (NZA-32949, 2462±35 BP).

3.4 Trench 13 (PDZ1 1.16)

Introduction

3.4.1 Samples from this trench were selected as a north-south post-medieval ditch would provide information, obtained from the mollusc assemblage, to provide information on the local environment and land-use, in particular evidence for water management, during this period.

Molluscs

3.4.2 A series of two samples were selected for molluscan analysis from the post-medieval ditch 184, shown in Table 15. The assemblages from both deposits mainly comprised freshwater species and no brackish water or marine shells were recovered.

CONTEXT (187), DITCH 184, SAMPLE <61>, BLUE GREY ALLUVIUM, POST MEDIEVAL

3.4.3 The moderate mollusc assemblage from this deposit was dominated by the moving water species group, in particular *Bithynia*. This species favours large bodies of slowly flowing water with dense growths of aquatic plants. There were also a number of ditch loving species, such as *Planorbis carinatus* which is found 'in a wide variety of permanent, well-vegetated aquatic habitats, avoiding marshy places subject to desiccation' and *Planorbis planorbis* which is also found 'in all kinds of well-vegetated aquatic habitats but especially characteristic of shallow pools and swampy ditches liable to dry up in the summer' (Kerney 1999, 58-59). *Anisus leucostoma*, a species which is also 'most typical of swampy pools and ditches, especially those drying up in the summer' (Kerney 1999, 60), represented 12% of the assemblage.

3.4.4 The assemblage appears to be indicative of well vegetated, well oxygenated, slowly moving water within the ditch with occasional areas of marsh or swampy grassland in the vicinity.

CONTEXT (182), DITCH 184, SAMPLE <60>, GREEN GREY ALLUVIUM, POST MEDIEVAL

3.4.5 Shell numbers were too low within the sample from this deposit to define the local environment in any detail. There were more fresh water species than land snails.

3.4.6 The mollusc assemblage obtained from context 187 is likely to be indicative of a permanent wet well vegetated, well oxygenated slowly flowing water environment within ditch 184 with occasional areas of marsh or swampy grassland in the vicinity during the Post medieval period.

Table 15: Mollusc Assemblage from Trench 13

Sample	<61>	<60>
Context	(187)	(182)
Feature	184	184
Depth	0.52 to 0.54m OD	2.30 to 2.84m OD
Sample size (litres)	5 l	5 l
Land snails		
Carychium cf. *minimum*	-	1
Succinea/ Oxyloma spp.	3	-
Aegopinella nitidula	-	1
Limacidae	1	-
Cepaea hortensis	1	-
Fresh and Brackish Water Snails		
Valvata cristata	8	1
Valvata piscinalis	2	-
Bithynia tentaculata	14	1
Bithynia spp.	47	1
Bithynia opercula	72	1
Lymnaea palustris	1	-
Lymnaea peregra	3	-
Lymnaea spp.	4	-
Planorbis planorbis	4	1
Planorbis carinatus	6	-
Anisus leucostoma	11	-
Bathyomphalus contortus	2	-
Planorbids	7	-
Pisidium spp.	3	-
Taxa	13	5
Total	117	6
% Open country species	0	0
% Intermediate species	1.71	0
% Shade - loving species	0	33.3
% Unassigned species	2.56	0
% Amphibious species	9.4	0
% Intermediate species	5.13	0
% Ditch species	15.38	33.3
% Moving water species	53.85	33.3
% Unassigned species	11.97	0

3.5 Trench 21 (PDZ1 Site 26 PLUG East-2)

Introduction

3.5.1 This trench, located on the raised area of gravel to the east of the main channel identified during deposit modelling, was selected for further work as it provided a relatively rare opportunity to examine sequences with probable archaeological associations containing potentially waterlogged material of probable Saxon and post-medieval date.

3.5.2 A ditch feature (previously interpreted as a pond, but mollusc results strongly suggest otherwise; see below) of probable post-medieval date cut through a sequence of Saxon humic marshy deposits which directly overlay gravels and was sealed by overbank alluvial deposition (Figure 9).

3.5.3 During evaluation the ditch feature was thought to be of Saxon date, but is now thought to be significantly later due to a further radiocarbon date and the notable inclusion of fragments of post-medieval pan-tile in the lower fill of the feature (see dating below).

3.5.4 Monolith <13> was taken through the centre of feature [13], while monolith <14> was taken through the humic sequence adjacent to and cut by the same feature [13].

Sediments

3.5.5 The sediment descriptions and interpretations for monolith samples <13> and <14> can be found in Table 16 and Table 17.

3.5.6 Ditch feature [13] was cut through a sequence containing a humic silt loam layer (11) overlying gravels. This humic deposit represents a highly vegetated marshy environment, possibly a channel edge, and has been dated to the Anglo-Saxon period. The humic/ marsh layer (11) was sealed by a layer of redeposited alluvial material (not sampled by the monolith).

3.5.7 The lower fills of ditch [13] were fine organic sediments (14) consistent with deposition in slow moving water conditions. The upper fills (15) appear to be composed of deliberately backfilled material of alluvial origin in which post-medieval or later finds were located. An initial spurious Anglo-Saxon radiocarbon date for this feature has been discounted (see dating); a later medieval date is now suggested.

Table 16: Sediment descriptions for Monolith <13>, Trench 21

Level (m OD)	Context	Sediment description	Interpretation
2.00 to 1.84	15	10YR4/ 3 brown clay loam, quite well developed medium granular structure, modern inclusions include fragments of coal, a matchstick (used) and mortar flecks. Boundary sharp and uneven. Unlikely to be much over 100 years (matchstick not waterlogged, looked fresh, possibly intrusive)	Redeposited modern topsoil
1.84 to 1.79	15	10YR3/ 1 very dark grey clay loam, weak to moderate granular structure. Similar to above but bit more humic, likely due to wetness at base. At base of layer is thin (c.5mm) layer of laminated fine iron-rich particles of very fine sand size (strong brown). Not iron pan but settled out in water.	Redeposited modern topsoil
1.79 to 1.60	14	10YR3/ 3 dark brown clay loam, common freshwater molluscs (inc. *Lymnaea* & *Pisidium*). Small wood fragments. Some slight indications of lamination, not obvious but breaks horizontally. Section of sample missing from 1.68-1.64m OD taken at assessment for (radiometric) date. Abrupt boundary.	Organic alluvium (clay loam). Pond or ditch deposit.
1.60 to 1.50	10	Yellowish brown sandy gravel (gravel abundant and sub-rounded, 3-30mm diameter).	Gravels

Table 17: Sediment descriptions for Monolith <14>, Trench 21

Level (m OD)	Context	Sediment description	Interpretation
2.13 to 2.00	15	10YR3/ 2 very dark greyish brown clay, massive, very hard & cohesive. Brick and mortar fragments. Seems very different from the same context sampled in <13>; more like alluvial clay infill than topsoil. Sharp boundary at 45 degree diagonal.	Dump of redeposited clay in feature
2.00 to 1.93	14	10YR4/ 2 dark greyish brown clay, occasional waterlogged wood frag (?root). Sharp boundary. Bears no resemblance to same context in monolith <13>. Diagonal boundary as above	Dump of redeposited clay in feature
1.93 to 1.73	11	10YR5/ 3 dark brown sandy silt loam, humic, massive. No molluscs or other ecofacts observed. Some gravel to base. Clear boundary. NB complete chunk missing at 1.81-1.77m OD, taken for (radiometric) date during assessment.	Humic marsh
1.73 to 1.63	10	Yellowish brown sandy gravel (gravel abundant and sub-rounded, 3-30mm diameter).	Gravels

Dating

3.5.8 Three radiocarbon dates have been obtained from Monoliths <13>, <14> and bulk sample <15> (Table 18).

3.5.9 Initial radiocarbon dating of bulk sediment material from the lower fill of the (14) returned a Saxon date. However, the first evaluation report for the Site (Hawkins 2005) reports the recovery of post-medieval pan-tile in this context. A very likely explanation for the spurious radiocarbon date is the erosion of humic material from marshy layer (11) through which the feature was cut.

3.5.10 The later medieval date now obtained for context (14) is more secure due to the use of waterlogged plant remains as opposed to bulk sediments as a source of dating material. This date is not necessarily at odds with the presence of post-medieval finds in the context, as they may have been recovered from higher in the layer.

Table 18: Radiocarbon dates from Trench 21

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<14> (11)	1.77	Sediment (acid wash)	Beta-213550+	1300±50	-29.4	cal AD 640–870	2
<13> (14)	1.61	Sediment (acid wash)	Beta-213551+	1110±60	-28.7	cal AD 770–1030	3
<15> (14)	1.79 to 1.60	Seeds: 4 x *Rumex* + bract, *Carex* trig, *Ranunculus arb*, *Polygonum aviculare*	SUERC-24956	580±30	-25.5	cal AD 1290–1420	1

Plant macrofossils

3.5.11 Four samples were examined in detail from Trench 21 (Table 19). Two of the samples came from a ditch cut [13], (15) and (14) at the base and the other two from the alluvial layers through which the ditch cuts (11) above the gravels and (12) above (Halsey and Hawkins 2007). As two sequences are represented in the table, the samples are laid out in chronological order with the oldest to the left. Radiocarbon dates would indicate that the earliest deposits are probably late Anglo-Saxon to Saxo-Norman in date while the ditch is likely to be late 13th to 15th century in date.

Table 19: Waterlogged plant macrofossils from Trench 21

Sample		**<17>**	**<18>**	**<15>**	**<16>**
Context		**(11)**	**(12)**	**(14)**	**(15)**
Depth top (m OD)		**1.93**	**c.2.25**	**1.79**	**2.00**
Depth bottom (m OD)		**1.73**	**1.93**	**1.60**	**1.79**
Sediment Type		**humic marsh**	**alluvial clay**	**Clay ditch base**	**top-soil in ditch**
Sample Size (litres)		**10.00**	**10.00**	**10.00**	**10.00**
Flot size (ml)		**10**	**10**	**5**	**20**
Bryophyta (leaf stem)	mosses	-	-	1	-
Ranunculus subg. *Ranunculus* (arb)	buttercup	4	1	1	2
Ranunculus sceleratus	celery-leaved buttercup	3	-	-	-
Ranunculus lingua	greater spearwort	-	-	-	1
Ranunculus subg. *Batrachium*	water-crowfoots	1	-	5	-
Persicaria maculosa/ lapathifolium	redshank/ pale persicaria	-	-	-	1
Polygonum aviculare	knotgrass	-	-	1	-
Rumex sp.	dock	-	-	4	5
Salix catkin bud scale	willow bud scale	-	-	cf.1	-
Barbarea vulgaris	winter-cress	-	-	1	-
Reseda sp.	mignonettes	-	-	1	-
Rubus sp.	bramble	-	1	-	2
Rubus/ Rosa type sp. (thorn)	bramble/ rose type thorns	-	1	-	2
Crataegus monogyna (fruit stones)	hawthorn berries	-	-	-	cf.2
Apium graveolens/ nodiflorum	wild celery/ fool's watercress	1	-	-	-
Menyanthes trifoliata	bogbean	2	-	-	-
Lycopus europaeus	gypsywort	2	-	-	-
Mentha sp.	mint	1	-	-	1
Callitriche sp.	water-starwort	2	-	-	-
Sambucus nigra	elder	-	-	-	2
Carduus/ Cirsium sp.	thistle	-	-	1	1
Asteraceae: *Taraxacum* type	dandelion	-	-	1	-
Sagittifolia sagittifolia	arrowhead	-	-	-	2
Baldellia ranunculoides	lesser water plantain	1	-	-	-
Alisma cf. *plantago-aquatica*	water-plantain	1	-	-	-
Potamogeton sp.	pondweeds	-	1	34	-
Juncus sp.	rush	+	-	-	-
Eleocharis palustris	common spike-rush	-	2	-	-
Schoenoplectus lacustris	common club-rush	+	1	-	?
Carex sp.	sedge	2	1	1	1
Poaceae/ cereal (culm internode)	grass stem/ straw	-	-	-	1
Sparganium erectum (fruit/ achene)	branched bur-reed	2	-	-	1
Sparganium erectum (inner seed/ embryo)	branched bur-reed	-	-	-	1
Roots indet.		-	-	-	+
Coal/ vitrified charcoal		-	-	-	+
Insect		+	-	+	-
Daphnia sp. (*Ephippium*)	water flea	+	-	-	-

+C – denotes material that was preserved by charring; cf. compares with; Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more

3.5.12 The samples were not particularly rich in waterlogged remains and were dominated mainly by species of wetland. The oldest deposit (11) a silt loam from a probable humic marsh, overlying the gravels deposit was dominated by seeds of wetland species growing close to or in the shallows of water-bodies, for example, rush (*Juncus* sp.), sedge (*Carex* sp.), club-rush (*Schoenoplectus lacustris*), along with lesser numbers of fruits of branched bur-reed (*Sparganium erectum*), wild celery/ fool's watercress (*Apium* sp.), water starwort (*Callitriche* sp.), water plantains (*Alisma plantago-aquatica* and *Baldellia ranunculoides*) and water-crowfoot (*Ranunculus* subg. *Batrachium*).

3.5.13 Seeds of bogbean (*Menyanthes trifoliata*), gypsywort (*Lycopus europaeus*), mint (*Mint* sp.) and buttercup (*Ranunculus* sp.) represent a wet grassy marsh element. Of some interest is the presence of eggs or *Ephippium* of water flea (*Daphnia* sp.) which would indicate the presence of a body of relatively still standing water or possible pools, and hence accord well with the interpretation of the ditch feature.

3.5.14 The sample above this from the alluvial clay (12) was generally sparse in terms of waterlogged seeds and it may be that these alluvial deposits had dried out and been situated below the watertable for long periods after their deposition. While some elements are similar to the underlying sample eg. the presence of club-rush, sedge and buttercup, along with spikerush (*Eleocharis palustris*) and pondweed (*Potamogeton* sp.) but others are more indicative of scrub, eg. bramble (*Rubus* sp.) and thorns of bramble/ rose (*Rubus*/ *Rosa* sp.).

3.5.15 The lowest sample from the base of the ditch (14) was somewhat different. Most prevalent were a number of seeds of pondweed (*Potamogeton* sp.), along with other species associated with overgrown water bodies such as water-crowfoot.

3.5.16 Of wasteland and/ or poor overgrown pasture were seeds of thistle (*Carduus*/ *Cirsium* sp.), buttercup, dock (*Rumex* sp.), mignonette (*Reseda* sp.) and knotgrass (*Polygonum aviculare*). There were also a slight indication of possible more woody scrub/ hedges in the general locality including possible bud of willow (*Salix* sp.) and winter-cress (*Barbarea vulgaris*). A single seed of possible dandelion (*Taraxacum* sp.) looked very fresh and potentially modern. The sample also contained a single leaf stem of moss.

3.5.17 The final sample was slightly richer than that from context (12), the range of species was generally similar to that seen from the other samples, with sedge, bur-reed, mint, buttercup and arrowhead (*Sagittifolia sagittifolia*) all being present, along with dock (*Rumex* sp.) and redshank/pale *persicaria* (*Persicaria maculosa*/ *lapathifolium*). The sample also contained several fragments of coal/ vitrified charcoal and given the general absence of this material in context (12) it might be postulated that the deposit is likely to be no earlier than the 17th to 18th century in date when the use of coal increased significantly, although the earliest records date to the 14th century.

3.5.18 Seeds of shrub species were slightly more numerous in this sample and included those of bramble, thorns of probable bramble or most probably dog-rose (*Rosa* sp.) and possible stones of hawthorn (*Crataegus monogyna*), along with seeds of elder (*Sambucus nigra*). The lowest sample gives an impression of marshland perhaps with frequent and isolated shallow pools within it. The sample from the overlying context (12) should be regarded with some caution as it is possible that some of the material is intrusive.

3.5.19 The general impression from the ditch samples is one of vegetated water surrounded by rough pasture, the upper sample would indicate some potential invasion by woody shrub or possibly hedgerows as the ditch began to silt up and dry out.

Pollen

3.5.20 Pollen assessment was carried out on eight samples from two monoliths in Trench 21: Monoliths <13> and <14>. A smaller number of samples from both monoliths had been assessed as part of the evaluation stage (Scaife in Halsey and Hawkins 2007). Results from both assessments are comparable and discussed below.

3.5.21 Results of the pollen assessment from monolith <13> are shown in Figure 10. The pollen assemblage is dominated by Poaceae (grasses; 60-74%). Tree and shrub/ climber taxa are rare. *Alnus glutinosa* (alder) is present in the upper levels in low amounts, but is unlikely to represent a local presence. *Ranunculus acris*-type (buttercup) reaches values of up to 16% and is likely to be a component of the local vegetation. Similarly, taxa such as Cyperaceae (sedges) and *Filipendula* (meadowsweet) may also form a component of the wetland plant assemblage.

3.5.22 The high percentages of Poaceae indicate that it was locally dominant and may also have formed an important component of the wetland flora, with *Glyceria*-type also locally present. When combined with the presence of *Rumex acetosa* (common sorrel), *Rumex acetosella* (sheep's sorrel) and *Plantago lanceolata* (ribwort plantain), all indicators of soil disturbance (such as from trampling), it is probably that some pastoral activity was occurring. Taxa such as Chenopodiaceae (goosefoots and oraches), Brassicaceae (cabbage and mustard family), *Cichorium intybus*-type (dandelion/ chicory) and *Solidago virgaurea*-type (daises/ goldenrods) may indicate waste or disturbed ground, possibly in close proximity to the feature after abandonment and subsequent sediment in-filling.

3.5.23 The occurrence of *Papaver rhoeas*-type (field poppy) and *Polygonum* (knotgrass), often implied as agricultural weeds, may indicate arable activity, though *Polygonum* is also present in natural habitats such as along river banks (Godwin 1975, 230). If arable activity was occurring, it would have been of limited extent in the local area around the sample location. High values for *Sparganium emersum*-type (bur-reed) with *Potamogeaton natans*-type (pondweed) suggest slow moving water or marshy conditions within the ditch. Pteridophytes were also recorded in low amounts including *Pteridium aquilinum* (bracken).

3.5.24 Pollen preservation was found to be poor in the upper three samples taken from monolith <14>, and insufficient pollen was retrieved to enable assessment. Table 20 shows the pollen assemblage obtained from the basal sample at 1.76m OD. A similar pollen assemblage was retrieved to that from monolith <13> and has the same interpretation being dominated by Poaceae (67%) with high values of *Ranunculus acris*-type (11%), with aquatic pollen represented by *Potamogeton natans*-type (3.2%) and *Sparganium emersum*-type (10.3%).

Table 20: Pollen assemblage from Trench 21, Monolith <14>

Sample	**<14>**
Depth (m OD)	**1.76**
Taxon	**Proportion**
Pinus sylvestris	1.0%
Ulmus	1.8%
Quercus	2.8%
Ranunculus acris-type	11.0%
Urtica dioica	0.9%
Filipendula	0.9%
Rosaceae undiff.	0.9%
Apiaceae undiff.	0.9%
Rubiaceae	0.9%
Cichorium intybus-type	0.9%
Solidago virgaurea-type	0.9%
Cyperaceae undiff.	5.5%
Poaceae undiff.	67.0%
Gylceria-type	2.8%
Arrhenatherum-type	1.8%
Potamogeton natans-type	3.2%
Sparganium emersum-type	10.3%
Trees	5.5%
Shrubs & Climbers	0.0%
Dwarf Shrubs & Herbs	94.5%
Total Land Pollen Sum	109
Pollen Concentration (grains cm^{-3})	2341458

3.5.25 The pollen assessment by Scaife (in Halsey and Hawkins 2007) did recover pollen from two upper levels of monolith <14> (1.86 and 1.97m OD). At 1.86m OD there was a higher presence of woodland taxa with *Quercus* (oak) present at 13%, *Alnus glutinosa* at 19% TLP (note a different pollen sum was used in current assessment as *Alnus glutinosa* was not excluded from the TLP sum) and *Betula* (birch) at 5% TLP. This would imply some local woodland regeneration around the Site. However, the absence of any other samples containing this pollen assemblage may also indicate the incorporation of older sediment into the ditch fill.

3.5.26 At 1.97m OD Lactucoidaceae (which includes *Cichorium intybus*-type) was found to be present at 45% TLP in the uppermost sample. The increased presence of Lactucoidaceae pollen coincides with increases in *Sinapsis*-type (included within the group Brassicaceae), *Bidens*-type (included within the group *Solidago virgaurea*-type), Chenopodiaceae, *Pteridium aquilinum* and unidentifiable (poorly preserved) pollen grains. These pollen types, although indicative of waste and/ or disturbed ground, also contain distinctive pollen ornamentation (eg. *Cichorium intybus*-type and *Solidago virgaurea*-type contain an echinate (spiky) surface sculpturing) and are more resistant to corrosion. They can also be preserved and identified even when other pollen types deteriorate beyond recognition (see Havinga 1964; 1984).

3.5.27 The pollen sample at 1.97m OD (which contains the high numbers of these corrosion resistant pollen types) is situated at the very top of context (11) just below context (14), a dump of redeposited clay. It is therefore possible that this sample may contain some redeposited material or that the upper part of context (11) was subject to increased sediment aeration prior to the overlying sediments deposition, decreasing pollen preservation further. This is likely to account for the change in the pollen assemblage identified in the original assessment. For this reason it is suggested that the change in the pollen assemblage is largely due to taphonomic processes rather than a change in the local vegetation and land use.

3.5.28 Both pollen assessments support a pollen assemblage dominated by Poaceae with the local presence of wetland plants, and indicators of disturbed and/ or waste ground identified. Some pastoral indicators have been identified suggesting pastoral activity was occurring locally. The original suggestion of grass-sedge-reed type local wetland vegetation is still supported from the assessment undertaken here.

3.5.29 Due to issues with differential pollen preservation and the limited variability within the pollen assemblage it was not been recommended that further analysis be undertaken upon these two monolith sequences. Although the pollen identifies a largely open landscape, problems with securely dating this sequence and the sampling strategy make the potential of this Site for pollen analysis very limited.

Diatoms

3.5.30 Four samples were prepared for diatom analysis from context 14 in the sequence from Monolith <13>, Trench 21 (Figure 11). These samples are from organic alluvium taken from a feature cut through gravel which appears to have held slow-moving or still water such as a pond or ditch. All four samples have moderate or high diatom numbers, whilst the quality of diatom valve preservation varies from good to poor. In all four samples diatom species diversity is high or moderately high.

3.5.31 The four samples from 1.62m OD to 1.78m OD have similar diatom assemblages that are dominated by the common freshwater epiphyte *Cocconeis placentula* (25% to almost 60% of the total diatoms) along with other freshwater non-plankton such as *Achnanthes lanceolata, Achnanthes minutissima, Fragilaria brevistriata, Fragilaria pinnata, Gomphonema acuminatum, Gomphonema truncatum* and *Navicula rhyncocephala*. A significant number of halophilous and mesohalobous taxa are also present, for example *Synedra pulchella, Amphora veneta, Gomphonema olivaceum, Navicula menisculus, Rhoicosphaenia curvata* and *Surirella brebissonii*.

3.5.32 These indicate a sustained level of slightly higher salinity than freshwater that also appears to increase towards the top of the diatom sequence. Further there is evidence of flooding from the estuary with small but significant numbers of polyhalobous and polyhalobous to mesohalobous diatoms from the outer Thames Estuary. These allochthonous, mainly planktonic diatoms, include *Campylosira cymbelliformis, Coscinodiscus* sp*., Cymatosira belgica, Paralia sulcata, Plagiogramma van-heurckii, Rhaphoneis minutissima, Rhaphoneis surirella* and *Actinoptychus undulatus*. Freshwater and halophilous planktonic diatoms such as *Cyclotella kuetzingiana* and *Cyclotella meneghiniana* are uncommon. Diatoms associated with flowing water are absent from the assemblages.

Ostracods and Foraminifera

3.5.33 The ostracod content of the three samples is given in Table 21. Of the three samples from Trench 21 (1.54, 1.62 and 1.70m OD), ostracods were present in two samples (at 1.62 and 1.70m OD). At 1.62m OD a few Candoniids were present including *Candona candida*, *Candona neglecta* and species of the genus *Fabaeformiscandona*. *Cyclocypris ovum* was also present. At 1.70m OD ostracods were more numerous and more diverse including *Candona candida*, *Candona neglecta*, *Limnocythere inopinata*, *Pseudocandona sarsi*, *Pseudocandona albicans* and species of the genus *fabaeformiscandona*.

3.5.34 In these two samples, molluscs including *Bithynia* opercula (1.62 and 1.70m OD), *Lymnaea* (1.62m OD), *Pisidium* (1.72m OD) and Planorbids (1.72m OD). Plant remains including stems were frequent in these two samples and notably absent from the sample at 1.54m OD.

Table 21: Microfaunal content of ostracod/ foraminifera from Trench 21

Sample	**<13>**	**<13>**	**<13>**
Depth (m OD)	**1.54**	**1.62**	**1.70**
Ostracoda			
Candona candida		x	xx
Candona spp.			x
Candona neglecta		x	xx
Cyclocypris ovum		x	
Fabaeformiscandona sp.		x	x
Limnocythere inopinata			x
Pseudocandona sarsi			x
Pseudocandona albicans			x
Other remains			
Molluscs		x	
Bithynia opercula		x	x
Lymnaea		x	
Pisidium			x
Planorbid			x
Plant stems/ remains		xxx	xxx

x = 1 to 9 specimens; xx = 10 to 50 specimens; xxx = over 50 specimens

3.5.35 The numbers of ostracods where recovered (at 1.62 and 1.70m OD) are low, the sample at 1.70m OD produced the largest assemblage of ostracods.

3.5.36 The most numerically abundant ostracods recovered are Candoniid ostracods from two samples from Trench 21 (1.62 and 1.70m OD) including *Candona candida* and *Candona neglecta*. These species are known to inhabit a wide range of freshwater environments including springs, brooks, wells, ponds and ditches. They are also are known from the littoral and profundal zones of lakes. Both are also known to be tolerant of slightly brackish waters. *Candona candida* and *Candona neglecta* are not uncommon in the Baltic Sea (Meisch 2000) with a maximum recorded salinity tolerance of 16‰ for *Candona neglecta* and 5.77‰ for *Candona candida* (Hiller 1972).

3.5.37 Despite this these taxa are indicative of non-marine “freshwater” environments, confirmed in this case by the absence of any commonly occurring brackish water taxa. *Candona candida* and *Candona neglecta* are both usually found in permanent water-bodies although the juveniles of *Candona candida* and the eggs, juveniles and adults of *Candona neglecta* are desiccation resistant. These taxa are often indicative of colder water and a “*candida* fauna” is often found in post-glacial sediments of small European water-bodies (Boomer 2002). The desiccation resistance of these taxa and parthenogenesis reproductive cycle of *Candona candida* make them suitable for pioneer colonisation of habitats.

3.5.38 In addition to these taxa the following species were recovered as singular valves; *Cyclocypris ovum* (at 1.62m OD), *Limnocythere inopinata* and *Pseudocandona sarsi* (both at 1.70m OD). *Limnocythere inopinata* and *Pseudocandona sarsi* are of interest as they both prefer very shallow water-bodies with *Pseudocandona sarsi* being intolerant of any salinity and preferring water-bodies which dry up in the summer months (Meisch 2000). A few specimens of *Pseudocandona albicans* (at 1.70m OD) which prefers shallow still and slow flowing freshwater bodies with a muddy bottom confirm the probable depositional environment.

3.5.39 The other plant and animal remains within these samples, particularly the mollusc *Bithynia* (including opercula), would confirm a shallow, slow moving or still freshwater depositional environment at these levels (1.62 and 1.70m OD).

3.5.40 No foraminifera were recovered from these samples despite a detailed search. If a tidal influence were to be inferred for these samples then foraminifera would be expected. The agglutinating foraminifera which can be preserved within the most reducing environments were not observed.

Molluscs

3.5.41 A series of four samples were examined for molluscan remains at Trench 21 through a humic marsh sequence and later medieval ditch/ pond fills (Table 22). The sediments of this sample sequence have been described above. Shell numbers were very low apart from the basal layer (14) of the ditch/ pond feature. The entire mollusc assemblage comprised only fresh-water species, no terrestrial, brackish water or *in situ* marine shells were recovered, and hence the sequence is not illustrated.

3.5.42 Snail numbers are too low to determine the local environment reflected in potentially marshy deposits contexts (11) and (12) (Samples <17> and <18>). For context (14) (Sample <15>, basal fill of ditch/ pond), the assemblage was dominated by *Bithynia tentaculata* and *Lymnaea peregra*. *Bithynia tentaculata* is indicative of moving well-oxygenated, permanent water environments. It thrives in muddy-bottomed well-vegetated areas. The ratio of *Bithynia* shells to operculum demonstrates that there has been some movement of material and is indicates a slow rather than fast flowing water environment. Kerney (1999, 39) states that ‘it is rare in small closed ponds’. *Lymnaea peregra* is found in all types of aquatic habitats. The other species in the assemblage can also occur in slow flowing well-vegetated water environments.

3.5.43 The mollusc assemblage obtained from the context (14) is therefore indicative of a permanently wet well vegetated, possibly muddy-bottomed, slow moving water environment. The feature is much more likely to be an over-grown drainage ditch or channel, with slow-flowing water, than a pond. The snail assemblage only reflects the detailed environment within this feature rather than the wider landscape.

3.5.44 The few snails recovered from context (15) (Sample <16>, upper fill of ditch/ pond) are indicative in very broad terms of a similar environment to that observed in context (14) but snail numbers are too low to make any detailed comments.

Table 22: Mollusc Assemblages from Trench 21

Sample	<17>	<18>	<15>	<16>
Context	**(11)**	**(12)**	**(14)**	**(15)**
Depth top (m OD)	**1.93**	**c.2.25**	**1.79**	**2.00**
Depth bottom (m OD)	**1.73**	**1.93**	**1.60**	**1.79**
Sediment Type	**humic marsh**	**alluvial clay**	**clay in ditch/ pond**	**top-soil in ditch/ pond**
Sample Size	**10.00**	**10.00**	**10.00**	**10.00**
Date	**?Late Saxon - Saxo-Norman**		**?Late 13-15th Century**	
Fresh and Brackish Water Snails				
Valvata cristata	-	-	6	-
Valvata piscinalis	-	-	11	4
Bithynia tentaculata	-	-	59	5
Bithynia spp.	-	-	22	-
Bithynia opercula	-	-	7	1
Lymnaea peregra	-	1	59	-
Lymnaea spp.	-	-	5	-
Planorbis planorbis	-	-	17	-
Planorbis carinatus	-	-	6	-
Anisus vortex	-	-	13	-
Bathyomphalus contortus	-	-	1	-
Hippeutis complanatus	-	-	3	-
Pisidium spp.	-	-	6	-
Taxa	**0**	**1**	**10**	**2**
Total	**0**	**1**	**208**	**9**
% Intermediate species	**0**	**100**	**30.3**	**0**
% Ditch species	**0**	**0**	**13.9**	**0**
% Moving water species	**0**	**0**	**44.2**	**100**
% Unassigned species	**0**	**0**	**11.5**	**0**

3.6 Trench 24 (PDZ1 Site 26 PLUG West-2)

Introduction

3.6.1 This trench, located to the south-west of Trench 21 and also on the raised area of gravel to the east of the main channel identified during deposit modelling, was selected for further work due to the presence in the sampled sequence of a buried land surface with strong associations with prehistoric archaeology of Bronze to Iron Age date (Figure 9).

Sediments

3.6.2 Sediment descriptions and interpretations can be found in Table 23.

Table 23: Sediment descriptions for Monoliths <4> and <5>, Trench 24

Level (m OD)	Context	Sediment description	Interpretation
2.58 to 2.44	2	10YR4/ 3 brown clay, common distinct sharp mottles of iron staining (strong brown, 7.5YR4/ 6). Massive, rare small gravel inclusions, boundary ?clear (sample in poor condition and difficult to describe)	Alluvium (clay)
2.44 to 2.31	3	10YR4/ 2 dark greyish brown clay, moderately well developed coarse to very coarse granular structure, crumbly.0.5% fine/ very fine macropores. Clear boundary. NB interpreted in assessment as alluvium; structure seems definitive however.	A-Horizon of soil (or topsoil derived material)
2.31 to 2.12	4	10YR4/ 3 brown clay, weak blocky structure, 0.5% fine/ very fine macropores, occasional gravel to base	Truncated B-horizon of prehistoric dryland soil
2.12 to 2.03	5	10YR4/ 6 dark yellowish brown clay loam/ sandy clay loam with occasional gravel small to large gravel	Floodplain gravels
2.03 to 1.92		10YR4/ 6 dark yellowish brown sandy clay loam with very common to abundant gravel 2-40mm	Floodplain gravels

3.6.3 The sequence consists of basal gravels to 2.03m OD (most likely of Pleistocene date), overlain by a fining-upwards sequence of clay loam to clay. A soil formed in this material, of which the B-horizon has survived later truncation. Earlier reports suggest that this soil horizon (4) is probably of Pleistocene/ Early Holocene date; however there is little direct evidence to support this. This deposit did, however, certainly form part of a dry land surface into the Prehistoric period, as made evident from the Bronze Age and Iron Age probable settlement-related features found to truncate the deposit.

3.6.4 Above (4) lay dark greyish brown clay with a moderately well developed crumb structure (3). Although previously interpreted as alluvium, this material appears to be topsoil, most probably formed *in situ* as a shallow gley soil rather than redeposited. A radiocarbon date from the layer returned a post-medieval date (SUERC-25013; Table 23), meaning that some significant degree of truncation of the sequence is very likely to have occurred between the Bronze Age land surface and the formation of this layer, which is sealed by overbank alluvium and made ground.

3.6.5 An attempt to tie down the age of soil horizon (4) returned a Anlgo-Saxon date (SUERC-24954; Table 23) – this is clearly an incorrect age for the soil itself, as is shown by the firmly dated Bronze Age feature cutting the layer adjacent to the point of sampling. The sampled material is intrusive, and represents a missing sedimentary phase as discussed below.

3.6.6 The interpretation of this spurious date is as follows: No waterlogged material suitable for radiocarbon dating has survived contemporary with the formation of (4), as the conditions were then drier and aerated. As water levels rose in later periods the area would have become wet and marshy, providing conditions for preservation of organic materials; no deposits are extant from this phase, but the intrusive waterlogged material which has been dated to the Anglo-Saxon period indicates that a wet marshy environment existed at that time.

3.6.7 It could therefore be reasonably surmised that the sequence has been considerably truncated, and that some of the missing material may have included a marshy humic deposit of the Saxon period similar to that seen in Trench 21.

3.6.8 The mechanisms for such truncation are as yet unclear, but the general depositional sequence can be defined as:

- *Gravels deposited;*
- *Soil builds up, under relatively dry conditions (possibly with seasonal overbank flooding);*
- *Features cut in the Bronze Age/ Iron Age, possibly from a higher level than where encountered during fieldwork;*
- *Unknown sediments deposited, including wet/ marshy in Saxon period;*
- *15th – 18th century truncation occurs, down to the level of context (4);*
- *Shallow organic A-Horizon forms, likely to be shallow due to high water tables and waterlogged subsoil;*
- *Overbank alluvium deposition (would have to be rapid to 'seal' A-Horizon; sample was unclear (broken) so may be dumped rather than in situ); and*
- *Made ground deposited.*

Dating

3.6.9 Five radiocarbon dates have been obtained from material extracted from bulk samples <1>, <8>, <10>, <12> and <24> (Table 24).

3.6.10 All these dates, with the exception of the two from the earliest (Bronze Age; Beta-210488 and SUERC-35325), are almost certainly intrusive. The reasons for this are discussed above, but essentially the Bronze Age date is from charcoal in a securely stratified pit deposit; the others are from intrusive waterlogged material moved down profile by rooting/ bioturbation.

Table 24: Radiocarbon dates from Trench 24

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<1> (6)	2.12	Charred material indet.	Beta-210488	2990±40	-24.7	1390–1050 cal BC	1
<8> (4)	2.31 to 2.12	Seeds: *Schoenoplectus*, *Ranunculus arb*	SUERC-24954	1050±30	-26.3	cal AD 890–1030	3
<10> (3)	2.44 to 2.31	Seeds: *Carex*, *Ranunculus*, *Atriplex*, 2 x Alismataceae	SUERC-25013	310±60	-	cal AD 1440–1800	2
<12> (2)	2.58 to 2.44	Charred cereal: 2 x frags. *Avena* sp.	SUERC-24955	135±30	-27.5	cal AD 1670–1950	1
<24> (24)	-	Charcoal: *Prunus spinosa*	SUERC-35325	3075±30	-27.8	1420–1260 cal BC	1

Micromorphology

3.6.11 Monolith <5> from Section 2, Trench 24 was submitted for soil micromorphology analysis. This sample contained a record of the Bronze Age soil (Contexts 4 and 5) and immediately overlying presumed alluvium (Context 3). A soil micromorphological investigation was carried out in order to examine site formation processes associated with this soil, sampled less than one metre from Bronze Age pit/post hole [7].

3.6.12 Results are presented below, and supported by Figure 12.

Lower Context (4) ('dry soil horizons') over Context 3 ('floodplain gravels') (M5C):

3.6.13 This is a heterogeneous, moderately poorly sorted coarse silt, fine and medium sand, with frequent flint gravel (including a possible calcined/ burned flint, Figure 12 C-J). The soil is very poorly humic. It is characterised by very abundant complex textural pedofeatures composed of many poorly laminated clay void infills and coatings, succeeded by very abundant dark and dusty clay coatings, especially in relict broad burrows and often associated with dusty intercalations. Root traces sometimes occur as calcitic root pseudomorphs, but often these have been stained/ replaced by iron impregnations. Other matrix areas show weak iron and clay depletion.

3.6.14 Lower Context (4) formed in upward-fining probable Late Pleistocene-Early Holocene alluvial sands and gravels. As the textural pedofeatures (poorly laminated clay coatings and infills, iron stained dusty coatings, and intercalations) are often associated with burrows containing more fine soil than surrounding matrix, these pedofeatures cannot be totally accepted as all relating to pedogenesis under Holocene environmental conditions and human impacts, up and until the Bronze Age. The possible calcined flint could have originated from early clearance(s). The clay coatings are likely to have been affected by flooding, and certainly the textural intercalations probably result from flooding (see above). Possible pre-inundation conditions seem to have first given rise to plant roots precipitating $CaCO_3$ – probably drawing up calcitic water from underlying calcareous river gravels. Inundation, water table fluctuations then led to iron depletion and iron staining.

Upper Context (4) ('dry soil horizons')(M5B):

3.6.15 Here a heterogeneous, moderately well-sorted, stone-free, coarse silt, fine and medium sand, characterised by many micritic and microsparitic void infills, and abundant poorly oriented clay coatings, infills and intercalations, is present (Figure 12 K-P). There are also depleted areas, and iron and clay enriched patches. The latter are especially associated with relict thin and broad burrows. The matrix contains rare traces of charcoal and was once probably moderately humic. Many fine channels and open vughs occur.

3.6.16 This appears to have once been a homogeneous, finely rooted and well-burrowed, moderately humic lower topsoil with trace amounts of very fine charcoal. Perhaps originally fluctuating groundwater produced calcitic root pseudomorphs and nodules (infills), but full inundation led to $CaCO_3$ depletion and iron staining, and slaking of soil producing depleted soil and preferential soil translocation down burrows.

Uppermost Context (4) ('dry soil horizons')(Lower M5A):

3.6.17 The junction between Contexts (3) and (4) is marked by a very diffuse boundary where the stone-free buried soil includes a 5 mm-size probable flint flake, and very abundant textural intercalations (Figure 28 O-U). The soil is either, iron depleted and clay poor, or locally enriched in clay and iron. Fine humic material and rare fine charcoal are present. Possible root/plant material ghosts occur. An original fine sub-angular blocky structure appears to be partially collapsed.

3.6.18 This is a once, moderately humic, topsoil (Context (4)) with small amounts of anthropogenic inclusions – a probable flint flake and rare charcoal. The void pattern in underlying M5B, and here, the amount of burrows showing humic soil and relict fine sub-angular blocky structures could suggest a grassland cover – probably without much obvious human impact. Unfortunately, the effects of inundation (soil slaking, partial structural collapse and textural intercalation formation) make it impossible to identify any land use that may have pre-dated this 'grassland' period that also occured prior inundation. It is possible that some 'ghosts' (enigmatic voids) could be relict of a grass cover (cf. Wallasea Island – see below).

CONTEXT (3) ('LOWER ALLUVIAL CLAY')(M5A UPPER):

3.6.19 This is an essentially stone-free homogeneous silt, fine and medium sand, as found in M5B (one flint gravel is present; Figure 12 V-Y). In small contrast to Context (4) below, shell fragments and rare blackened (detrital?) organic inclusions occur. Patchy iron-staining, and iron and clay depleted soil, occurs. Very abundant textural intercalations characterise the soil-sediment.

3.6.20 This Context (3) soil-sediment, at first glance, is formed of very local muddy 'alluvium' developed out of the local slaked soil (see below). This could record the first effects of flooding and alluviation before putative full blown alluviation (Context 2).

DISCUSSION

3.6.21 The Olympic Park Site occurs in urban areas where soils are unmapped. It is possible, however, to extrapolate from the mapped soil cover nearby, to suggest that the mid-Holocene soils were likely to have been typical argillic brown earths (Huckersbrook soil association) or argillic gley soils (Hurst soil association) formed in coarse and fine loamy river terrace drift, which also included gravel (Jarvis et al. 1983; Jarvis et al. 1984). There is no clear evidence of argillic formation or pedogenic clay translocation in the 3 samples studied, however. The effects of freshwater and later saline water inundation has transformed the soil to a partial extent, and so the exact nature of the original mid-Holocene is unknown.

3.6.22 What can be suggested, however, is that the soil is a stone-free loam formed in upward-fining probable Late Pleistocene-Early Holocene river terrace sediments (see Figure 12 A-C). Again, because of inundation effects (see below), it is difficult to clearly understand the land use history of the soil prior to the Bronze Age, but anthropogenic impact is poorly recorded by a possible calcined/ burned flint in the subsoil (Figure 12 C-E), and rare charcoal and a probable flint flake in the topsoil (Figure 12 O-T). The Bronze Age soil appears to have been a mull grassland soil (based upon the presence of thin and broad burrows, relict fine root channelling, 'humic' soil excrements; possible surface vegetation 'ghosts' and partially collapsed fine subangular blocky structures; Figure 12 A-B, F-G, L-P).

3.6.23 It is possible to suggest a history of site formation processes. First, perhaps as water tables fluctuated, roots became saturated with secondary calcium carbonate (presumably extracted from underlying calcareous gravels) and root pseudomorphs and nodules formed (Figure 12 F-G, K-M). As water tables began to rise more permanently, however, iron in the soil was partially mobilised under hydromorphic conditions and both depleted and iron-stained soil developed (Bouma *et al*. 1990) – some secondary calcium carbonate features became decalcified at this time (Figure 12 F-G, K-M). Humic soil within burrows and clay soil mobilised by slaking, also became a focus for iron staining and ferruginisation.

3.6.24 Inundation of soils during the Holocene, studied from various archaeological sites and experiments (Goldcliff, River Severn; Crouch and Blackwater estuaries, Essex and at Wallasea Island, Crouch River, Essex) has shown that hydromorphic transformations and soil slaking and down-profile fine soil translocation, are typical results of this process (Bell *et al*. 2000; Macphail 1994; Macphail 2009; Macphail *et al*. 2010). Near coastal areas, salt marsh can eventually form in once-terrestrial sites (Boorman *et al*. 2002). A further case study can be included in this discussion, namely sites along the A13 London gateway that parallel the River Thames in East London (Macphail and Crowther, 2009). Here, as at Trench 24, soils and middens can be buried by muddy soil-sediments before being sealed by clayey alluvium. In monolith <5> at Trench 24, the boundary between the buried soil and overlying muddy Context (3) is typically unclear. It shows inclusions of shell, not present in the underlying Contexts (4)-(5), more fine organic fragments, and is totally characterised by features such as textural intercalations and embedded grains that are typically formed in slaked soils and slurries under muddy conditions (Figure 12 A-Y). It is therefore possible that this Context (3) is muddy soil both associated with occupation/trampling (flint flake) and inundation effects. As only one profile location was examined, the above interpretations must remain relatively speculative.

CONCLUSIONS

3.6.25 Despite the hydromorphic and slaking effects of freshwater inundation of this site, it is possible to suggest a history of: pedogenesis in an upward-fining stone-free loam soil, the development of a grassland mull topsoil by Bronze Age times, and possibly that occupation associated with the post hole led to trampling and an accumulation of muddy soil associated with intermittent flooding of the site. As only one profile location was examined, the above interpretations must remain relatively speculative.

Plant macrofossils

3.6.26 Six samples were examined in detail from Trench 24, three from context (4), the soil B-horizon on top of the floodplain gravels, one from context (3), the overlying topsoil derived material, and two further samples from the overlying alluvial clay (2) (Table 25). A charcoal filled pit/ posthole [7] dated to the Middle to Late Bronze Age, and probably part of a roundhouse, was cut though context (4) (Halsey and Hawkins 2007).

3.6.27 All of the samples contained generally very little botanical material with the richest sample by far being that from the uppermost sample in context (4). The lowest sample from context (4) contained a few sees of elder (*Sambucus nigra*), a bud and a few other wetland species seeds such as gypsywort (*Lycopus europaeus*) and water plantain (*Alisma plantago-aquatica*). The sample above contained only single seeds of buttercup (*Ranunculus* subg. *Ranunculus* (arb)) and common club-rush (*Schoenoplectus lacustris*), while that from the top had only a single seed of Chenopodiceae) and several fragments of charcoal.

3.6.28 Seeds of common club-rush (*Schoenoplectus lacustris*), sedge (*Carex* sp.), water-plantain, and orache (*Atriplex* sp.), and Chenopodiaceae indet. were recovered from context (3).

3.6.29 The two samples from the uppermost context (2) both contained coal and as seen above are at least 17th to 20th century in date. The samples again had only a few seeds, mainly of rough wasteland species, such as buttercup including celery-leaved buttercup (*Ranunculus sceleratus*), Chenopodiaceae, knotgrass (*Polygonum aviculare*), dock (*Rumex* sp.), mignonette (*Reseda* sp.) and cinquefoil (*Potentilla* sp.), as well as two seeds of sedge (*Carex* sp.). The sample also contained two grains of oat (*Avena* sp.) which were radiocarbon dated, yielding a date of cal AD 1670-1950 (SUERC-24955, 135±30 BP).

Table 25: Waterlogged plant macrofossils from Trench 24

Sample		**<7>**	**<8>**	**<9>**	**<10>**	**<11>**	**<12>**
Context		**(4)**	**(4)**	**(4)**	**(3)**	**(2)**	**(2)**
Depth top (m OD)		**2.31**	**2.31**	**2.31**	**2.44**	**2.58**	**2.58**
Depth bottom (m OD)		**2.12**	**2.12**	**2.12**	**2.31**	**2.44**	**2.44**
Sediment Type		**alluvial B-horizon**				**alluvium**	
Sample Size (litres)		**10**	**10**	**10**	**10**	**10**	**10**
Flot size (ml)		**2**	**2**	**3**	**4**	**3**	**10**
Ranunculus subg. *Ranunculus* (arb)	buttercup	-	1	-	-	-	1
Ranunculus sceleratus	celery-leaved buttercup	-	-	-	-	-	1
Ranunculus subg. *Batrachium*	water-crowfoots	-	-	-	-	-	1
Chenopodiaceae indet.	goosefoot	-	-	1	2	-	1
Atriplex sp.	orache	-	-	-	1	-	-
Polygonum aviculare	knotgrass	-	-	-	-	-	2
Rumex sp.	dock	-	-	-	-	-	1
Reseda sp.	mignonettes	-	-	-	-	-	1
Rubus sp.	bramble	-	-	-	-	-	1
Potentilla sp.	cinquefoil/ tormentil	-	-	-	-	-	1
Lycopus europaeus	gypsywort	1	-	-	-	-	-
Sambucus nigra	elder	1	-	-	-	-	-
Alisma plantago-aquatica	water-plantain	1	-	-	2	-	-
Schoenoplectus lacustris	common club-rush	-	1	-	-	-	-
Carex sp.	sedge	-	-	-	1	1	1
Poaceae (small indet.)	small grass seed	1	-	-	-	-	-
Avena sp. L. (grain) charred	oat grain	-	-	-	-	-	2
Bud indet.		1	-	-	-	-	-
Charcoal	charred wood indet.	-	-	6 frgs	-	-	-
Coal/ Vitrified Charcoal		-	-	?	-	+	++

+C – denotes material that was preserved by charring. cf. compares with. Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more

3.6.30 The uppermost samples (2) and (3) contained such poor assemblages that the material may be intrusive or at least have dried out enough that the chances of waterlogged preservation were very low. The B-horizon (4) through which the Bronze Age feature cuts was dated to the Late Saxon period, but given the low amount of material it is thought that the dated is probably intrusive (see sediments above).

3.6.31 No waterlogged material was noted in the charcoal rich fill of this feature [23] and it is probable given the presence of Bronze Age settlement that the site (Halsey and Hawkins 2007) was relatively dry during this period and that the sediments forming the B-horizon (4) would have regularly dried out and that no material would have survived from the Bronze Age. The material therefore, as stated, probably became incorporated into the deposit during a later period of stabilisation and the formation of the A-horizon (3). As such the occasional seed of buttercup and elder can only have come from plants growing in the region during the Late Anglo-Saxon/ early medieval period at best.

Pollen

3.6.32 Pollen assessment was carried out on six samples from two monoliths in Trench 24: Monolith <4> and <5> (Figure 13). Both monoliths had also been previously assessed as part of the evaluation stage (Scaife in Halsey and Hawkins 2007).

Results from both assessments are generally comparable and will be discussed below.

3.6.33 The pollen assemblage from monoliths <4> and <5> is dominated by Poaceae (grasses; 39-54%), *Cichorium virgaurea*-type (dandelion; 15-36%) and Cyperaeceae (sedges; 8-23%). The high percentages of Poaceae indicate that it is locally dominant, as so may have formed an important component of the wetland flora, which is also likely to be the origin of the *Glyceria*-type (up to 4%) recorded. Poaceae also probably represents Poaceae in the wider floodplain environment. Pastoral indicators are not abundant within the pollen assemblage, with only two occurrences of *Plantago lanceolata* (ribwort plantain) recorded.

3.6.34 *Pteridium aquilinum* (bracken) is present throughout the sequence and may also be indicative of local disturbance. The high presence of *Cichorium intybus*-type may indicate waste or disturbed ground. However, this pollen type is also abundant in pollen assemblages where differential preservation has occurred due to poor preservation conditions existing. This is due to the pollen type being more resistant to corrosion than other pollen types and is easily identifiable due to distinctive pollen ornamentation (echinate (spiky) surface sculpturing). It can therefore be preserved and identifiable even when other pollen types have deteriorated beyond identification (see Havinga 1964; 1984).

3.6.35 Other herb taxa present include Brassicaceae (cabbage and mustard family; 2-4%), Chenopodiaceae (goosefoots and oraches), *Cirsium*-type (thistle) and *Solidago virgaurea*-type (daises/ goldenrods) which, although possibly indicative of waste or disturbed ground, are also taxa more resistant to corrosion and easier to identify under poor preservation conditions.

3.6.36 The single occurrence of *Polygonum* (knotgrass), often implied as an agricultural weed, may be associated with arable activity, though this plant is also present in natural habitats such as along river banks (Godwin 1975, 230).

3.6.37 Pollen from tree and shrub/ climber taxa is rare. *Corylus avellana*-type (hazel) is present in low amounts along with *Quercus* (oak) and *Alnus glutinosa* (alder), though these are unlikely to be locally present and instead are sourced from the background pollen rain. *Pinus sylvestris* (pine), in comparison to the original assessment, is also only found in low amounts (see discussion below). Spores from *Polypodium* (polypody) and Pteropsida (monolete) indet. (fern spores) are also present throughout the sequence. There are occurrences of *Nympaea alba* (white water-lily), *Sparganium emersum*-type (bur-reed) and *Potamogeaton natans*-type (pondweed) suggest standing or slow moving water, or marshy conditions.

3.6.38 Both pollen assessments support a pollen assemblage dominated by Poaceae with the local presence of wetland plants, and indicators of disturbed and/ or waste ground. Possible arable indicators have also been identified, though it is suspected that these are related to the local wetland vegetation rather than arable activity upon the floodplain itself. The original suggestion of grass-sedge-reed type local wetland vegetation is still supported from the assessment undertaken here.

3.6.39 The high values of *Pinus* found at 2.51m OD by Scaife was not found in this assessment in samples taken at 2.48 and 2.52m OD. It is suspected that the original sample from 2.51m OD contained older reworked sediment (contained within context (2); overbank alluvium) resulting in the high *Pinus* values originally recorded (48%). The original suggestion of a possible Pleistocene age for context (4) is dismissed, as the pollen assemblage is similar to other deposits identified across the Olympic Park from the mid- to late-Holocene showing an open floodplain environment dominated by grasses with sedge and reed communities also forming an important local component. It should be noted, however, that the original idea of a possible Pleistocene age for these deposits was postulated by the interpretation of the sedimentary sequence prior to pollen assessment and Scaife raised concerns over this interpretation, citing possible contamination of the samples by modern pollen down rootlet hollows if the Pleistocene date was correct (Scaife in Halsey and Hawkins 2007, 36). The substantial peak in *Pinus* (with the presence of *Betula* (birch) pollen) and herb pollen from open ground, although suggestive of a possible Pleistocene element, has been dismissed. Instead it is concluded that the non-contemporised *Pinus* dominated sample is most likely to have been derived from reworked sediment and that the upper sequence is instead post-medieval in date.

3.6.40 Due to potential issues with differential pollen preservation and the limited variability within the pollen assemblage it was not recommended that further analysis be undertaken upon this monolith sequence. Although the pollen identifies a largely open landscape, problems with securely dating this sequence and the potential of reworked pollen makes this unsuitable for obtaining a meaningful interpretation of the local environment at the time of sediment deposition and/ or accretion.

Ostracods and Foraminifera

3.6.41 No ostracods or any plant or animal remains were recovered from the Trench 24 sample (at 2.06m OD). The residue consisted wholly of sand with rounded to angular pebbles up to 10mm diameter. The pebbles were predominantly flint although *c.* 5% was quartz.

Molluscs

3.6.42 Only a very small number of molluscs were retrieved from the samples (Table 26). This comprised *Bithynia/ Lymnaea* from the buried soil and shells marsh/ terrestrial species of *Carychium* sp. and *Vallonia* sp. That several shells of the burrowing shell *Cecilioides acicula* is further evidence of bioturbation and the possibility of intrusive elements occurring within the profile in general.

Table 26: Assessment of Mollusc from Trench 24

Sample	**<6>**	**<7>**	**<8>**	**<9>**	**<10>**	**<11>**	**<12>**
Context	**(4)**				**(3)**	**(2)**	
Depth top (m OD)	**2.31**	**2.31**	**2.31**	**2.31**	**2.44**	**2.58**	**2.58**
Depth bottom (m OD)	**2.12**	**2.12**	**2.12**	**2.12**	**2.31**	**2.44**	**2.44**
Sediment Type	**alluvial B-horizon**				**buried soil**	**alluvium**	
Sample Size (litres)	**10**	**10**	**10**	**10**	**10**	**10**	**10**
Flot size (ml)	**2**	**2**	**2**	**3**	**4**	**3**	**10**
Molluscs							
Cecilioides acicula	-	-	-	-	-	+	-
Marsh Snails							
Vallonia	-	-	-	-	-	-	2
Carychium	-	-	-	-	-	-	1
Water Snails							
Bithynia/ Lymnaea	-	-	-	-	1	-	-
Marine Molluscs							
Mussel	-	-	-	-	-	1frg	-

Where abundant material was present +-present, ++-10-50, +++ 50-100, ++++- Hundreds

3.7 Trench 27 (PDZ1 Site 25 Trench 2)

Introduction

3.7.1 As the original evaluation report showed little potential for this sequence (Howell *et al.* 2005), remains and sediments from this trench were not initially taken to more detailed assessment in during the Phase 3B works. However, since then the Post-Excavation assessment of the waterlogged plant remains has been made available and demonstrated that remains of flax were present in quite large quantities (Giorgi in Spurr and Corcoran 2010, 14). Given that this flax represented archaeological activity of potentially Iron Age date or earlier, rapid detailed assessment was undertaken on sample <4> from context (15) (NB in Spurr and Corcoran 2010, Table 10, it is listed as from (16), however after examination of the records the sample is likely to have come from around 1.30-1.40m OD, but may be slightly lower in elevation).

3.7.2 The main object of this detailed assessment was to extract remains of flax for submission for radiocarbon dating. The dating of bulk sediments from above the sample at *c.* 1.54m OD indicated that that the remains potentially might predate the Middle to late Iron Age, 360-40 cal BC (Beta-220048, 2130±40 BP).

Dating

3.7.3 Three radiocarbon dates were obtained from this sequence (Table 27).

Table 27: Radiocarbon dates from Trench 27

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<9> (C13)	2.02	Bulk Sediment	Beta-220051+	1630±50	-28.6	cal AD 250 - 550	3
<1> (6(C13))	1.54	Bulk Sediment	Beta-220048	2130±40	-28.7	360 - 40 cal BC	3
<4/3> (15/16)	c. 1.30	*Linum usitatissimum* capsules	SUERC-31390	1335±30	-29.0	cal AD 640 - 770	1

3.7.4 The dates on bulk sediments were obtained from the monolith sample, whilst that on plant macrofossils is most likely to come from the bottom of context (15) (just above context 16) at around 1.30-1.40m OD.

Plant macrofossils

3.7.5 The single sample examined contained only a limited number of species, mostly associated with wetlands (Table 28). The remains of flax (*Linum usitatissimum*) were by far the most common in the sample with mainly remains of capsules, but also seeds present. The other remains were generally of aquatics and included narrow-fruited watercress (*Rorippa* cf. *nasturtium-aquaticum*) and horned pondweed (*Zannichellia palustris*), as well as those of shallow water and wet marshy grassland/ waste places, such as water-droplets (*Oenanthe* sp.), spikerush (*Eleocharis* sp.), sedge (*Carex* sp.) and common club rush (Schoenoplectus lacustris), while dock (Rumex sp.) can be associated with waste places and rough pastures. Several capsule fragments were submitted for radiocarbon dating. The returned date, cal AD 640-770 (SUERC-31390, 1335±30BP), indicates that the flax was grown and deposited during the Middle Saxon period.

3.7.6 While the date for the flax does not match that from the bulk sediment, there is no reason to suspect that the remains are intrusive given the large number present. Problems with radiocarbon dating of bulk sediments have been common across the site, with artificially young dates being attributable to the inclusion of later root material. It might also be noted that flax was also present in lower numbers from sample <3> in the underlying (16) (Giorgi in Spurr and Corcoran 2010, 14). Finally, the date is generally in keeping with that from remains associated with flax within Trench 7 which also indicated a probable Anglo-Saxon date. The sample is generally similar in some respects to the aforementioned sample from Trench 7, although there was less indication of grassland and more aquatics present in the sample examined here. The presence of remains of flax, a crop often grown on drier sandier soils, is unusual and unlikely to be related to locally growing plants. It is more likely that the remains relate to the retting of flax, either coming from waste discarded prior to the flax being submerged in ditches or pits or from the retted bundles themselves.

3.7.7 While no remains of Early to Middle Anglo-Saxon ditches were found in the Trenches themselves, records of a bundle of flax within channel deposits have come from broadly similarly dated (Late Anglo-Saxon) deposits at Yarnton, Oxfordshire, along with finds of seeds and capsules (Robinson 2004). Here the deposits were associated with a palaeochannel that had largely silted up forming a series of ponds (Hey 2004, 11; Robinson 2004). The retting of flax is often done away from settlements, and at Yarnton the channel where evidence for such activities lay some 500m from the area of Late Anglo-Saxon settlement.

Table 28: Plant waterlogged macrofossils from Trench 27

Sample		**<4>**
Context		**(15)/ (16)**
Depth top (m OD)		**c.1.4**
Depth bottom (m OD)		**c.1.3**
Sediment Type		**fluvial sands**
Period		**Saxon**
Sample Size (litres)		**10-20**
Bryophyta (leaf stem)	mosses	+
Rumex sp.	dock	+
Rorippa cf. *nasturtium-aquaticum*	narrow-fruited watercress	+
Linum usitatissimum (seed)	flax seeds	++
Linum usitatissimum (capsule)	flax capsule	+++
Oenanthe sp.	water-droplets	+++
Zannichellia palustris	horned pondweed	1
Eleocharis palustris	common spike-rush	+
Schoenoplectus lacustris	common club-rush	+
Carex sp. (trigonous)	sedge (trigonous)	+
Pod or capsule indet. cf. Lentil		1
Worm cocoons		++
Charcoal		+

$^{+}$C – denotes material that was preserved by charring. cf. compares with. Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more

3.8 Trench 29 (PDZ1 Site 25 Trench 4)

Introduction

3.8.1 Trench 29 is located *c.* 150m to the north-west of Trench 34. According to the deposit model, Trench 29 is located firmly within the main north-south palaeochannel cut into the basal gravels. The sampled section is presented in Figure 14.

3.8.2 Initial dating suggested that the sampled sequence may span at least the Early/ Middle to the Late Bronze Age and thus had the potential to provide palaeoenvironmental data contemporary with archaeological activity in the immediate vicinity (eg. Trench 9). However further AMS dating on securely stratified plant macrofossils has returned dates firmly within the Romano-British period. Futher details can be found in *Dating* below.

Sediments

3.8.3 Sediment descriptions and interpretations can be found in Table 29.

Table 29: Sediment descriptions for Monoliths <30> to <33>, Trench 29

Level (m OD)	Context	Sediment description	Interpretation
2.70 to 2.52		10YR3/ 1 very dark grey clay loam, organic, very hard and dried, well developed coarse granular structure. Very small to small cbm frags, sharp to clear boundary	Modern/ post-medieval soil
2.52 to 1.95		10YR4/ 2 dark greyish brown silty clay loam, distinct sharp fine/ medium mottles of 7.5YR3/ 4 dark brown (iron staining), stonefree, occasional mollusc observed (freshwater). Moderately coarse blocky structure, *c.* 0.1% fine/ v fine macropores. Basal 100mm has a quite well developed crumb structure, and mottling more prominent, *c.* 2% fine/ v fine macropores. Clear boundary	Overbank alluvium with soil development (Accretionary floodplain soil).
1.95 to 1.75		10YR5/ 2 greyish brown clay loam, quite common freshwater mollusca, stonefree, weak to moderate blocky structure, 1% fine/ very fine macropores. Possibly slightly more organic than above. Diffuse boundary.	Alluvium, either overbank or channel edge
1.75 to 0.74		10YR4/ 3 brown silty clay loam, very humic, stonefree, freshwater mollusca observed. Upper portion to 1.30m OD is mottled with 10YR3/ 2 very dark greyish brown – appears to be oxidation of the organics, some of which may be post-sampling. None or very rare macropores.1-2% $CaCO_3$ precipitate, flaky/ planar, very small (1-3mm), at x400 appears that may be reed/ grass/ sedge impressions. Sediment itself is moderately calcareous (quite vigorous fizzing with 10% HCl). Increase in very fine sand content down profile below 0.90m OD, also slight concentrations of sandier sediment at 1.33-1.35m OD and 1.46-1.47m OD.	Highly organic fine calcareous sediment with freshwater molluscs – likely channel edge

3.8.4 Definite Pleistocene gravels were not reached in Trench 29, which was excavated to a depth of *c.* 0.6m OD – however loose sandy gravel was noted to 0.8m OD in places before water ingress prevented further recording. The gravel was interpreted during evaluation as a probably Holocene active channel deposit.

3.8.5 The lowest sampled deposits were a thick (0.74-1.75m OD) layer of highly organic fine calcareous silty clay loam, with occasional inwashes of fine sand and generally increased sand content towards the base (fining upwards). It contained freshwater molluscs, reed fragments, and also tufaceous material with probable reed imprints. The layer probably represents a channel edge or backwater environment (with inputs from calcareous rich springwater as seen elsewhere) which has been progressively less influenced by channel flow through time.

3.8.6 Initial dating suggested that the upper part of this layer was dated to the Late Bronze Age, whilst a sample just below the depth of the monolith returned an Early to Middle Bronze Age date. However, two further dates on secure plant material have shown that the deposits were laid down in the Romano-British period (see dating below).

3.8.7 Above this were deposits of overbank alluvium forming an accretionary floodplain soil to 2.52m OD. At the top of the sampled sequence a post-medieval to modern soil was sealed by made ground.

Dating

3.8.8 Four radiocarbon dates have been obtained, two from bulk samples <40> and <44>, one from a bulk sediment sample <45>, and one from Monolith <32> (Table 30).

Table 30: Radiocarbon dates from Trench 29

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<40> (37)	1.75	Seeds: 2 x *Iris pseudacorus*	SUERC-26954	1720±30	-26.7	cal AD 240–400	1
<32> (36)	1.71	Sediment (acid wash)	Beta-220049	2720±40	-28.0	980–800 cal BC	3
<44> (37)	0.74	Seeds: 16 x *Ranunculus cf. repens*, 2 x *Rubus* sp.	SUERC-26953	1855±30	-26.1	cal AD 80–240	1
<45> (37)	0.70	Bulk low carbon analysis on sediment	Beta-204034+	3310±60	-29.1	1740–1450 cal BC	3

3.8.9 Initial dating, by one AMS (Beta-220049) and one radiometric date (Beta-204034), suggested that the sampled sequence may have spanned at least the Early/ Middle to the Late Bronze Age. However, further AMS dating on securely stratified plant macrofossils has returned dates firmly within the Romano-British period.

3.8.10 Given the calcareous nature of the deposits and the type of sample used for dating (bulk sediments), it is very probable that the Bronze Age dates are artificially old and are due to the inclusion of old carbon in the samples, in addition to reworded sediment. This is especially likely given the presence of *Chara*, which, along with other species of sub-aquatic plants, is known to absorb calcium bicarbonate (originating from the calcareous geology) in order to extract the carbon dioxide it needs, and in turn precipitate calcium carbonate (Pitty 1971).

3.8.11 For these reasons the Bronze Age dates have been dismissed.

Plant macrofossils

3.8.12 Ten samples were examined in detail from Trench 29, and the results are shown in Table 31. The samples come from the post-medieval soil at the top (context (31)) through over-bank alluvium (contexts 32-36) to organic calcareous sediments (context (37)) at the base. The samples are laid out in chronological order with the youngest to the left. The radiocarbon dates on plant macrofossils indicate that the earliest deposits at the base (37) were likely to have been laid down in the Romano-British period during the 1st to 3rd centuries AD. A further date from the top of context (37) provided a date of mid 3rd to late 4th century AD. Therefore it is probable that most of the sediments represent the immediate environment of the area during the Romano-British period.

3.8.13 As discussed in *Dating* above, two dates on bulk sediments yielded Middle to Late Bronze Age dates but have been dismissed as unreliable. The upper samples were undated, although the presence of a clay-pipe in context (33) indicates a likely post-medieval date while at least the uppermost two samples are likely to be of post-medieval date, and probably a 19th/ 20th century date.

3.8.14 The lowest and earliest samples from context (37) were relatively rich in waterlogged plant remains. The samples from the contexts above in the alluvium (contexts (34), (35) and (36)) had little to no material in them and that from (35) had no waterlogged material and for this reason is not included in the table. The absence of waterlogged material indicates that it is probable that these alluvial sediments had dried out prior to the late 19th century, those from the uppermost two samples had some material and the survival of this material may in part be due to the sealing of the deposits by the more recent overburden.

3.8.15 The Romano-British samples from context (37) were generally relatively similar in composition. That the range of taxa and quantity of waterlogged material increases towards the base of the trench probably indicates the effects of drying out and aeration within the overlying sediments, at a much later date.

3.8.16 The most common elements were those of rough, poorly managed, pastures including buttercups (probably both creeping buttercup (*Ranunculus repens*) and bulbous buttercup (*R. bulbosus*)) and docks (including clustered dock (*Rumex conglomeratus*) and broad-leaved dock (*Rumex obtusifolius*)), as well as seeds of thistle (*Cirsium/ Carduus*), prickly sow-thistle (*Sonchus asper*) and hawkbit (*Leontodon* sp.). Also indicative of rough pasture, probably nitrogen enriched by animal grazing, were large numbers of seeds of nettle. Indicative of disturbed ground were seeds of knotgrass (*Polygonum aviculare*) fumitory (*Fumaria* sp.), goosefoot (*Chenopodium* sp.), orache (*Atriplex* sp.) stitchwort (*Stellaria* cf. *media*) and mouse-ears (*Cerastium* sp.).

3.8.17 More classic indicators of generally wet grassland were seeds of common meadow rue (*Thalictrum flavum*), ragged robin (*Lynchis flos-cuculi*) silverweed/ cinquefoil (*Potentilla* sp.) and winter-cress (*Barbarea vulgaris*). Also within grassy marshes and wet-grassland are found moor grass (*Molina caerulea*), marsh-marigold (*Caltha palustris*), yellow iris (*Iris pseudacorus*) and hemp-agrimony (*Agrimonia eupatoria*) although all may also be in slightly more shaded conditions. Meadowsweet is also common in grasslands although tends to be in slightly drier conditions and was slightly better represented in the uppermost sample from context (37).

3.8.18 Celery-leaved buttercup (*Ranunculus sceleratus*), greater spearwort (*Ranunculus lingua*), water-pepper (*Persicaria hydropiper*) and small water-pepper (*Persicaria minor*) would have grown on the along the riverside and within the shallow water at the rivers edge. Similarly gypsywort (*Lycopus europaeus*), water-droplets (*Oenanthe* sp.) hemlock (*Conium maculatum*) and mint (*Mentha* sp.) are found in marshy fen grassland and wetlands often close to the waters edge. Seeds of sedges, rushed and reeds were particularly common in all of the samples and included those of branched bur-reed (*Sparganium erectum*) and club-rushes (*Schoenoplectus* sp.), sedges (*Carex* sp.) and rushes (*Juncus* sp.).

3.8.19 The riverine environment itself was reflected in the presence of gametes of stonewort (*Chara* sp.) that are indicative of slow, or still, shallows of often calcareous enriched water, as well as water-buttercup (*Ranunculus* subg. *Batrachium*) that may have gown on the river-edge, but equally can form patches of dense vegetation within slower flowing rivers. Similarly narrow-fruited watercress (*Rorippa nasturtium-aquaticum*) may be found within the shallows or in periodically dried out parts of the floodplain. More indicative of the vegetated nature of the channel were seeds of horned-pondweed (*Zannichellia palustris*), pondweed (*Potamogeton* sp.), water-plantain (*Alisma plantago-aquatica*) and arrowhead (*Sagittifolia sagittifolia*).

3.8.20 A few catkin fragments and fruits of alder (*Alnus glutinosa*) in the base of the deposit point to probably occasional alder trees or small stands within the general vicinity of the area rather than any extensive carr woodland. It is probable that occasional trees of hazel and willow may also have been present, and this picture is generally similar to that seen for the pollen. Seeds of elder (*Sambucus nigra*) also point to the presence of at least low growing shrub in the area and possibly hedges. Similarly the presence of three-nerved sandwort (*Moehringia trinervia*) might also be related to more shaded environments and might rather point to the presence of small stands of such trees. Other species more common in overgrown shrubland were those of bramble (*Rubus* sp.) and rose (*Rosa* sp.).

3.8.21 Differences between the basal samples and the upper samples in context (37) were only slight. Most notably alder was absent in the upper two samples from this context as were in general other indicators of wood and shrubland.

3.8.22 The samples from contexts (34) and (36), as stated above, were relatively devoid of waterlogged material. Those seeds present comprised only those from wetland species, for example, rush and sedge. The uppermost samples had, as well as rough grassland, pasture elements, such as *Ranunculus* sp., and rough ground such as orache and stitchwort. The presence of seeds of bittersweet (*Solanum dulcamara*) might point to some hedges in the locale at this time. These seeds probably reflect the late 19th century environment prior to the laying down of the made-up ground and the industrialisation of the area. There is also some indication of flooding and wetland through the presence of stonewort gametes and a few seeds of sedge.

Table 31: Waterlogged plant macrofossils from Trench 29

Sample		<34>	<35>	<37>	<39>	<40>	<41>	<42>	<43>	<44>
Context		(31)	(32)	(34)	(36)	(37)	(37)	(37)	(37)	(37)
Depth top (m OD)		2.65	2.60	2.25	1.95	1.70	1.55	1.35	1.15	0.95
Depth bottom (m OD)		2.60	2.45	2.15	1.70	1.55	1.35	1.15	0.95	0.80
Sediment Type		mod-post-med soil	alluvium with soil	alluvium with soil	Alluvium	organic cal sediment	organic cal sediment	organic cal sediment	organic cal sediment	organic cal sediment
Sample Size (litres)		10-20	10-20	10-20	10-20	10-20	10-20	10-20	10-20	10-20
Period / Date		Post-medieval	Post-medieval	-	few remains	AD 240-400	RB	RB	-	AD 80-240
Chara (gametes)	stonewort	-	+	-	-	-	-	+	-	++
Bryophyta (leaf stem)	mosses	-	-	-	-	-	-	+	2	28
Pteridium/ Polypodium type pinnule	bracken/ polypody	-	-	-	-	-	cf.1	-	1	-
Caltha palustris	marsh-marigold	-	-	-	-	-	-	1	1	1
Ranunculus subg. *Ranunculus* (arb)	buttercup	16	1	-	-	1	19	1	49	5/36/0
Ranunculus sardous	hairy buttercup	-	-	-	-	1	-	-	-	-
Ranunculus sceleratus	celery-leaved buttercup	-	-	-	-	-	-	+	1	-
Ranunculus lingua	greater spearwort	-	-	-	-	-	-	+?	5	cf.3
Ranunculus subg. *Batrachium*	water-crowfoots	1	+	-	-	-	7	-	33	43
Thalictrum minus	lesser meadow-rue	-	-	-	-	-	-	-	2	-
Thalictrum flavum	common meadow-rue	-	-	-	-	-	2	+	7	1
Fumaria sp.	fumitory	-	-	-	-	-	-	-	-	1
Ficus carica	fig	1	-	-	-	-	-	-	-	-
Urtica dioica	common nettle	-	-	-	-	8	++	++	4	60+
Alnus glutinosa (fruits)	alder fruits	-	-	-	-	-	-	3	9	4
Alnus glutinosa (male catkins)	alder male catkins	-	-	-	-	-	-	1+f	3	3
Alnus glutinosa (female catkins/cones)	alder male catkins	-	-	-	-	-	-	-	5	-
Corylus avellana	hazel	-	-	-	-	-	-	-	2	-
Chenopodium rubrum	red goosefoot	-	-	-	-	-	-	-	-	4
Chenopodium murale	nettle-leaved goosefoot	-	-	-	-	-	-	-	-	1
Chenopodium ficifolium	fig-leaved goosefoot	-	-	-	-	-	1	-	-	2

Sample		<34>	<35>	<37>	<39>	<40>	<41>	<42>	<43>	<44>
Context		(31)	(32)	(34)	(36)	(37)	(37)	(37)	(37)	(37)
Depth top (m OD)		2.65	2.60	2.25	1.95	1.70	1.55	1.35	1.15	0.95
Depth bottom (m OD)		2.60	2.45	2.15	1.70	1.55	1.35	1.15	0.95	0.80
Sediment Type		mod-post-med soil	alluvium with soil	alluvium with soil	Alluvium	organic cal sediment	organic cal sediment	organic cal sediment	organic cal sediment	organic cal sediment
Sample Size (litres)		10-20	10-20	10-20	10-20	10-20	10-20	10-20	10-20	10-20
Period / Date		Post-medieval	Post-medieval	-	few remains	AD 240-400	RB	RB	-	AD 80-240
Chenopodium album	fathen	-	-	-	-	-	1	1	-	6
Atriplex sp.	orache	2	-	-	-	-	-	+	5	5
Moehringia trinervia	three-nerved sandwort	-	-	-	-	-	-	-	-	2
Stellaria sp.	stitchwort	3	-	-	-	1	-	+	4	5
Cerastium sp.	mouse-ears	-	-	-	-	-	-	-	-	2
Lynchis flos-cuculi	ragged robin	-	-	-	-	-	-	-	1	-
Persicaria maculosa/ lapathifolium	redshank/ pale persicaria	-	-	-	-	-	-	-	11	1
Persicaria hydropiper	water-pepper	-	-	-	-	-	-	-	3	1
Persicaria minor	small water-pepper	-	-	-	-	-	cf.1	cf.1	cf.2	1
Polygonum aviculare	knotgrass	-	-	-	-	-	4	1	20	11
Rumex sp.	dock	-	-	-	-	3	14	+	31	27
Rumex acetosella group	sheep's sorrel	-	-	-	-	-	-	1	2	-
Rumex hydrolapathum	water dock	-	-	-	-	-	3	-	-	-
Rumex crispus	curled-leaved dock	-	-	-	-	-	-	-	cf.12	-
Rumex conglomeratus (whole fruit)	clustered dock	-	-	-	-	-	38	+	13	14
Rumex obtusifolius	broad-leaved dock	-	-	-	-	-	cf.1	-	-	-
Rumex maritimus (whole fruit)	golden dock	-	-	-	-	?1	-	-	-	-
Elantine hexandra/ *Hypericum* sp.	waterwort/ St. John's wort	-	-	-	-	-	-	-	-	1
Salix catkin bud scale	willow bud scale	-	-	-	-	-	1	2	18	11
Barbarea vulgaris	winter-cress	-	-	-	-	-	-	+	10	4
Rorippa cf. *nasturtium-aquaticum*	narrow-fruited watercress	-	-	-	-	-	-	+	1	17
Filipendula ulmaria	meadowsweet	-	-	-	-	-	22	+	2	6

Sample		<34>	<35>	<37>	<39>	<40>	<41>	<42>	<43>	<44>
Context		(31)	(32)	(34)	(36)	(37)	(37)	(37)	(37)	(37)
Depth top (m OD)		2.65	2.60	2.25	1.95	1.70	1.55	1.35	1.15	0.95
Depth bottom (m OD)		2.60	2.45	2.15	1.70	1.55	1.35	1.15	0.95	0.80
Sediment Type		mod-post-med soil	alluvium with soil	alluvium with soil	Alluvium	organic cal sediment	organic cal sediment	organic cal sediment	organic cal sediment	organic cal sediment
Sample Size (litres)		10-20	10-20	10-20	10-20	10-20	10-20	10-20	10-20	10-20
Period / Date		Post-medieval	Post-medieval	-	few remains	AD 240-400	RB	RB	-	AD 80-240
Rubus sp.	bramble	-	-	-	-	-	-	+	2	4
Potentilla anserina	silverweed	-	-	-	-	2	cf.2	-	2	2
Potentilla erecta/ reptans	tormentil/ creeping cinquefoil	-	-	-	-	-	-	1	10	-
Potentilla erecta/ sterilis	Tormentil/ barren strawberry	-	-	-	-	-	-	-	-	16
Potentilla/ Fragaria sp.	cinquefoil/ strawberry	-	-	-	-	-	-	+	-	1
Agrimonia eupatoria/procera	Agrimony	-	-	-	-	-	-	-	-	3
Rosa sp.	rose	-	-	-	-	-	-	1	-	-
Myriophyllum sp.	water-milfoil	-	-	-	-	-	-	-	-	1
Epilobium sp.	willowherb	-	-	-	-	-	-	-	-	1
Linum catharticum	fairy flax	-	-	-	-	-	-	-	cf.1ch	2
Berula erecta	lesser water-parsnip	-	-	-	-	-	-	-	cf.2	cf.1
Oenanthe sp.	water-droplets	-	-	-	-	-	3	-	6	2
Oenanthe fistulosa	tubular water-droplet	-	-	-	-	-	2	+	2	cf.1
Conium maculatum	hemlock	-	-	-	-	-	-	-	3	-
Apium sp.	celery/ water-cress	-	-	-	-	-	-	-	4	3
Solanum sp.	nightshade	-	-	-	-	-	-	1	1	1
Solanum dulcamara	bittersweet	-	+	-	-	-	-	-	1	-
Menyanthes trifoliata	bogbean	-	-	-	-	-	-	cf.1f	-	1
Pulmonaria cf. *officinalis*	lungwort	-	-	-	-	-	cf.1	-	-	-
Myosotis sp.	Forget-me-nots	-	-	-	-	-	-	-	-	1
Stachys cf. *sylvatica*	hedge woundwort	-	-	-	-	-	cf.1	-	1	1
Ballota nigra	black horehound	-	-	-	-	1	-	-	-	-

Sample		<34>	<35>	<37>	<39>	<40>	<41>	<42>	<43>	<44>
Context		**(31)**	**(32)**	**(34)**	**(36)**	**(37)**	**(37)**	**(37)**	**(37)**	**(37)**
Depth top (m OD)		**2.65**	**2.60**	**2.25**	**1.95**	**1.70**	**1.55**	**1.35**	**1.15**	**0.95**
Depth bottom (m OD)		**2.60**	**2.45**	**2.15**	**1.70**	**1.55**	**1.35**	**1.15**	**0.95**	**0.80**
Sediment Type		**mod-post-med soil**	**alluvium with soil**	**alluvium with soil**	**Alluvium**	**organic cal sediment**	**organic cal sediment**	**organic cal sediment**	**organic cal sediment**	**organic cal sediment**
Sample Size (litres)		**10-20**	**10-20**	**10-20**	**10-20**	**10-20**	**10-20**	**10-20**	**10-20**	**10-20**
Period / Date		**Post-medieval**	**Post-medieval**	**-**	**few remains**	**AD 240-400**	**RB**	**RB**	**-**	**AD 80-240**
Lamium sp.	dead-nettle	-	-	-	-	-	-	1	1	-
Galeopsis cf. *augustifolia*	hedge woundwort	-	-	-	-	-	-	-	2	-
Prunella vulgaris	selfheal	-	-	-	-	-	2	1	-	3
Clinopodium acinos	basil thyme	-	-	-	-	-	-	cf.+	-	1
Lycopus europaeus	gypsywort	-	-	-	-	7	2	+	2	11
Mentha sp.	mint	-	-	-	-	8	4	+	1	++
Hippuris vulgaris	mare's-tail	-	-	-	-	-	-	1	-	-
Callitriche stagnalis	Common water-starwort	-	-	-	-	-	-	1	-	1
Plantago major	greater plantain	-	-	-	-	-	-	-	-	1
Galium palustre	marsh bedstraw	-	-	-	-	-	-	+	-	2ch
Sambucus nigra	elder	-	-	-	-	-	3	+	5	2
Valeriana offcinalis	common valerian	-	-	-	-	-	1	-	-	1
Dipsacus cf. *fullonum*	wild teasel	-	-	-	-	-	-	1	-	-
Carduus/ Cirsium sp.	thistle	-	-	-	-	1	-	+	3	9
Hypochaeris glabra/ Leotodon sp.	cat's-ears/ hawkbit	-	-	-	-	-	cf.1	-	-	-
Lapsana communis	nipplewort	-	-	-	-	-	-	-	-	1
Leontodon hispidus/ autumnalis	rough/ autumn hawkbit	-	-	-	-	-	1	+	3	2
Leotodon saxatilis	lesser hawkbit	-	-	-	-	-	-	-	-	1
Sonchus arvensis type	milk sow thistle	-	-	-	-	-	-	+	1	-
Sonchus asper type	prickly sow-thistle	-	-	-	-	-	-	+	6	12
Asteraceae: Taraxacum type	dandelion	-	-	-	-	-	-	+	-	-
Achillea sp.	yarrow	-	-	-	-	-	-	-	2	-

Sample		**<34>**	**<35>**	**<37>**	**<39>**	**<40>**	**<41>**	**<42>**	**<43>**	**<44>**
Context		**(31)**	**(32)**	**(34)**	**(36)**	**(37)**	**(37)**	**(37)**	**(37)**	**(37)**
Depth top (m OD)		**2.65**	**2.60**	**2.25**	**1.95**	**1.70**	**1.55**	**1.35**	**1.15**	**0.95**
Depth bottom (m OD)		**2.60**	**2.45**	**2.15**	**1.70**	**1.55**	**1.35**	**1.15**	**0.95**	**0.80**
Sediment Type		**mod-post-med soil**	**alluvium with soil**	**alluvium with soil**	**Alluvium**	**organic cal sediment**	**organic cal sediment**	**organic cal sediment**	**organic cal sediment**	**organic cal sediment**
Sample Size (litres)		**10-20**	**10-20**	**10-20**	**10-20**	**10-20**	**10-20**	**10-20**	**10-20**	**10-20**
Period / Date		**Post-medieval**	**Post-medieval**	**-**	**few remains**	**AD 240-400**	**RB**	**RB**	**-**	**AD 80-240**
Leucanthemum sp.	ox-eye daisy	-	-	-	-	-	-	-	1	-
Eupatorium cannabinum.	hemp-agrimony	-	-	-	-	1	-	1	1	2
Sagittifolia sagittifolia (whole fruit)	arrowhead	-	-	-	-	-	3	+	6	5
Sagittifolia sagittifolia (inner)	arrowhead	-	-	-	-	-	4	-	11	7
Baldellia ranunculoides	lesser water plantain	-	-	-	-	-	-	1	-	1
Alisma plantago-aquatica	water-plantain	-	-	-	-	1	1	-	4	6
Potamogeton sp.	pondweeds	-	-	-	-	cf.1?	-	+	11	15
Zannichellia palustris	horned pondweed	-	-	-	-	2	2	+	14	97
Lemna sp.	duckweeds	-	-	-	-	-	-	+	-	-
Juncus sp.	rush	-	-	+	+	+	+	++	-	+++
Eleocharis sp.	spike-rush	-	-	-	-	1	1	+	4	1
Schoenoplectus sp.	club rushes	-	-	-	-	1	7	+	42	20
Carex sp. (flat)	sedge (lenticular)	-	-	-	-	-	-	2	12	4
Carex sp. (trigonous small)	sedge (trigonous)	1	1	-	-	-	4	-	2	-
Carex sp. (trigonous)	sedge (trigonous)	-	-	-	+	4	6	+	45	4
Carex nigra/ pulicaris	common/ flea sedge	-	-	-	-	-	cf.2	-	-	-
Lolium perenne spikelet	rye grass	1	-	-	-	-	-	-	-	-
Molina/ Glyceria sp.	moor grass/ sweet-grass	-	-	-	-	-	-	+	1	-
Molinia caerulea	purple moor grass	-	-	-	-	10	22	-	5	60
Phragmites australis (stems/ rhizomes?)	common reed	-	-	-	-	-	1	-	-	-
Sparganium erectum (fruit/ achene)	branched bur-reed	-	-	-	-	-	+	+	2	-
Sparganium erectum (inner seed/ embryo)	branched bur-reed	-	-	-	-	-	+	++	50+	99

Sample		**<34>**	**<35>**	**<37>**	**<39>**	**<40>**	**<41>**	**<42>**	**<43>**	**<44>**
Context		**(31)**	**(32)**	**(34)**	**(36)**	**(37)**	**(37)**	**(37)**	**(37)**	**(37)**
Depth top (m OD)		**2.65**	**2.60**	**2.25**	**1.95**	**1.70**	**1.55**	**1.35**	**1.15**	**0.95**
Depth bottom (m OD)		**2.60**	**2.45**	**2.15**	**1.70**	**1.55**	**1.35**	**1.15**	**0.95**	**0.80**
Sediment Type		**mod-post-med soil**	**alluvium with soil**	**alluvium with soil**	**Alluvium**	**organic cal sediment**	**organic cal sediment**	**organic cal sediment**	**organic cal sediment**	**organic cal sediment**
Sample Size (litres)		**10-20**	**10-20**	**10-20**	**10-20**	**10-20**	**10-20**	**10-20**	**10-20**	**10-20**
Period / Date		**Post-medieval**	**Post-medieval**	**-**	**few remains**	**AD 240-400**	**RB**	**RB**	**-**	**AD 80-240**
Iris pseudacorus	yellow iris	-	-	-	-	4	1	1	-	-
Stem indet + rootlet		1	-	-	-	-	-	-	-	-
Indet seed (nettle hex cell pattern)		-	-	-	-	-	-	2	-	-
Indet. Buds		-	-	-	-	-	-	-	8-buds	-
Indet. Catkin bud scale		-	-	-	-	-	1	-	-	-
Charcoal	charred wood indet.	-	-	-	-	+	1	+	-	+?oak
Coal		-	++	-	-	-	-	-	-	-
Worm cocoons		-	-	-	-	-	-	-	+	-

[+]C – denotes material that was preserved by charring. cf. compares with. Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more

Pollen

3.8.23 Pollen assessment was carried out on sixteen samples from four overlapping monoliths in Trench 29: Monoliths <30>, <31>, <32> and <33>. Samples from these monoliths had also been previously assessed as part of the evaluation stage (Allen and Brown 2006, in Spurr and Corcoran 2010).

3.8.24 The pollen diagram (Figure 15) has been split into three local pollen assemblage zones (LPAZ), prefixed Tr29-; see Table 32 for zone descriptions. The zone boundary coincides with the change in stratigraphy recorded at 1.75m OD from the underlying highly organic fine calcareous sediment (context (36)) to the overlying alluvium (contexts (35), (34) and (33)).

Table 32: Pollen zone descriptions for Trench 29, Monoliths <30>- <33>

Zone	Depth (m OD)	Description
Tr29-3	2.20 to 1.76	Dominated by Cyperaceae (40-63%), Poaceae (13-33%) and *Cichorium intybus*-type (5-20%). *Pinus sylvestris* (1-2%), *Quercus* (1-2%), *Alnus glutinosa* (1-4%) and *Corylus avellana*-type (1-4%) are recorded throughout the zone. Dwarf shrub/ herb taxa, although dominating the zone, are of limited diversity. Chenopodiaceae (1-3%) and Brassicaceae (1%) are present throughout the zone, with occurrences of other taxa including *Stellaria holostea* (up to 1%), *Lotus* (up to 1%), Apiaceae undiff. (up to 2%), *Plantago lanceolata* (up to 2%), *Stachys*-type (up to 2%), *Valeriana officinalis* (up to 1%), *Arctium*-type (up to 1%) and *Solidago virgaurea*-type (up to 3%). Aquatic pollen types are represented by *Potamogeton natans*-type (up to 1% TLP + aquatics), *Lemna* (up to 1% TLP + aquatics), *Sparganium emersum*-type (1-3% TLP + aquatics) and *Typha latifolia* (up to 1% TLP + aquatics). *Polypodium* (1% TLP + pteridophytes), *Pteridium aquilinum* (up to 3% TLP + pteridophytes) and Pteropsida (monolete) indet. (3-18% TLP + pteridophytes) are also recorded. Pollen concentrations vary between 12728 - 40400 grains cm^{-3}.
Tr29-2	1.76 to 1.36	Dominated by Poaceae (%) and Cyperaceae (%), with *Corylus avellana*-type (4-25%), *Plantago lanceolata* (1-5%). *Quercus* (3-5%) and *Alnus glutinosa* (1-8%) are present throughout the zone, along with *Pinus sylvestris* (2-7%), *Ulmus* (up to 1%), *Betula* (up to 1%), *Tilia cordata* (up to 1%), *Salix* (up to 2%) and *Hedera helix* (up to 2%). *Ranunculus acris*-type (1-3%), *Urtica dioica* (up to 3%), Chenopodiaceae (up to 1%), Brassicaceae (up to %), *Polygonum* (up to 1%), *Sedum* (up to 5%), *Filipendula* (up to 3%), Apiaceae undiff. (up to 2%), *Cichorium intybus*-type (1-8%), *Solidago virgaurea*-type (up to 2%) and *Arrhenatherum*-type (up to 4%). Aquatic pollen types are represented by *Potamogeton natans*-type (up to 1% TLP + aquatics), *Sparganium emersum*-type (up to 4% TLP + aquatics) and *Typha latifolia* (1-3% TLP + aquatics). A continuous presence of Pteropsida (monolete) indet. (4-9% TLP + pteridophytes) is recorded, along with *Polypodium* (up to 1% TLP + pteridophytes), *Pteridium aquilinum* (up to 2% TLP + pteridophytes) and rare occurrences of *Dryopteris filixmas*-type (up to 1% TLP + pteridophytes) spores. Pollen concentrations range between 22697 and 53460 grains cm^{-3}.
Tr29-1	1.36 to 0.76	Dominated by Poaceae (36-52%), with *Corylus avellana*-type (4-17%), *Plantago lanceolata* (2-8%) and Cyperaceae (2-16%). *Quercus* (1-9%) and *Alnus glutinosa* (1-9%) are present throughout the zone, along with *Pinus sylvestris* (1-4%) and a discontinuous presence of *Betula* (up to 3%) and *Salix* (up to 2%). Rare occurrences of *Ulmus* (up to 2%), *Fagus sylvatica* (up to 1%), Car*pinus betulus* (up to 1%), *Tilia cordata* (up to 1%) and *Sorbus*-type (up to 2%) are also recorded. *Ranunculus acris*-type (2-6%), Chenopodiaceae (up to 3%), Brassicaceae (up to 3%), *Cichorium intybus*-type (1-5%), *Solidago virgaurea*-type (1-2%), *Glyceria*-type (up to 4%) and *Arrhenatherum*-type (up to 3%) are present throughout the zone, with occurrences of *Urtica dioica* (up to up to 2%), *Filipendula* (up to 2%) and *Solanum dulcamara* (up to 1%). Aquatic pollen types are represented by *Sparganium emersum*-type (1-4% TLP + aquatics) and *Typha latifolia* (up to 2% TLP + aquatics). A continuous presence of Pteropsida (monolete) indet. (2-7% TLP + pteridophytes) is recorded, along with *Polypodium* (up to 2% TLP + pteridophytes), *Pteridium aquilinum* (up to 4% TLP + pteridophytes) and rare occurrences of *Dryopteris filix mas*-type (up to 1% TLP + pteridophytes) spores. Pollen concentrations range between 29070 and 113114 grains cm^{-3}.

3.8.25 The pollen assemblage is dominated by dwarf shrub/ herb taxa in LPAZ Tr29-1/ 2, in particular Poaceae (grasses). There is a continuous presence of tree and shrub/climber taxa, the most notable being *Corylus avellana*-type (hazel), *Quercus* (oak) and *Alnus glutinosa* (alder). Although not locally dominant, the presence of continuous arboreal pollen (up to 40% TLP) implies the presence of woodland within the local and/ or extra-local source area. These areas of woodland are likely to be small stands or isolated occurrences if located upon the floodplain, with a greater presence likely to be upon the more distant dryland itself. Occurrences of *Sorbus*-type pollen are likely to be derived from taxa such as hawthorn (*Crataegus* sp.) which may form small patches of scrub upon the floodplain, possibly associated with the *C. avellana*. The low presence of *Pinus sylvestris* (pine) is unlikely to reflect its local presence upon the floodplain as percentages below 20% TLP have been suggested by Bennett (1984) to imply that the pollen is derived from longer distance travel.

3.8.26 The local floodplain woodland is identified by the presence of *Alnus glutinosa* and occurrences of *Salix* (willow). Values are lower than would be expected if extensive *A. glutinosa* woodland (carr) was present on-site, but the pollen may imply either small stands or isolated trees locally, or alternatively denser alder woodland further away upon the floodplain, such as that found at Stratford Box (Barnett *et al*. 2011). The presence of taxa including *Ranunculus acris*-type (buttercup), *Potentilla*-type (cinquefoil), *Filipendula* (meadowsweet) and *Glyceria*-type (sweet-grasses) are likely to also be associated with the wetland vegetation. The presence of Cyperaceae (sedges) and aquatic pollen including *Sparganium emersum*-type (bur-reed) and *Typha latifolia* (bulrush) imply standing or slow moving water.

3.8.27 The occurrence of *Polygonum* (knotgrass), often implied as agricultural weeds, may indicate arable activity, though *Polygonum* is also present in natural habitats such as along river banks (Godwin 1975, 230). If arable activity was occurring, it would have been of limited extent in the local area around the sample location.

3.8.28 More important is the presence of *Plantago lanceolata* (ribwort plantain) with values up to 8% TLP. *P. lanceolata* is an indicator of trampled and disturbed ground and may therefore indicate disturbance from human and pastoral activity upon the floodplain. Other taxa commonly associated with disturbance that are present include *Pteridium aquilinum* (bracken), *Rumex acetosa* (common sorrel) and *Rumex acetosella* (sheep sorrel). Poaceae is dominant and although some will be associated with the local wetland vegetation, it is likely to also be recording its presence within the wider open floodplain environment. These open areas would have been suitable for grazing, with the presence of grassland also indicated by taxa including *Sanguisorba minor* ssp. *minor* (burnett) and *Silene vulgaris*-type (bladder campion). Taxa including Chenopodiaceae (goosefoots and oraches), *Urtica dioica* (common nettle) Brassicaceae (cabbage and mustard family), *Arctium*-type (burdock), *Cichorium intybus*-type (dandelion/ chicory) and *Solidago virgaurea*-type (daises/ goldenrods) may indicate areas of waste or disturbed ground.

3.8.29 The change in stratigraphy at 1.75m OD to alluvium deposition coincides with a change in the pollen assemblage (LPAZ Tr292/ 3 boundary). The sedimentary boundary is recorded as being diffuse, with a gradual rise in Cyperaceae recorded across this boundary.

3.8.30 The high presence of *Cichorium intybus*-type may indicate waste or disturbed ground, yet this pollen type is also abundant in pollen assemblages where differential preservation has occurred due to poor preservation conditions existing. This is due to the pollen type being more resistant to corrosion than other pollen types and is easily identifiable due to distinctive pollen ornamentation (echinate (spiky) surface sculpturing). It can therefore be preserved and identifiable even when other pollen types have deteriorated beyond identification (see Havinga 1964; 1984). *Cichorium intybus*-type values increase upwards in the sediment column, with context (33) and (34) containing distinct sharp fine/ medium mottles indicating fluctuating water levels which would lead to the aeration of the soil and deterioration of the pollen.

3.8.31 Other herb taxa present include Brassicaceae (cabbage and mustard family) and Chenopodiaceae which, although possibly indicative of waste or disturbed ground and present throughout the sequence, are also taxa more resistant to corrosion and easier to identify under poor preservation conditions. The reduction in pollen concentrations and reduced pollen taxa diversity of these samples in LPAZ Tr29-3 compared to those from LPAZ Tr29-1/ 2 suggests a change in pollen preservation may be having a strong influence upon the pollen assemblage. *Alnus glutinosa* continues to be present, albeit at lower values, along with *Corylus avellana*-type and

Quercus. These reductions alone may be taken to indicate woodland clearance, yet they are more likely to be the result of a change in the pollen rain (dominated by local taxa), increased site wetness, and possible lateral expansion in the floodplain, resulting in the dryland edge being further from sample site (resulting in the processes of paludification and reciprocal processes affecting the pollen assemblage ratios).

3.8.32 The interpretation previously forwarded by Allen and Brown (2006) of an “oak/ pine dominated mixed woodland” is not supported by this assessment. *Pinus sylvestris* values are regarded as being too low to indicate a local presence (below 20% TLP). The single high occurrence of *P. sylvestris* recorded by Allen and Brown (2006) is similar to that found by Scaife (Scaife in Halsey and Hawkins 2007) at Trench 24. In both instances this appears to be an arbitary sample, possibly the result of sediment reworking, rather than actually reflecting abundance in the contemporary vegetation. The presence of *Quercus* and *Corylus avellana*-type is suggested (for LPAZ Tr29-1/2) as either reflecting the dryland vegetation and/or small local stands upon drier areas of the floodplain itself. *Alnus glutinosa* is found to have a strong consistent presence throughout the sequence (previously only recorded periodically) but it likely to be derived from isolated local stands or else more extensive alder carr woodland elsewhere in the floodplain.

3.8.33 Disturbance, implied to be related to pastoral activity, is found to have a very strong representation within the pollen diagram. This is a different conclusion to that by Allen and Brown (2006) that the frequency of pollen types recorded which can be associated with anthropogenic activity was low and therefore reflecting possible natural disturbance of the landscape. The original suggestion of mixed woodland with areas of open ground, with periods of damp or wet conditions at the site is in need of modification. Instead it is suggested that the pollen records a largely open floodplain environment with patches of woodland found in drier areas upon it, with woodland being more extensive upon the fringing dryland. The site remained wet throughout the sequence with the local presence of sedge-reed-fen vegetation, and alder and willow-carr woodland elsewhere upon the floodplain.

3.8.34 The change in the nature of sediments deposited resulted in a change in the pollen assemblage with local wetland becoming more important and wetland expansion leading to a reduced representation of the dryland vegetation (paludification). In addition, poor pollen preserving conditions has led to some pollen types being over-represented and a general reduction in pollen diversity, so the interpretation of LPAZ Tr29-3 must be considered with caution.

3.8.35 Within LPAZ Tr29-1/ 2 a number of different vegetation types are represented and provide a valuable insight into the wetland and dryland vegetation during the Romano-British period. A strong signal relating to anthropogenic activity is suggested from this sequence.

Diatoms

3.8.36 Eight slides were prepared for diatom analysis from Trench 29. Of these, six slides were suitable for diatom counting and diatom percentage counts have been made. The top two samples from 1.72m OD and 1.88m OD were not suitable for diatom counting (Table 33) but poorly-preserved diatom assemblages were recorded (Table 34).

3.8.37 The diatom assemblages from 1.72 and 1.88m OD are of freshwater non-planktonic species with aerophiles (*Navicula mutica, Ellerbeckia arenaria*) also present. The most common freshwater attached diatom present at 1.72m OD is *Gomphonema* *angustatum* var. *productum*. Other freshwater non-plankton present in the two samples includes *Cocconeis placentula, Fragilaria pinnata* and *Synedra ulna*.

3.8.38 The diatom sequence counted from Trench 29 (as are the upper two samples) are from one sediment unit and lie between 0.76 to 1.56m OD. This sediment unit, spanning a large part of the Bronze Age, is described as highly organic, fine calcareous sediment with freshwater molluscs and reed fragments. It is likely to have been deposited at a channel edge or is a backwater deposit.

3.8.39 The diatom assemblages in the sequence are consistent in showing freshwater non-planktonic diatoms that are derived from shallow water attached and benthic habitats. Open water planktonic diatoms such as *Cyclotella kuetzingiana* and the halophile *Cyclotella meneghiniana* are uncommon. Diatoms associated particularly with flowing water such as *Melosira varians* and *Meridion circulare* also represent a small part of the diatom assemblages. Estuarine diatoms are absent.

3.8.40 The most common taxon here is the epiphyte *Cocconeis placentula* (maximum of over 25%) along with a range of other attached taxa such as *Achnanthes lanceolata, Cymbella affinis, Cymbella minuta, Fragilaria brevistriata, Fragilaria construens* var. *venter, Fragilaria pinnata* (maximum of almost 20% of the total diatoms), *Fragilaria vaucheriae* and *Gomphonema intricatum*. The attached species *Achananthes minutissima* reaches over 25% of the total diatoms at 0.92m OD, however, in general the diatom composition is stable and there are no indications of significant changes in diatom habitats or water quality. Diatoms, for example *Navicula tripunctata*, that are associated particularly with the benthic, mud-surface habitat are present, but they are less common than diatoms that are attached to submerged surfaces.

3.8.41 Halophilous diatoms such as *Gomphonema olivaceum* and *Rhoicosphaenia curvata* are present, and the mesohalobous diatom *Anomoeoneis sphaerophora* was recorded at 1.56m OD. However, none of these halophiles are found exclusively in estuarine waters and their presence reflects only slightly elevated salinity. The diatom assemblages in the Trench 29 sequence do not indicate anything more than moderate nutrient levels and diatoms derived from aerial habitats, for example as a result of soil erosion or drying out of sediments, are rare.

Table 33: Diatom evaluation results for the top two samples from Trench 29

Sam. No.	Depth (m OD)	Diatoms	Diatom numbers	Quality of preservation	Diversity	Assemblage type	Potential for % count
<17>	1.72	present	very low	very poor	low	fw non-pk aero	none/low
<18>	1.88	present	very low	very poor	very low	fw non-pk aero	none/low

(fw – freshwater, aero – aerophilous, non-planktonic – non-pk)

Ostracods and Foraminifera

3.8.42 Five samples taken from monoliths <30>, <31> and <32> have been assessed and analysed for the presence, preservation and environmental significance of their ostracod content. The full results detailing the ostracod content of the five samples is given in Table 35. Ostracods were recovered from the samples at 0.80, 1.05 and 1.37m OD but not from the samples at 1.82 and 2.12m OD.

3.8.43 The numbers of ostracods recovered from the sample at 0.8m OD are sufficient to allow some comment to be made upon the depositional environment. The dominant ostracod in this sample was *Ilyocypris monstrifica*. This ostracod prefers stagnant and slow flowing muddy bottomed waters. It has been recorded in fish ponds, the littoral zone of lakes and slow flowing brooks, rivers and canals. *Darwinula* *stevensoni* occurred in low numbers and, although a cosmopolitan taxa which can tolerate increases in salinity up to 15‰, is generally found in “non-marine” environments and prefers ponds, lakes and slow streams and has been recorded in water depths up to 12m. *Candona candida* also occurred in low numbers. This ostracod is known to inhabit a wide range of environments including springs, brooks, wells, ponds and ditches. They are known from the littoral and profundal zones and are also known to be tolerant of slightly brackish waters (Meisch 2000). Both *Candona candida* and *Darwinula stevensoni* were recovered as stray adult valves and were probably washed in to the sediment. The occurence of the mollusc *Pisidium* in this sample confirms the interpretation of a freshwater environment, with the ostracods indicating a slow flowing or still and possibly stagnant freshwaterbody.

Table 34: Diatom species assessment for the top two samples from Trench 29

Sample	**<17>**	**<18>**
Depth (m OD)	**1.72**	**1.88**
Salinity Group/Taxon		
Halophilous		
Navicula mutica	+	
Oligohalobous Indifferent		
Cocconeis placentula		+
Ellerbeckia arenaria	+	+
Fragilaria pinnata	+	
Gomphonema angustatum var. *productum*	++	
Synedra ulna	+	
Unknown Salinity Preference		
Gyrosigma sp.	+	+
Navicula sp.		+
Synedra sp.		+
Unknown Naviculaceae	+	

+ diatom present; ++ diatom more common

3.8.44 At 1.05m OD a few stray ostracod valves were recovered including *Herpetocypris intermedia* and species of the genera *Ilyocypris* and *Potamocypris*. *Herpetocypris intermedia* prefers permanent waterbodies, usually rich in vegetation and with a muddy bottom such as (fish) ponds, ditches, slow streams and rivers (Meisch 2000). The occurence of *Bithynia* opercula in this sample confirms the interpretation of a freshwater environment. Both the osracods and the opercula are transported elements probably of a freshwater brook/ stream.

3.8.45 Foraminifera were recovered from the samples at 0.80 and 1.05m OD and are reworked fossils. Warren *et al*. (1934) recovered foraminifera from Holocene deposits in the Lea Valley (from the “marsh clay above the peat” at Broxbourne) conluded that the foraminifera were reworked fossil forms.

3.8.46 The sample at 1.37m OD contained a singular occurrence of the ostracod *Darwinula stevensoni* and, together with other transported elements including *Bithynia* opercula and plant remains, is indicative of deposition in a freshwater stream.

3.8.47 No ostracods were recovered from the samples at 1.82 and 2.12m OD. The sample at 1.82m OD contained broken molluscs and is indicative of deposition in a slightly higher energy environment. Charcoal indicatinig possible human activity was also noted in this sample. At 2.12m OD molluscs were abundant with *Bithynia*, *Lymnaea*, Planorbids and a slug plate indicative of shallow freshwater evironments.

Table 35: Microfaunal content of ostracod/ foraminifera samples from Trench 29

Sample/monolith number	**<30>**	**<30>**	**<31>**	**<32>**	**<32>**
Depth (m OD)	**0.80**	**1.05**	**1.37**	**1.82**	**2.12**
Ostracods					
Candona candida	x				
Darwinula stevensoni	x		x		
Herpetocypris intermedia		x			
Ilyocypris sp.		x			
Ilyocypris monstrifica	x				
Potamocypris	x	x			
Foraminifera					
Rotaliid	x	x			
Globorotalia truncatulinoides	x	x			
Animal remains					
Molluscs				x	x
Bithynia opercula		x	x		
Bithynia apices					x
Lymnaea					x
Pisidium	x	x			
Planorbid					xx
Slug plate					x
Plant remains					
Radiate diatoms	xx	xx			
Sponge spicules	xx	xxx			
Plant stems/ remains			x		x
Charcoal				x	x
Coal	x				

x = 1 to 9 specimens; xx = 10 to 50 specimens; xxx = over 50 specimens

3.9 Trench 33 (PDZ1 Site 25 Trench 8)

Introduction

3.9.1 This sequence is located just to the west (channel-wards) of Trench 34, apparently mapped within the north-south channel on the deposit model. Results indicate calcareous humic deposits building up between sand bars. The base of the sequence is dated to the Late Neolithic. The sampled section is presented in Figure 14.

Sediments

3.9.2 Sediment descriptions and interpretations can be found in Table 36. Of note in this sequence is that all deposits, except the overbank alluvium/accretionary soil (probably Anglo-Saxon or later), are moderately to very calcareous.

Table 36: Sediment descriptions for Monoliths <25> to <28>, Trench 33

Level (m OD)	Context	Sediment description	Interpretation
2.74 to 2.12	76 77	Dark greyish brown clay, common faint to distinct clear strong brown mottles of strong brown iron staining. Occasional freshwater molluscs (inc. Planorbidae). Non-calcareous (no reaction with 10% HCl). Clear boundary. (NB upper section of mono <27> wasbroken up and unsampleable)	Overbank alluvium/ accretionary soil
2.12 to 1.87	78 79	10YR3/ 1 very dark grey clay loam, massive, occasional mollusca. GAP	Humic clay loam – likely marsh-type environment
GAP		GAP	Step in section
1.80 to 1.66	79	10YR4/ 1 grey clay loam, humic, moist, fine fleshy rootlets, occasional freshwater mollusca, slightly calcareous (moderate reaction with 10% HCl). Some structure definitely present but hard to pin down, breaks readily into angular pieces of medium blocky size. Few (<0.5%) fine macropores. Sharp boundary. Possibly some pedogenesis but on balance is more strictly speaking a marshy/ well vegetated shallow water environment.	Humic clay loam - likely marsh-type environment
1.66 to 1.51	81	10YR2/ 1 black clay loam, organic, humified, not quite a peat proper, too mineralogenic. Most plant remains decayed but some still recognisable and horizontal, occ fine fleshy rootlets. Sharp boundary.	Humified peaty clay loam, represents a period of drying out & pause in accumulation.
1.51 to 1.13	82	10YR3/ 2 very dark greyish brown silty clay loam, moderately calcareous, mixed with slightly paler humic highly calcareous silt and very fine sand c. 50% (in discrete but mostly non-planar deposits – looks like bioturbation mixing the two deposits at a macro scale, possibly animal/ human or larger rooting). Quite common roots <5mm diameter. Concentration of *c.* 75% woody fragments (c.10-30mm) in discrete lens at 1.24-1.27m OD; looks somewhat like a strandline deposit. Sharp boundary	Shallow water, with likely channel edge strandline/ swale deposit
1.13 to 0.97	83	Very pale brown coarse sand, well sorted. Common freshwater mollusca, highly calcareous (10% HCl vigorous rection). At x100- x400 it is apparent that in with the sand are slightly larger sand-sized (1-2mm) concretions of highly calcareous light grey silt, likely tufaceous in origin and probably redeposited from upstream.	Fluvial sand, (including eroded tufaceous material). Likely sandbank/ active channel feature

3.9.3 Deposits of fluvial sand at the base of the sequence, containing redeposited tufaceous material and frequent freshwater mollusca, are the product of an active channel, and would best be interpreted as bars or sandbanks. Their surface varied between 0.80 and 1.20m OD in the trench, and where sampled it lay at 1.13m OD. This level has been dated to the Late Neolithic.

3.9.4 Above this to 1.51m OD a humic alluvial deposit was recorded (towards the base of which was a clear strandline deposit largely consisting of wood fragments). This layer originates from a well vegetated shallow water environment, and may be channel edge or possibly swale (marsh area between ridges/ sandbanks).

3.9.5 From 1.51 to 1.66m OD was a peaty clay loam, humified towards the middle and base and with structure indicative of occasional drying out and weathering. This represents a period of relative drying out and slowing of accumulation/ possible hiatus, before wetter marsh conditions were resumed and humic clay loams deposited to 1.80m OD.

3.9.6 Above this to 2.74m OD fine overbank alluvia represent a stable seasonally flooded land surface/ accretionary floodplain soil.

Dating

3.9.7 Five radiocarbon dates have been obtained, three from bulk sediment samples and two from identified plant macrofossils (Table 37).

3.9.8 As with other sequences in which dates on both bulk sediment and discrete plant ramains have been obtained, it appears that those dates obtained from bulk sediments have proved unreliable.

3.9.9 The two uppermost dates at 2.01m and 1.68m OD - both obtained from bulk sediments - are notably older than that obtained from identified plant macrofossils below them in the sequence at 1.45-1.55m OD. The sediments sampled were calcareous, and were noted to contain significant quantities of *Chara*; it can therefore be surmised with some confidence that these dates are significantly older than the true age of the deposits.

Table 37: Radiocarbon dates from Trench 33

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<28> (79)	2.01	Sediment (acid wash)	Beta-220050	2420±40	-28.2	760-390 cal BC	3
<25> (79)	1.68 to 1.66	Sediment	SUERC-31389	2745±30	-28.2	980-810 cal BC	3
<77> (81)	1.55 to 1.45	Plant material: 3 x *Alnus glutinosa* cones	SUERC-31556	2285±30	-28.5	410-210 cal BC	1
<26> (82)	1.35 to 1.37	Plant material: 21 x *Alnus glutinosa* seeds + catkin frag., 6 x *Persicaria hydropiper*	SUERC-35334	2270±30	-26.7	400-200 cal BC	1
<69> (82)	1.10	Bulk low carbon analysis on sediment	Beta-204036+	3690±60	-28.7	2280-1910 cal BC	2
<79> (83)	1.05 to 0.95	Plant material: 2 x *Alnus glutinosa* cones	SUERC-31388	6240±30	-26.2	5310-5070 cal BC	1

3.9.10 Less obviously, as it falls in chronological order, the Early Bronze Age date on bulk sediments at 1.10m OD (Beta-204036) is also likely to be erroneous. It is not possible to be certain whether the date is too old (due to the hard water effect or incorporation of reworked sediments) or too young (due to the inclusion of root material); however the plant macrofossil results (below) suggest that from comparisions between other assemblages in the area that a Middle Iron Age date would be probable for material from that level, similar to that from 1.45-1.55m OD (SUERC-31556).

Plant Macrofossils

3.9.11 A total of nine samples were examined in detail from Trench 33. The samples are laid out in chronological order in Table 38 and Table 39 with the youngest to the left.

3.9.12 The uppermost samples from 2.20 to 2.75m OD, probably dating from the later Iron Age to potentially the Romano-British/ Anglo-Saxon periods, contained little waterlogged material. The remains probably indicate a marshy grassland, indicated by seeds of buttercup (*Ranunculus* sp.) along with those of celery-leaved buttercup (*Ranunculus sceleratus*), and fool's watercress (*Apium nodiflorum*). There were also a few seeds of elder (*Sambucus nigra*) perhaps associated with overgrown scrubland or hedging.

3.9.13 The samples dating probably to the later Iron Age/ early Romano-British period were much richer in remains and reflected a relatively open environment. The most common remains were seeds of common nettle (*Urtica dioica*), in the Late Bronze Age samples, indicative of disturbed areas probably within wet poor pastureland/marshy grassland. Such an environment is also indicated by seeds of buttercup (*Ranunculus* sp.) and common meadow-rue (*Thalictrum flavum*).

3.9.14 Along with seeds of nettle, those of orache (*Atriplex* sp.), blinks (*Montia fontana* subsp. *chondrosperma*), stitchwort (*Stellaria* sp.), knotweed (*Polygonum aviculare*), dock (*Rumex* sp.), thistles (*Carduus/ Cirsium* sp.) and fumitory (*Fumaria* sp.) all indicate quite high amounts of disturbance possibly associated with pasture and animals, but potentially also with arable. Seeds of mint (*Mentha* sp.), rushes (*Juncus* sp.) and sedges (*Carex* spp.) were also very common and again are indicative of wet, marshy grassland and/ or possibly disturbed soils. Seeds of celery-leaved buttercup (*Ranunculus sceleratus*) and fool's watercress (*Apium nodiflorum*) can also be taken to indicate wet disturbed soils close to the channel edge.

3.9.15 It might be noted that other sites of Middle and Later Bronze Age date indicate that fields and arding within this period could extend into areas of flooding and alluviation (cf. Sidell 2000, 64-65; Bates and Minkin 1999). However, as seen below, the pre-agricultural Late Mesolithic deposits often contained relatively high numbers of seeds of such species and therefore might indicate that such environments were common in this locale, perhaps associated with periodic flooding and shifting channels.

3.9.16 Seeds of aquatics were also present, but less common than those of general channel edge and wetlands, these included seeds of water-crowfoot (*Ranunculus* subg. *Batrachium*), branched bur-reed (*Sparganium erectum*), water-plantain (*Alisma plantago-aquatica*) and gametes of stonewort (*Chara* sp.).

3.9.17 Seeds of bramble (*Rubus* sp.), elder (*Sambucus nigra*), bittersweet (*Solanum dulcamara*) and fragments of sloe (*Prunus spinosa*) and alder (*Alnus glutinosa*) catkins might all be associated with areas of overgrown scrub or possible hedgerows. However, it might be noted that all these elements were in the minority.

3.9.18 The samples from below this level dated from the Late Mesolithic to the Middle Iron Age differed mainly in the high presence of fruits, catkin fragments and cones (female catkins) of alder (*Alnus glutinosa*), along with probable leaf fragments and possible nodules from roots. These were particularly noticeable in the Early Bronze Age and Middle Iron Age contexts, but less represented in the Mesolithic context. However, many of the species noted above were also common in these Mesolithic to Middle Iron Age samples. Seeds of nettle were very common, and along with those of red goosefoot (*Chenopodium rubrum*), many-seeded goosefoot (*Chenopodium polyspermum*), fig-leaved goosefoot (*Chenopodium ficifolium*), fat-hen (*Chenopodium album*), orache (*Atriplex* sp.), stitchwort (*Stellaria media*) and redshank/ pale persicaria (*Persicaria maculosa/ lapathifolium*), blinks (*Montia fontana* subsp. *chondrosperma*) and greater plantain (*Plantago major*), indicate again some considerable disturbance along the channel edge, possibly associated with nitrogen enriched soils. Similarly seeds of thistles (*Carduus/ Cirsium* sp.), prickly sow-thistle (*Sonchus asper* type), golden-rods/ragworts (*Solidago/ Senecio*) all generally indicate higher levels of disturbance that might usually be associated with land alternating regularly between arable and pasture or waste places. Such elements were relatively common in the Mesolithic samples but had even greater representation in the Early Bronze Age.

3.9.19 Seeds of wet grasslands and damp disturbed soils, such as buttercup (*Ranunculus* sp.), celery-leaved buttercup (*Ranunculus sceleratus*), common meadow-rue (*Thalictrum flavum*), lesser spearwort (*Ranunculus flammula*) and silverweed (*Potentilla anserina*), were common in the uppermost sample dated to the Middle Iron Age.

3.9.20 Seeds of marshland, including rushes (*Juncus* sp.), common spikerush (*Eleocharis palustris*), common club-rush (*Schoenoplectus lacustris*), grey club-rush (*Schoenoplectus tabernaemontani*), bogbean (*Menyanthes trifoliata*) gypsywort (*Lycopus europaeus*), forget-me-knots (*Myosotis* sp.) and mint (*Mentha* sp.), were very common, as were seeds of species associated with the channel edges, such as fool's watercress (*Apium nodiflorum*).

3.9.21 Seeds of aquatics, such as yellow water-lily (*Nuphar* lutea), rigid hornwort (*Ceratophyllum demersum*) and water-crowfoot (*Ranunculus* subg. *Batrachium*), along with gametes of stonewort (*Chara* sp.), narrow-fruited watercress (*Rorippa nasturtium-aquaticum*), water-plantain (*Alisma plantago-aquatica*), pondweed (*Potamogeton* sp.), horned pondweed (*Zannichellia palustris*), arrowhead (*Sagittifolia sagittifolia*) and water starwort (*Callitriche* sp.), were all relatively common in these lower samples and can be associated with slow moving water and still water within cut off channels and ponds.

3.9.22 Along with remains of alder were also stones of dogwood (*Cornus sanguinea*), hawthorn (*Crataegus monogyna*), sloe (*Prunus spinosa*), thorns of sloe/ hawthorn (*Prunus spinosa/ Crataegus monogyna*), seeds of bramble (*Rubus* sp.), elder (*Sambucus nigra*), bittersweet (*Solanum dulcamara*), dog's mercury (*Mercurialis perennis*) and possible fragments of hazelnut (*Corylus avellana*) shell, that can all be associated with the drier edges and openings within the alder woodland. It might also be noted that while winter-cress (*Barbarea vulgaris*) is common by steam-sides and wet waste places it is also common within hedges and therefore might be associated with the more open wooded scrub/ alder carr edge that these other species. A large number of the dock seeds are probably of clustered dock (*Rumex conglomeratus*), as numerous whole fruits were readily identifiable in the deposits. This species, while common on damp soils, is also found on the edge of woodlands and woody scrub.

3.9.23 The high presence of alder within Mesolithic, Neolithic and Early Bronze Age samples is not uncommon within the Lea Valley. Alder dominated the Neolithic assemblages within Trench 120, as well as those at Victoria dock (Barnett *et al.* 2010), Temple Mills Depot (Bates and Stafford, in press), and Silvertown Fort Street (Crockett *et al.* 2002), while it was also prevalent in the later Mesolithic samples from Stratford Box (Barnett *et al.* 2011). However, within these aforementioned deposits, unlike those seen here, seeds of species associated with disturbance were present. The high levels of seeds of disturbed, nitrogen rich soils in the Mesolithic samples are therefore of some interest and may be associated with disturbance caused by periodic flooding, flushes and shifting channels, or possibly sand/ gravels bars and a crossing point at this point of the river. As such they may also be related to disturbance by animals, potentially related to open areas of wet marshy grassland in the Mesolithic.

3.9.24 Generally the replacement of alder woodland is by species associated with open wet grasslands dated to sometime between the Early Bronze Age and Late Bronze Age as commonly seen within the assemblages from both this site and the London area and Lower Thames Valley (Waller and Grant 2012).

3.9.25 However, it would appear at this site that at least the localised presence of alder continued through to the Middle Iron Age. It might be noted that within the pollen sequence alder is beginning to decline at this period and it may be that much of the floodplain was relatively open going beyond the immediate locality of deposition. It might be noted that alder was still present within Trench 10 and Trench 35, just to the south-east, both dated to the Late Bronze Age to Early Iron Age. In this context the dated finds of alder suggest the localised survival of patches of alder woodland through the Late Bronze Age and into the early Iron Age.

3.9.26 It is worth noting that the date of the Early Bronze Age material was on sediments and in addition to the Middle Iron Age deposits from this site that one from, Trench 94 also had high numbers of seeds of golden-rods/ ragworts (*Solidago/ Senecio* types) and might indicate a potentially later date for this part of the sequence.

Table 38: Waterlogged plant macrofossils from Trench 33 (upper)

Sample		**<72>**	**<73>**	**<74>**	**<75>**	**<76>**	**<mono>**
Context		**(76)**	**(77)**	**(78)**	**(79)**	**(79)**	**(81)**
Depth top (mOD)		**2.75**	**2.49**	**2.3**	**2.09**	**1.73**	**1.6**
Depth bottom (mOD)		**2.65**	**2.39**	**2.2**	**1.99**	**1.63**	**1.58**
Sediment Type		**alluvium**			**clay loam**		**peaty clay**
Date					**EIA**	**LBA**	
Chara (gametes)	stonewort	-	-	-	-	1	-
Ranunculus subg. *Ranunculus* (arb)	buttercup	2	-	-	3	4	-
Ranunculus sceleratus	celery-leaved buttercup	1	-	-	-	41	-
Ranunculus subg. *Batrachium*	water-crowfoots	-	-	-	1	3	-
Thalictrum flavum	common meadow-rue	-	-	-	-	3	-
Fumaria sp.	fumitory	-	-	-	-	1	-
Urtica dioica	common nettle	-	-	-	-	1260	++
Alnus glutinosa (male catkins)	alder male catkins	-	-	-	-	3f.	-
Atriplex sp.	orache	-	-	-	-	2	-
Montia fontana subsp. *chondrosperma*	blinks	-	-	-	-	3	-
Stellaria sp.	stitchwort	-	-	-	-	3	-
Polygonum aviculare	knotgrass	-	-	-	-	cf.3	-
Rumex sp.	dock	-	-	-	-	7	-
Viola sp.	violet	-	-	-	-	1	-
Rubus sp.	bramble	-	-	-	2	7	1f.
Potentilla anserina	silverweed	-	-	-	-	2	-
Potentilla erecta/ reptans	tormentil/ creeping cinquefoil	-	-	-	2	1	-
Prunus spinosa	sloe	-	-	-	-	-	1f.
Apium cf. *graveolens*	wild celery/ fool's watercress	-	-	-	-	-	1
Apium cf. *nodiflorum*	fool's watercress	1	-	-	-	14	-
Solanum dulcamara	bittersweet	-	-	-	-	2	-
Stachys sp.	woundwort	-	-	-	-	cf.1	-
Clinopodium acinos	basil thyme	-	-	-	-	2	-
Lycopus europaeus	gypsywort	-	-	-	-	2	1
Mentha sp.	mint	-	-	-	32	81	+

Sample		**<72>**	**<73>**	**<74>**	**<75>**	**<76>**	**<mono>**
Context		**(76)**	**(77)**	**(78)**	**(79)**	**(79)**	**(81)**
Depth top (mOD)		**2.75**	**2.49**	**2.3**	**2.09**	**1.73**	**1.6**
Depth bottom (mOD)		**2.65**	**2.39**	**2.2**	**1.99**	**1.63**	**1.58**
Sediment Type		**alluvium**			**clay loam**		**peaty clay**
Date					**EIA**	**LBA**	
Sambucus nigra	elder	2	-	-	7	12	-
Carduus/ Cirsium sp.	thistle	-	-	-	2	3	1
Alisma plantago-aquatica	water-plantain	-	-	-	-	1	+
Juncus sp.	rush	-	-	-	4	12	-
Eleocharis palustris	common spike-rush	-	-	-	-	-	1
Schoenoplectus lacustris	common club-rush	-	-	-	2	-	-
Carex sp. (flat)	sedge (lenticular)	-	-	-	1	-	-
Carex sp. (trigonous)	sedge (trigonous)	-	-	-	4	18	-
Sparganium erectum (fruit/ achene)	branched bur-reed	-	-	-	-	1	-
Sparganium erectum (inner embryo)	branched bur-reed	-	-	-	-	5	-
Trigs/ roundwood/ stems		1	+	-	-	-	-
Bud indet.		-	-	-	1	-	-
Bark		-	-	-	-	1	-
Charcoal		-	-	-	-	22	-
Worm cocoons		-	-	-	10	-	-

[+]C – denotes material that was preserved by charring. cf. compares with. Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more

Table 39: Waterlogged plant macrofossils from Trench 33 (lower)

Sample		**<77>**	**<78>**	**<79>**
Context		**(81)**	**(82)**	**(83)**
Depth top (m OD)		**1.55**	**1.35**	**1.05**
Depth bottom (m OD)		**1.45**	**1.25**	**0.95**
Sediment Type		**humic alluvium**		
Date		**MIA**	**EBA**	**L Meso**
Chara (gametes)	stonewort	12	15	++
Bryophyta (leaf stem)	mosses	5	15	-
Nuphar lutea	yellow water-lily	-	2	3
Ceratophyllum demersum	rigid hornwort	-	-	2
Ranunculus subg. *Ranunculus* (arb)	buttercup	25	23	12
Ranunculus sceleratus	celery-leaved buttercup	227	10	1
Ranunculus subg. *Batrachium*	water-crowfoots	-	55	22
Ranunculus flammula	lesser spearwort	-	1	1
Thalictrum flavum	common meadow-rue	1	1	2
Urtica dioica	common nettle	374	15	107
Alnus glutinosa (fruits)	alder fruits	2012	347	11
Alnus glutinosa (female catkins/ cones)	female catkins/ cones	40	35	18
Alnus glutinosa (female catkins/ cones)	summer female catkins/ cones	3	4	-
Alnus glutinosa (leaf)	female catkins/ cones	cf.24f	cf.7f	-
Alnus glutinosa (alder female cone scale)	female cone scale	1	-	-
Alnus glutinosa (male catkins)	alder male catkins	287	159	8f
Alnus glutinosa (galls/ rootlets?)	alder root nodules?	12	5	-
Corylus avellana	hazelnut	-	-	cf.1
Chenopodium rubrum	red goosefoot	-	1	1
Chenopodium polyspermum	many-seeded goosefoot	5	20	11
Chenopodium ficifolium	fig-leaved goosefoot	-	-	1
Chenopodium album	fat-hen	5	12	12
Atriplex sp.	orache	12	40	10
Caryophyllaceae (indet capsule)		cf.1	-	-
Montia fontana subsp. *chondrosperma*	blinks	5	1	-
Stellaria palustris (Retz)/ *graminea*	marsh stitchwort/ lesser stitchwort	-	-	1
Stellaria sp.	stitchwort	16	110	3
Stellaria .cf. *holostea*	greater stitchwort	1	-	1
Cerastium sp.	mouse-ears	-	1	-
Persicaria maculosa/ lapathifolium	redshank/pale persicaria	6	5	-
Persicaria hydropiper	water-pepper	75	52	8
Persicaria minor	small water-pepper	-	-	3
Polygonum aviculare	knotgrass	-	5	-
Rumex sp.	dock	115	170	-
Rumex conglomeratus (whole fruit)	clustered dock	22	35	-
Hypericum sp.	St. John's wort	-	-	2
Brassicaceae (*Lepidium, Barbarea* etc.)	small indets. 1-2mm	-	1	-
Barbarea vulgaris	winter-cress	-	33	21
Rorippa cf. *nasturtium-aquaticum*	narrow-fruited watercress	-	1	4
Rubus sp.	bramble	20	9	35
Rubus/ Rosa type sp. (thorn)	bramble/ rose type thorns	5	-	-
Potentilla anserina	silverweed	10	3	3
Potentilla erecta/ reptans	tormentil/ creeping cinquefoil	-	23	-
Prunus spinosa	sloe	-	1	-
Crataegus monogyna (fruit stones)	hawthorn berries	5	2	-
Crataegus monogyna (thorns)	hawthorn berries	3	3	-
Epilobium cf. *hirsutum*	great willowherb	-	cf.1	7

Sample		**<77>**	**<78>**	**<79>**
Context		**(81)**	**(82)**	**(83)**
Depth top (m OD)		**1.55**	**1.35**	**1.05**
Depth bottom (m OD)		**1.45**	**1.25**	**0.95**
Sediment Type		**humic alluvium**		
Date		**MIA**	**EBA**	**L Meso**
Cornus sanguinea	dogwood	-	-	3
Mercurialis perennis	Dog's Mercury	-	1	-
Berula erecta	lesser water-parsnip	-	?3	-
Oenanthe sp.	water-droplets	-	-	6
Apium cf. *graveolens*	wild celery/ fool's watercress	-	22	-
Apium cf. *nodiflorum*	fool's watercress	103	81	6
Solanum dulcamara	bittersweet	-	28	3
Menyanthes trifoliata	bogbean	-	1	2
Myosotis sp.	Foget-me-nots	-	1	1
Stachys sp.	woundwort	-	1	-
Ballota nigra	black horehound	-	1	-
Lamium sp.	dead-nettle	-	-	2
Galeopsis sp.	hemp-nettle	-	-	3
Lycopus europaeus	gypsywort	10	50	4
Mentha sp.	mint	35	50	35
Callitriche sp.	water-starwort	354	-	-
Plantago major	greater plantain	10	-	-
Galium palustre	marsh bedstraw	1	-	-
Sambucus nigra	elder	2	5	5
Arctium sp.	burdock	2	1	-
Carduus/ Cirsium sp.	thistle	25	30	3
Lapsana communis	nipplewort	-	1	-
Leontodon/ Tragopogon	hawkbits/ goat's-beard	-	-	1
Sonchus asper type	prickly sow-thistle	-	2	-
Solidago/ Senecio types	Golden-rods/ ragworts	16	31	-
Bidens cf. *cernua*	nodding bur-marigold	1	-	-
Sagittifolia sagittifolia (inner)	arrowhead	5	-	3
Alisma plantago-aquatica	water-plantain	10	1	12
Potamogeton sp.	pondweeds	-	15	45
Zannichellia palustris	horned pondweed	-	1	-
Juncus sp.	rush	30	-	+
Eleocharis palustris	common spike-rush	-	1	5
Schoenoplectus lacustris	common club-rush	-	65	163
Schoenoplectus tabernaemontani	club rushes	6	6	33
Carex sp. (flat)	sedge (lenticular)	2	5	5
Carex sp. (trigonous)	sedge (trigonous)	2	24	36
Sparganium erectum (fruit/ achene)	branched bur-reed	-	9	10
Sparganium erectum (inner seed/ embryo)	branched bur-reed	9	166	21
Poaceae (charred culm)	charred grass/ cereal stems	-	3	-
Twigs/ roundwood/ stems		-	++	+
Bud indet.		3	3	1
Thorn indet.		-	-	2
Indet seed		-	-	3
Charcoal		-	-	+
Acari	Mites, ticks	+	-	-
Worm cocoons		-	6	9
Anuran bone	Toads, frogs bones	1	-	-
Fish bone		-	1	-
Eel (*Anguina* sp.)		-	3	-

$^{+}$C – denotes material that was preserved by charring. cf. compares with. Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more

Pollen

3.9.27 Pollen assessment was carried out on eight samples from Monoliths <25>, <26>, <27> and <28> in Trench 33.

3.9.28 The pollen diagram (Figure 14) has been split into two local pollen assemblage zones (LPAZ), Tr33-1 and Tr33-2 – see Table 40 for LPAZ descriptions.

3.9.29 Radiocarbon dates from the base of the sequence are difficult to interpret, with a bulk sediment date at 1.10m OD (based upon a radiometric date of large volume from bulk <69>) providing a date of 2280-1910 cal BC (Beta-204036, 3690±60 BP) directly underlain (in sample <79> at 1.05-0.95mOD) by a radiocarbon date upon *Alnus glutinosa* cones of 5310-5070 cal BC (SUERC-31388, 6240±30 BP). This discrepancy implies either a truncation within the sequence or a problem with one of the radiocarbon dates, most likely in Beta-204036 due to the unknown origin of the organic material contained within it and high probability of intrusive younger root material. LPAZ Tr33-1 shows that Poaceae (grasses) and *Alnus glutinosa* (alder) are locally abundant, probably reflecting local alder woodland. Within this alder woodland *Salix* (willow) would have also been an important component.

3.9.30 However, the presence of strandline deposits associated with these samples may mean that the fluctuations in *Alnus glutinosa* are also due to the deposition and concentration of catkins within the swale deposits. A single occurrence of *Taxus baccatta* (yew) is also found at the top of this zone and may be associated with the wetland vegetation as it is commonly found in floodplain and low lying environments in prehistoric contexts across northwest Europe (Deforce and Bastiaens 2007). Wood from *Taxus baccatta* has been recovered from sites upon the Thames floodplain (Rackham and Sidell 2000; Branch *et al.* 2012). Herbs associated with this wetland environment include *Caltha palustris*-type (marsh marigold), *Filipendula* (meadowsweet) and *Glyceria*-type (sweet-grasses). There is also a local presence of aquatic pollen types including *Sparganium emersum*-type (bur reed), *Typha latifolia* (bulrush) and Pteropsida (monolete) indet. (fern spores).

3.9.31 Areas of fen edge or dryland are indicated by the presence of *Quercus* (oak), *Corylus avellana*-type (hazel) and occurrences of *Tilia cordata* (small leaved lime). The later is known to have been extensive across the London area during the mid-Holocene but its reduction has been linked to human activity such as clearance (Sidell *et al.* 2000) and local wetland expansion (Grant *et al.* 2011; Waller and Grant 2012). It is known to have persisted as a main woodland component in Epping Forest until the Romano-British period (Grant and Dark 2006). Its low intermittent presence in this sequence may indicate that it was still growing upon areas of dryland during the Late Neolithic to Early Iron Age periods, but its poor pollen dispersal means that the pollen is not well represented within wetland sequences. Areas of disturbed/ waste ground and possible grazing are suggested by the presence of *Urtica dioica* (common nettle), Plantago lanceolata (ribwort plantain), *Cichorium intybus*-type (dandelions/ chicory) and *Solidago virgaurea*-type (daises/ goldenrods). This may be related to the bioturbation mixing recognised within the sediments that may be the result of local animal/ human activity.

3.9.32 The transition from LPAZ Tr33-1 to Tr33-2 coincides with a change in the stratigraphy, changing from the underlying humified peaty clay loam to a humic clay loam. Radiocarbon dates across this transition show a number of reversals and therefore it is difficult to identify the exact timing of this transition. The calibrated ranges of the accepted radiocarbon date (SUERC-31556) indicated a Middle Iron Age date. Given that the two uppermost radiocarbon dates are derived from bulk sediment, it is possible these may be affected by intrusive material (young roots and reworked organic sediments deposited in the humic clay loams). Coinciding with the change in sediments is an increase in Cyperaceae, *Sparganium emersum*-type and Pteropsida (monolete) indet., with a reduction in *Alnus glutinosa*. This is probably reflecting a reduction in the local fen woodland/ carr and an increase in more open wetland communities, resulting in smaller stands of *Alnus glutinosa* and *Salix* and an increase in sedge-reed-fen vegetation with an increase in local ferns. Associated taxa include *Filipendula*, *Ranunculus acris*-type (buttercup), *Polygonum* (knotgrass) and *Glyceria*-type.

3.9.33 Although *Quercus* has reduced, *Corylus avellana*-type is present at similar values to the previous zone, though these are still relatively low suggesting predominantly open surrounding vegetation. The increase in *Cichorium intybus*-type may be associated with areas of waste ground/ disturbance, though it does coincide with an increase in *Pteridium aquilinum* (bracken), *Polypodium* (polypody), *Pinus sylvestris* (pine) and Pteropsida (monolete) indet. and may therefore also indicate an increase in reworked pollen along with some possible differential pollen preservation. However, as there is fairly good taxa diversity within these samples this influence is not thought to be significantly altering the represented pollen assemblage as found in other trenches such as the neighbouring Trench 34.

3.9.34 The pollen sequence shows a local wetland alder/ willow carr environment with local grassland and possibly grazing, giving way to a sedge-reed-fen environment as the carr vegetation recedes in later prehistory, probably as a result of increased site flooding or a shift in the local channel.

Table 40: Pollen zone descriptions Trench 33

Zone	Depth (m OD)	Description
Tr33-2	1.68 to 2.20	Dominated by Poaceae (18-38%) and Cyperaceae (31-64%) with *Alnus glutinosa* (1-9%), *Cichorium intybus*-type (3-11%) and Pteropsida (monolete) indet. (8-26% TLP + pteridophytes). *Pinus sylvestris* (1-6%) and *Corylus avellana*-type (2-6%) are present throughout the zone, with occurrences of *Quercus* (up to 3%), *Tilia cordata* (up to 1%), *Acer campestre* (up to 1%), *Salix* (up to 5%), *Sorbus*-type (up to 1%) and *Sambucus nigra* (up to 1%) also recorded. Herb/dwarf shrub taxa include *Ranunculus acris*-type (up to 2%), *Polygonum* (up to 1%), *Filipendula* (up to 1%), Apiaceae (up to 1%), *Plantago lanceolata* (up to 3%), *Solidago virgaurea*-type (2%) and *Glyceria*-type (up to 1%). *Sparganium emersum*-type (1-5% TLP + aquatics) is present throughout the zone. *Polypodium* (up to 1% TLP + pteridophytes) and *Pteridium aquilinum* (up to 6% TLP + pteridophytes) are also present. Pollen concentrations range between 63378 and 1416954 grains cm^{-3}.
Tr33-1	1.16 to 1.68	Dominated by Poaceae (19-46%) and *Alnus glutinosa* (8-64%), with *Quercus* (3-9%), *Corylus avellana*-type (2-14%) and Cyperaceae (1-18% TLP). Other tree taxa present include occurrences of *Pinus sylvestris* (1-6%), *Taxus baccata* (up to 1%), *Ulmus* (up to 4%) and *Tilia cordata* (up to 2%). *Salix* (1-9%) increases towards the end of the zone. Herb/dwarf shrub taxa include *Ranunculus acris*-type (up to 5%), Chenopodiaceae (up to 4%), *Filipendula* (up to 4%), *Plantago lanceolata* (up to 4%), *Cichorium intybus*-type (up to 3%), *Solidago virgaurea*-type (up to 2%) and *Glyceria*-type (up to 4%). *Sparganium emersum*-type (1-9% TLP + aquatics) is present throughout the zone. *Polypodium* (up to 1% TLP + pteridophytes) and *Pteridium aquilinum* (1-5% TLP + pteridophytes) are also present. Pollen concentrations increase towards the end of the zone from 117337 and 2434373 grains cm^{-3}.

Diatoms

3.9.35 Diatoms are present, but very poorly preserved, in five of the six samples prepared from Trench 33. Diatoms were absent from the slide prepared from 1.96m OD. The sequence of diatomaceous samples have no potential for percentage diatom counting (with very low counting potential for the assemblage at 1.32m OD), see Table 41 and Table 42 below. However, the diatoms present in these five samples do show the presence of consistent assemblages of non- planktonic diatoms associated with shallow freshwater. These diatoms include taxa such as *Synedra ulna, Fragilaria brevistriata, Fragilaria pinnata, Fragilaria construens* var. *venter, Cocconeis disculus and Cocconeis placentula*. *Hantzschia amphioxys* and

Ellerbeckia arenaria are desiccation-tolerant, aerophilous taxa; the latter is often associated with sandy substrates. Both epiphytic (eg. *Cocconeis placentula* and *Epithemia* sp.) and benthic taxa (eg. *Navicula pupula* and *Gyrosigma attenuatum*) were identified. There is no evidence for contact with tidal water.

Table 41: Summary of diatom evaluation results for Trench 33

Sam. No.	Depth (m OD)	Diatoms	Diatom numbers	Quality of preservation	Diversity	Assemblage type	Potential for % count
<5>	1.16	present	very low	very poor	low	fw non-pk aero	none
<6>	1.32	present	very low	very poor	low	fw non-pk aero	very low
<7>	1.48	present	very low	very poor	low	fw non-pk	none
<8>	1.72	present	very low	very poor	very low	fw aero benthic	none
<9.	1.96	absent	-	-	-	-	none
<10>	2.04	present	very low	very poor	one sp.	fw non-pk	none

(fw – freshwater, aero – aerophilous, non-planktonic – non-pk)

Table 42: Diatom species assessment from Trench 33

Sample	**<5>**	**<6>**	**<7>**	**<8>**	**<10>**
Depth (m OD)	**1.16**	**1.32**	**1.48**	**1.72**	**2.04**
Salinity Group/Taxon					
Halophilous to Indifferent					
Rhoicosphaenia curvata	cf.				
Oligohalobous Indifferent					
Achnanthes clevei		+			
Cocconeis disculus	+	+			
Cocconeis placentula		+			
Ellerbeckia arenaria	+	+			
Epithemia sp.		+			
Fragilaria brevistriata		+			
Fragilaria construens var. *venter*		+			
Fragilaria pinnata	+	+	+		
Gyrosigma attenuatum	+				
Gomphonema cf. angustatum					+
Hantzschia amphioxys				+	
Synedra ulna	+	+	+		
Cymbella sinuata			+		
Navicula pupula				+	
Unknown Salinity Preference					
Navicula sp.			+		

+ Diatom present

Ostracods and Foraminifera

3.9.36 Four samples taken from monoliths <25>, <26> and <28> have been assessed and analysed for the presence, preservation and environmental significance of their ostracod content.

3.9.37 The full results detailing the ostracod content of the four samples is given in Table 43. Ostracods were recovered from the samples at 1.02 and 1.37m OD, but not from the samples at 1.76 and 2.02m OD.

3.9.38 The samples at the base of the sequence (1.02 and 1.37m OD) contained only a few ostracods and therefore only tentative environmental interpretations are presented here. At 1.02m OD the ostracod *Darwinula stevensoni* was prevalent including one adult united carapace and some juveniles indicating that this taxa is *in situ* within the sediment. This ostracod is a cosmopolitan taxa which prefers ponds, lakes and slow streams. It can tolerate increases in salinity up to 15‰ and has been recorded in water depths up to 12m (Meisch 2000). One occurence of the ostracod *Candona candida* was also noted. This ostracod is known to inhabit a wide range of environments including springs, brooks, wells, ponds and ditches. They are known from the littoral and profundal zones of lakes and also known to be tolerant of slightly brackish waters. Abundant and numerically equal (and therefore *in situ*) remains of the opercula and apices of *Bithynia* were recorded in this sample indicative of a freshewater stream. Other freshwater molluscs including *Pisidium*, Planorbids and *Theodoxius fluviatalis* are also indicative of a shallow, slow moving freshwater environment.

3.9.39 At 1.37m OD *Candona neglecta* was the dominant taxa. This ostracod is known to inhabit a wide range of environments including springs, brooks, wells, ponds and ditches. It is also known from the littoral and profundal zones of lakes and tolerant of slightly brackish waters (Meisch 2000). *Candona neglegta* is not uncommon in the Baltic Sea with a maximum recorded salinity tolerance of 16‰ (Hiller 1972).

3.9.40 Despite this, *Candona neglecta* is usually indicative of non-marine “freshwater” environments, confirmed in this case by the absence of any commonly occurring brackish water ostracod taxa. Species of the genus *Fabaeformiscandona* were also recovered from this sample. This genus is known to inhabit non-marine environments although difficult to identify to species level as taxonomic differences are based upon the morphology and number of natatory setae which are rarely preserved in sub-fossil assemblages. The ostracods in this sample are indicative of a shallow, slow moving or still freshwaterbody. This is confirmed by the presence of *Bithynia* opercula and Planorbid molluscs.

Table 43: Microfaunal content of ostracod/ foraminifera samples from Trench 33

Sample/ monolith number	**<26>**	**<26>**	**<25>**	**<28>**
Depth (m OD)	**1.02**	**1.37**	**1.76**	**2.02**
Ostracoda				
Candona candida	x			
Candona neglecta		x		
Darwinula stevensoni	x			
Fabaeformiscandona sp.		x		
Pseudocandona sp.	x			
Foraminifera				
fossil rotaliid			x	
Animal remains				
Molluscs		xx		
Bithynia opercula	xx	x	x	
Bithynia apices	xx			
Pisidium	x			
Planorbid	x	x		
Theodoxius fluviatalis	x			
Amphibian bone	x			
Plant remains				
Seeds		x		
Charcoal			x	

x = 1 to 9 specimens; xx = 10 to 50 specimens; xxx = over 50 specimens

3.9.41 At 1.76m OD no ostracods were recovered. *Bithynia* opercula recovered are indicative of a freshwater environment, although they are likely to be reworked. One fossil Rotaliid foraminifera recovered is likely to be reworked from the underlying geological formations. Charcoal recovered from this sample probably indicates human activity in the area.

3.9.42 At 2.02m no ostracods or plant or animal remains were recovered.

Molluscs

INTRODUCTION

3.9.43 A series of eight samples were selected for molluscan analysis from Trench 33. The results are shown tabulated in Table 44 and plotted as a histogram in Figure 17. The combination of the results from the analysis of the molluscs, waterlogged plant remains, ostracods and pollen from these deposits should provide detailed information on the nature of the local environment in this area in the Late Mesolithic to Middle Iron Age and later periods.

3.9.44 The sediments of this sample sequence have been described in Table 36. A series of eight samples were selected for molluscan analysis from Trench 33. The combination of the results from the analysis of the molluscs, waterlogged plant remains, ostracods and pollen from these deposits should provide detailed information on the nature of the local environment in this area in the Late Mesolithic to Middle Iron Age and later periods.

CONTEXT (83), SAMPLE <79>, FLUVIAL SAND, LATE MESOLITHIC

3.9.45 This was the richest deposit in terms of shell numbers and species diversity and the mollusc assemblage mainly comprised fresh-water species. The moving water species were the dominant group within the fresh-water groups, in particular *Valvata piscinalis* and *Bithynia tentaculata*, which favour large bodies of slowly flowing water with dense growths of aquatic plants. The presence of Theodoxus fluviatilis within the assemblage may be more indicative of faster flowing water element and a fully riverine environment (Boycott 1936, 141).

3.9.46 The other species present in the assemblage in significant numbers included *Valvata cristata, Gyraulus albus* and *Gyraulus crista*, which are found in all kinds of well-vegetated aquatic habitats. There are also a number of shells of *Lymnaea truncatula* and *Anisus leucostoma*, which favour marshy grassland and swampy pools subject to seasonal desiccation, and *Vallonia excentrica/ pulchella*, typical of meadows and damp pastures.

3.9.47 The mollusc assemblage appears to reflect a well-vegetated moving water channel environment, with elements exploiting the marshy river edge and meadows/damp pasture in the vicinity.

CONTEXT (82), SAMPLE <78>, HUMIC ALLUVIUM

3.9.48 Shell numbers were high with good species diversity. The moving water species again dominate this assemblage, in particular *Valvata piscinalis* and *Bithynia tentaculata.* The assemblage indicates the continued presence of a number of different environments, with significant numbers of *Valvata cristata* and *Lymnaea truncatula* together with an increase in the numbers of *Vallonia pulchella/ excentrica* and the terrestrial species in general.

3.9.49 The decrease in *Theodoxus fluviatilis* and closer ratio of *Bithynia* operculum to apices may allude to slower moving water, well-vegetated aquatic environment than that indicated in context (83). There still appears to be elements of the assemblage exploiting the marshy river edge as well as an increase in the areas of meadow/damp pasture in the vicinity.

CONTEXT (81), SAMPLE <77>, HUMIFIED PEATY CLAY LOAM

3.9.50 This context produced a smaller number of shells. The environment indicated by the mollusc assemblage appears to have been mixed. There is a decrease in the moving water element, with the disappearance of *Valvata piscinalis* and a big fall in numbers of *Bithynia tentaculata*, although the Pisidiums increase. This is mirrored by a rise in those species indicative of marshy river edge and meadow/damp pasture, in particular *Lymnaea truncatula*. The well-vegetated channel appears to be becoming more stagnant in this location with increasing areas of marshy river edge and meadow/damp pasture environments in the vicinity.

CONTEXTS 79 AND 78, SAMPLES <76>, <75> AND <74>, HUMIC CLAY LOAM

3.9.51 Shell numbers are too low to determine the local environment reflected in these deposits.

CONTEXT (77), SAMPLE <73>, OVERBANK ALLUVIUM

3.9.52 This assemblage is dominated by the amphibious and marsh groups, in particular by *Lymnaea truncatula*, *Anisus leucostoma* and *Vallonia excentrica/ pulchella*. *Anisus leucostoma, Lymnaea truncatula and Lymnaea palustris* are indicative of marsh environments, small areas of standing water subject to seasonal desiccation or areas liable to frequent flooding, while *Vallonia pulchella/ excentrica* is typical of meadows and damp pastures.

3.9.53 The assemblage appears to indicate a local open environment of meadow/damp grassland with small areas of marsh, seasonal standing water or frequent flood water.

CONTEXT (76), SAMPLE <72>, OVERBANK ALLUVIUM

3.9.54 The assemblage was dominated by *Vallonia excentrica/ pulchella* and *Trichia hispida*. There was also an increase in the open-country species, while the amphibious species decreased. These species depict an open environment mainly of long moist grass, such as in meadows or damp pastures. The occurrence of *Lymnaea truncatula* may indicate areas subject to occasional flooding or seasonal standing water rather than permanent marsh as the amphibious species in general have declined within this deposit.

DISCUSSION

3.9.55 The mollusc assemblage from the Late Mesolithic deposit (context (83)) appears to reflect a well-vegetated moving water channel environment with a marshy river edge and an open area of damp grassland in the vicinity. The mollusc assemblages indicate that this moving water becomes slower during the Late Bronze Age (context (82)) and stagnates further during the Middle Iron Age (context (81)) while the areas of marsh and meadow/ damp pasture environments increase. There are similarities between these assemblages and those observed from the prehistoric and Iron Age/ Romano-British deposits at Trench 71.

3.9.56 It has not been possible to discern the local environment during the period represented by contexts (79) to (78).

3.9.57 By the period represented by context (77) the channel appears to have stagnated and silted up in this location and the molluscs reflect a local open environment of meadow/damp grassland with small areas of marsh, seasonal standing water or frequent flood water. During the period represented by context (76) a local environment of long moist grass with areas subject to occasional flooding or seasonal standing water is indicated by the molluscs. This localised environment is similar to that suggested by molluscs observed from the upper deposits at Trench 34.

Table 44: Mollusc assessment from Trench 33

Sample	**<79>**	**<78>**	**<77>**	**<76>**	**<75>**	**<74>**	**<73>**	**<72>**
Context	**(83)**	**(82)**	**(81)**	**(79)**	**(79)**	**(78)**	**(77)**	**(76)**
Depth top (m OD)	**1.05**	**1.35**	**1.55**	**1.73**	**2.09**	**2.3**	**2.49**	**2.75**
Depth bottom (m OD)	**0.95**	**1.25**	**1.45**	**1.63**	**1.99**	**2.2**	**2.39**	**2.65**
Sediment Type	**Fluvial sand**	**Humic alluvium**	**Humified peaty clay loam**		**Humic clay loam**		**Overbank alluvium**	
Period	**Late Mesolithic**				**LBA/EIA**			
Land snails								
Carychium minimum	6	5	2	-	1	-	12	6
Carychium tridentatum	3	-	-	-	-	-	9	3
Carychium sp.	1	2	-	-	-	-	5	2
Succinea/ Oxyloma spp	2	1	-	-	-	-	-	1
Cochlicopa spp.	2	1	2	-	-	-	4	1
Vertigo pygmaea	1	-	-	-	-	-	1	4
Vertigo spp.	-	1	-	-	-	-	1	2
Vallonia costata	-	-	-	-	-	-	12	8
Vallonia excentrica/ pulchella	40	32	12	-	1	-	71	54
Vallonia spp.	-	-	1	-	1	-	-	-
Discus rotundatus	1	-	1	-	-	-	-	-
Vitrea spp.	-	1	1	-	-	-	1	-
Aegopinella nitidula	1	5	1	-	-	-	1	-
Limicidae	-	-	2	2	-	-	-	-
Euconulus fulvus	1	2	-	-	-	-	-	-
Helicella itala	-	-	-	-	-	-	-	4
Trichia hispida	4	8	2	-	2	-	8	44
Cepaea sp.	-	1	+	-	-	-	-	-
Fresh and Brackish Water Snails								
Theodoxus fluviatilis	11	2	+	-	-	-	-	-
Valvata cristata	84	46	21	-	-	-	-	-
Valvata piscinalis	81	65	-	-	-	-	-	1
Bithynia tentaculata	19	7	1	-	-	-	-	-
Bithynia spp.	98	40	3	-	-	-	-	2
Bithynia opercula	25	24	17	27	-	-	-	3
Lymnaea truncatula	19	19	14	-	-	-	18	10
Lymnaea palustris	1	2	-	-	-	-	8	-
Lymnaea peregra	9	2	3	-	-	-	1	-
Lymnaea spp.	39	45	26	-	-	-	80	8
Planorbis planorbis	19	3	-	-	1	-	-	-
Anisus leucostoma	28	10	-	-	2	-	57	1
Bathyomphalus contortus	5	-	-	-	-	-	-	-
Gyraulus albus	47	23	-	-	-	-	-	-
Gyraulus crista	23	12	1	-	-	-	-	-

Sample	**<79>**	**<78>**	**<77>**	**<76>**	**<75>**	**<74>**	**<73>**	**<72>**
Context	**(83)**	**(82)**	**(81)**	**(79)**	**(79)**	**(78)**	**(77)**	**(76)**
Depth top (m OD)	**1.05**	**1.35**	**1.55**	**1.73**	**2.09**	**2.3**	**2.49**	**2.75**
Depth bottom (m OD)	**0.95**	**1.25**	**1.45**	**1.63**	**1.99**	**2.2**	**2.39**	**2.65**
Sediment Type	**Fluvial sand**	**Humic alluvium**	**Humified peaty clay loam**	**Humic clay loam**			**Overbank alluvium**	
Period	**Late Mesolithic**				**LBA/EIA**			
Hippeutis complanatus	1	-	-	-	-	-	-	-
Ancylus fluviatilis	13	8	-	-	-	-	-	-
Acroloxus lacustris	1	1	-	-	-	-	-	-
Pisidium amnicum	2	1	1	-	-	-	-	-
Pisidium spp.	40	32	25	-	-	-	2	-
Marine Shell								
Mytilus edulis	-	-	-	-	-	-	-	+
Taxa	26	24	14	1	5	0	14	13
Total	602	377	119	2	8	0	291	151
% Open country species	6.8	8.8	10.9	0	25	0	29.2	47.7
% Intermediate species	1.2	3.2	5	100	25	0	4.1	29.8
% Shade - loving species	2	3.5	4.2	0	12.5	0	9.6	7.3
% Marsh loving species	0.3	0.3	0	0	0	0	0	0.7
% Amphibious species	7.8	7.7	11.8	0	25	0	25.8	7.3
% Intermediate species	14.3	10.3	3.4	0	0	0	3.1	0
% Ditch species	17.3	13.3	17.7	0	12.5	0	0	0
% Moving water species	37.2	32.6	4.2	0	0	0	0	2
% Unassigned species	13.1	20.4	42.9	0	0	0	28.2	5.3

3.10 Trench 34 (PDZ1 Site 25 Trench 9)

Introduction

3.10.1 Trench 34 is located to the east of the main north/ south channel identified during deposit modelling, in the vicinity of the known archaeology of Trench 9. Although no archaeological features were found in the trench itself, the organic deposits, however, had the potential to provide a key palaeoenvironmental sequence of Neolithic date. The sampled section is presented in Figure 14.

Sediments

3.10.2 Sediment descriptions and interpretations can be found in Table 45.

Table 45: Sediment descriptions for Monolith <81> and <82>, Trench 34

Level (m OD)	Context (site description)	Sediment description	Interpretation
1.97 to 1.65	87 (grey/ white clay)	10YR4/ 1 grey clay, hard & dried, weak blocky structure, slight silt coatings in cracks. Clear boundary.	Likely overbank alluvium
1.65 to 1.44	88 (brown clay)	10YR4/ 3 dark greyish brown clay, rare molluscs observed, ?massive, clear boundary	Possible tree throw fill, or result of ridge & swale/ hummocks
1.44 to 1.10	89 (mid grey clay with light brown mottling) 90 (dark blue/ grey clay)	10YR3/ 2 dark greyish brown clay with abundant (c.60%) prominent iron stain mottling (7.5YR5/ 8 strong brown). Below 1.30m the mottling is lessened to 30%. Above 1.30m also seems to have moderate small blocky structure pr coarse granular; likely pedogenesis to top. NB clay has some fine sand content. Very heavily iron-stained, presumably some of this must be post-sampling oxygenation.	Organic alluvium with stabilisation to top
1.10 to 1.05	98	10YR5/ 4 yellowish brown sand, highly calcareous (very vigorous reaction with 10% HCl), freshwater molluscs observed,	Tufaceous sand

3.10.3 Gravels were not reached in Trench 34, which was excavated to a depth of c. 1m OD. The lowest deposit sampled consisted of highly calcareous tufaceous sand of probable Neolithic date. This deposit appears to represent a clear shallow riverine environment with inputs of calcareous springwater. The upper boundary of this material was 1.10m OD.

3.10.4 Above the tufaceous sands was recorded a layer of organic alluvial clay to 1.44m OD – a bulk sediment radiocarbon date (Beta-204037) from this layer indicates that it is Middle to Later Neolithic (see dating below). This may represent a marshy or channel edge environment. Heavy weathering/ iron-staining and structure to the top of the layer show that significant pedogenesis has taken place following its deposition. This indicates a drying out of conditions (probably due to channel movement) and the formation of a stable landsurface for an unknown period of time – there may therefore have been a significant hiatus before the resumption of sedimentation.

3.10.5 From observations on site, hollows in the surface of the sand and filled with the organic clay were suggestive of rooting, and may represent shrubby vegetation development following a period of standing/ stagnant water above the earlier fluvial sands.

3.10.6 Context (88) appeared intermittently in the section (Figure 14), and has been interpreted as the result of a landscape of sedge-filled hollows and grassy hummocks within an area of permanently and / or seasonally flooded marshy ground. Where sampled this extended to 1.65m OD; above this overbank alluvial deposits were recorded to 1.97m OD and above.

Dating

3.10.7 Two radiocarbon dates have been obtained from bulk sediment sample <90> and bulk sample <84> (Table 46).

Table 46: Radiocarbon dates from Trench 34

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	δ^{13}C (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<84> (88)	1.65 to 1.44	Seeds: 10 x *Rubus* sp.	SUERC-31557	2325±30	-28.4	490–230 cal BC	1
<90> (90)	1.16 to 1.20	Bulk low carbon analysis on sediment	Beta-204037+	4160±80	-26.3	2910–2490 cal BC	2

3.10.8 The dating results should be treated with some degree of caution as few plant macrofossils were available for dating. The lower (radiometric) bulk sediment date (Beta-204037) returned a Neolithic result; however given the problems with hard water error, reworked sediment and root intrusion which have been demonstrated elsewhere, this date cannot be considered reliable without corroboration.

3.10.9 The remaining date at 1.44-1.65m OD (SUERC-31557) was on identified plant macrofossils; however the nature of the context sampled has not been elucidated despite attempts via various proxy methods. Given the lack of understanding of the deposition of the dated context it is difficult to interpret, and the dating should also be treated with caution.

Plant Macrofossils

3.10.10 The results are shown in Table 47.

3.10.11 Five samples were chosen from Trench 34 for analysis of waterlogged plant remains. The lower sediments, at 1.27-1.10m OD, were dated to the Middle to Late Neolithic, while seeds of bramble (*Rubus* sp.) from the upper sediments, at 1.44-1.65m OD, were dated to Early-Middle Iron Age, 490–230 cal BC (SUERC-31557, 2325±30 BP). As discussed above both of these dates shoulc be treated with some caution.

Table 47: Waterlogged plant macrofossils from Trench 34

Sample		**<83>**	**<84>**	**<85>**	**<86>**	**<87>**
Context		**(87)**	**(88)**	**(89)**	**(90)**	**(98)**
Depth top (mOD)		**1.97**	**1.65**	**1.44**	**1.27**	**1.1**
Depth bottom (mOD)		**1.65**	**1.44**	**1.27**	**1.1**	**1.05**
Period/Date			**EIA/MIA**		**Neolithic**	
Chara (gametes)	stonewort	-	+	-	-	-
Bryophyta (leaf stem)	mosses	-	++	-	-	-
Ceratophyllum demersum	rigid hornwort	-	1	-	-	-
Ranunculus subg. *Ranunculus* (arb)	buttercup	-	44	-	-	-
Ranunculus subg. *Batrachium*	water-crowfoots	-	2	1	-	-
Thalictrum flavum	common meadow-rue	-	13	-	-	-
Urtica dioica	common nettle	-	124	10	2	-
Alnus glutinosa (fruits)	alder fruits	-	3	-	cf.1f	-
Alnus glutinosa (male catkins)	alder male catkins	-	1+5f	-	-	-
Chenopodium polyspermum	many-seeded goosefoot	-	22	11	18	-
Chenopodium album	fat-hen	1	52	-	-	-
Stellaria sp.	stitchwort	-	30	-	-	-
Stellaria cf. *holostea*	greater stitchwort	-	6	-	-	-
Persicaria hydropiper	water-pepper	-	15	-	-	-
Rumex sp.	dock	-	102	-	-	-
Rumex conglomeratus (whole fruit)	clustered dock	-	cf.17	-	-	-
Salix catkin bud scale	willow bud scale	-	1	-	-	-

Sample		<83>	<84>	<85>	<86>	<87>
Context		**(87)**	**(88)**	**(89)**	**(90)**	**(98)**
Depth top (mOD)		**1.97**	**1.65**	**1.44**	**1.27**	**1.1**
Depth bottom (mOD)		**1.65**	**1.44**	**1.27**	**1.1**	**1.05**
Period/Date			**EIA/MIA**		**Neolithic**	
Barbarea vulgaris	winter-cress	-	65	-	1	-
Rorippa cf. *nasturtium-aquaticum*	narrow-fruited watercress	-	4	-	-	-
Rubus sp.	bramble	-	14	-	-	-
Rubus/ Rosa type sp. (thorn)	bramble/ rose type thorns	-	1	-	-	-
Crataegus monogyna (fruit stones)	hawthorn berries	-	cf.1f	-	-	-
Epilobium cf. *hirsutum*	great willowherb	-	63	-	-	-
Berula erecta	lesser water-parsnip	-	1	-	-	-
Oenanthe sp.	water-droplets	-	-	1	-	-
Apium cf. *nodiflorum*	fool's watercress	-	cf.17	-	-	-
Solanum dulcamara	bittersweet	-	2	-	-	-
Stachys sp.	woundwort	-	1	-	-	-
Clinopodium acinos	basil thyme	-	10	-	-	-
Mentha sp.	mint	-	18	1	-	-
Sambucus nigra	elder	6	3	-	-	-
Carduus/ Cirsium sp.	thistle	-	27	1	-	-
Sonchus asper type	prickly sow-thistle	-	9	-	-	-
Solidago/ Senecio types	goldenrods/ragworts	-	65	-	-	-
Eupatorium cannabinum.	hemp agrimony	1f.	14	1	-	-
Monocot Root stems/ roots	grass/ sedge stems/ roots	-	-	-	1	-
Baldellia ranunculoides	lesser water plantain	-	1	-	-	-
Alisma plantago-aquatica	water-plantain	1	-	-	-	-
Potamogeton sp.	pondweeds	-	1	-	-	-
Juncus sp.	rush	-	++	1	-	-
Carex sp. (flat)	sedge (lenticular)	-	1	-	-	-
Carex sp. (trigonous)	sedge (trigonous)	-	1	-	-	-
Sparganium erectum (inner seed/ embryo)	branched bur-reed	-	4	-	-	-
Bud indet.		-	1	-	-	-
Trigs/ roundwood/ stems		-	10+	-	-	-

$^{+}$C – denotes material that was preserved by charring. cf. compares with. f fragment. Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more

3.10.12 The samples were generally not very rich in plant macrofossils with the exception of that from the Early to Middle Iron Age at 1.44-1.65m OD which came from swales or possibly tree-throw fills. The lowest samples had mainly seeds of nettle (*Urtica dioica*) and many-seeded goosefoot (*Chenopodium polyspermum*), along with occasional seeds of wetland plants; winter-cress (*Barbarea vulgaris*), water-droplet (*Oenanthe* sp.), mint (*Mentha* sp.), thistles (*Carduus/ Cirsium* sp.), hemp-agrimony (*Eupatorium cannabinum*), and rush (*Juncus* sp.).

3.10.13 The Middle Iron Age sample from 1.44-1.65m OD was very rich in comparison to the other samples with large numbers of seeds of common nettle (*Urtica dioica*), as well as other general species associated with rough wet grasslands/ meadows including buttercup (*Ranunculus* sp.), common meadow-rue (*Thalictrum flavum*) and greater dock (*Rumex* sp.), including clustered dock (*Rumex conglomeratus*), while rushes (*Juncus* sp.) and sedges (*Carex* sp.) may also be found in the wetter more marshy parts of such environments. Seeds of great willowherb (*Epilobium hirsutum*) were also common in the samples and indicative of fens, marshes and stream-sides.

3.10.14 In addition, seeds associated with disturbance were relatively frequent and included those of fat-hen (*Chenopodium album*), many-seeded goosefoot (*Chenopodium polyspermum*) and stitchwort (*Stellaria media*). Additionally those of prickly sow-thistle (*Sonchus asper* type), goldenrods/ragworts (*Solidago/ Senecio* sp.), and thistles (*Carduus/ Cirsium* sp.) are all associated with disturbed grassland and wasteland soils.

3.10.15 Seeds of aquatics were relatively common, but not in great numbers, including those of narrow-fruited watercress (*Rorippa nasturtium-aquaticum*), ridgid hornwort (*Ceratophyllum demersum*), water-crowfoot (*Ranunculus* subg. *Batrachium*), pondweed (*Potamogeton* sp.), lesser water-plantain (*Baldellia ranunculoides*) and occasional gametes of stonewort (*Chara* sp.). The higher presence of seeds of fool's watercress (*Apium nodiflorum*), in relation to seeds of the aforementioned species, undoubtedly reflects the fact that the deposit accumulated in a shallow pond or swale type feature rather than at the channel edge.

3.10.16 Other species are associated with ditches and shallow water in natural ponds, such as water-pepper (*Persicaria hydropiper*), while winter-cress (*Barbarea vulgaris*) is frequently associated with the edge of overgrown scrub or hedgerows, and ditches.

3.10.17 There is some indication of fen woodland edge or overgrown woody scrub, including fruits and catkins of alder (*Alnus glutinosa*), several twigs and buds, seeds of elder (*Sambucus nigra*), bramble (*Rubus* sp.), bittersweet (*Solanum dulcamara*) and greater stitchwort (*Stellaria holostea*).

3.10.18 The assemblage fits that of localised vegetation growing around shallow water in the possible swale in the Early-Middle Iron Age. As with Trench 33, seeds of species associated with disturbance were very common in the samples. In particular seeds of goldenrods and ragworts, which were relatively uncommon in many of the assemblages from the other trenches, were present in both this and Trench 33, with the assemblages appearing to be broadly contemporary.

Pollen

3.10.19 Pollen assessment was carried out on eight samples from Monoliths <81> and <82>. The pollen diagram (Figure 15) has been split into two local pollen assemblage zones (LPAZ), Tr34-1 and Tr34-2 – see Table 48 for LPAZ descriptions.

3.10.20 LPAZ Tr34-1 is dominated by Poaceae (grasses) and Cyperaceae (sedges) indicative of open damp vegetation such as channel edge or wet pasture. However, the pollen within this LPAZ contains significant quantities of taxa which may be associated with sediment reworking or differential preservation. The alluvium is heavily weathered with iron staining and the structure at top of the layer shows that significant pedogenisis has taken place following its deposition. The drying out of this layer is reflected in the low pollen assemblage diversity, dominated by corrosion resistant pollen types including Chenopodiaceae (goosefoot and oraches) and *Cichorium intybus*-type (dandelions/ chicory). The presence of *Pinus sylvestris* (pine), *Polypodium* (polypody), *Pteridium aquilinum* and Pteropsida (monolete) indet. (fern spores) is also probably indicative of reworked material and poor pollen preservation leading to their increased abundance.

3.10.21 Within many of these samples pre-Quaternary spores were also noted suggesting the presence of reworked material. A bulk radiometric date upon bulk sediment <90> towards the base of the sequence provided a date of 2910-2490 cal BC (Beta-204037, 4160±80 BP). However, given the problems of reworked material implied for the base of this sequence, it is highly probable that this date is contaminated by older reworked organic material. The interpretation of this LPAZ is therefore problematic and unlikely to be representative of the local vegetation at the time of deposition, but rather the result of deposition and post-depositional processes.

3.10.22 LPAZ Tr34-2 is similar to that found in LPAZ Tr34-1 as it is dominated by Poaceae and Cyperaceae, with *Sparganium emersum*-type (bur reed) also present indicating a well vegetated wet channel edge or marshy environment. *Corylus avellana*-type (hazel) and *Alnus glutinosa* (alder) may indicate small patches of woodland or carr vegetation in the area, with local wetland communities also reflected by the presence of taxa such as *Ranunculus acris*-type (buttercup), *Filipendula* (meadowsweet) *Typha latifolia* (bull rush) and *Equisetum* (horsetails). Grassland is suggested by occurrences of *Silene vulgaris*-type (bladder champion) and *Prunella vulgaris*-type (selfheal), with *Plantago lanceolata* (ribwort plantain) possibly indicating local grazing activity. However values of *Pinus sylvestris*, *Cichorium intybus*-type, *Polypodium*, *Pteridium aquilinum* and Pteropsida (monolete) indet. remain high which may indicate similar preservation issues to those identified for LPAZ Tr34-1.

3.10.23 The pollen sequence, although possibly indicating a wet grassland and marshy environment, also contains a number of taxa which are probably over-representated due to processes such as sediment reworking and differential preservation. Any interpretation of this sequence should therefore be treated with caution.

Table 48: Pollen zone descriptions for Trench 34, Monoliths <81> and <82>

Zone	Depth (m OD)	Description
Tr34-2	1.54 to 1.94	Dominated by Poaceae (31-39%), Cyperaceae (24-38%), *Sparganium emersum*-type (6-22% TLP + aquatics) and Pteropsida (monolete) indet. (15-19% TLP + pteridophytes). *Pinus sylvestris* (4-7%), *Alnus glutinosa* (4-6%), *Tilia cordata* (up to 1%) and *Corylus avellana*-type (2-7%) are present throughout much of the zone, with occurrences of *Quercus* (up to 1%) also recorded. Herb/dwarf shrubs account for 78-88% TLP, with *Ranunculus acris*-type (up to 2%), Chenopodiaceae (up to 3%), Brassicaceae (1-2%), *Cichorium intybus*-type (1-6%), *Solidago virgaurea*-type (1-5%) and *Glyceria*-type (up to 1%) present. *Polypodium* (up to 3% TLP + pteridophytes) and *Pteridium aquilinum* (1-8% TLP + pteridophytes) are also present. Pollen concentrations range between 46713 to 743320 grains cm^{-3}.
Tr34-1	1.14 to 1.54	Dominated by Poaceae (37-58%), Cyperaceae (21-38%), *Cichorium intybus*-type (6-21%) and Pteropsida (monolete) indet. (12-19% TLP + pteridophytes). *Pinus sylvestris* (1-7%), *Alnus glutinosa* (up to 3%) and *Corylus avellana*-type (up to 1%) are present throughout much of the zone, with occurrences of *Quercus* (up to 4%) also recorded. Herb/dwarf shrubs account for 89-98% TLP, with *Ranunculus acris*-type (up to 1%), Chenopodiaceae (up to up to 5%), Brassicaceae (up to 2%), *Cirsium*-type (up to 4%), *Solidago virgaurea*-type (up to 3%) and *Glyceria*-type (up to 1%) present. *Sparganium emersum*-type (1-10% TLP + aquatics) is present throughout the zone. *Polypodium* (1-12% TLP + pteridophytes) and *Pteridium aquilinum* (up to 6% TLP + pteridophytes) are also present. Pollen concentrations range between 10111 and 780486 grains cm^{-3}.

Diatoms

3.10.24 Four samples were prepared from Trench 34. The two lower diatom samples (1.14 and 1.30m OD) were taken from organic alluvium of possible Neolithic age. The two upper samples (1.46 and 1.62m OD) are from deposits interpreted as possible “tree throw fill or the result of ridge and swale hummocks”. Diatoms are absent from all four samples, with the exception of a coarse striate fragment of an indeterminate pennate diatom present at 1.46m OD.

Ostracods and Foraminifera

3.10.25 Four samples taken from monoliths <82> and <81> have been assessed for the presence, preservation and environmental significance of their ostracod content.

3.10.26 Although no ostracods were recovered from the samples, some comment on the depositonal environment can be made from the other remains which the samples contained (Table 49). At 1.08m OD the molluscan remains including *Lymnaea* and opercula of *Bithynia* would point towards a flowing freshwater environment. At 1.26 and 1.54m OD no identifiable remains were recovered. At 1.84m OD *Bithynia* opercula and plant remains are again indicative of a flowing freshwater environment.

Table 49: Microfaunal content of ostracod/ foraminifera samples from Trench 34

Sample/monolith number	**<82>**	**<82>**	**<82>**	**<81>**
Depth (m OD)	**1.08**	**1.26**	**1.54**	**1.84**
Animal remains				
Molluscs	xx		x	x
Bithynia opercula				x
Lymnaea	x			
Planorbid	xx			
Plant remains				
Plant stems/remains	xx	x		x

x = 1 to 9 specimens; xx = 10 to 50 specimens; xxx = over 50 specimens

Molluscs

INTRODUCTION

3.10.27 Five samples were examined for molluscan remains from the deposits at Trench 34. The sediments of this sample sequence have been described in Table 45. Shell numbers were generally low and no brackish water or marine shells were recovered. Although the assemblages were small, some general comments on the local environment can be made. The results are tabulated in Table 50.

CONTEXT (98), SAMPLE <87>, TUFACEOUS SAND.

3.10.28 The assemblage was dominated by the fresh water species, in particular *Valvata piscinalis* and *Bithynia tentaculata*. These species are indicative of well oxygenated, densely vegetated flowing permanent water environments. The other fresh water species present in the assemblage can also live in areas of well vegetated slow-moving water such as at the channel margins.

3.10.29 The single land snail recovered was a specimen of *Vertigo pygmaea*. Although this is an open country species, favouring short grassland and arable environments, it can also live in marshes.

CONTEXTS (90) AND (89), SAMPLES <86> AND <85>, ORGANIC ALLUVIUM

3.10.30 No shells were recovered from these contexts.

CONTEXT (88), SAMPLE <84>, POSSIBLE TREE THROW FILLS/ RIDGE/ SWALE, HUMMOCKS

3.10.31 This was the richest and most diverse assemblage within the sequence and appears to reflect the exploitation of a number of different niche environments. A number of the species are indicative of well oxygenated, densely vegetated flowing permanent water environments. These include *Bithynia tentaculata*, *Valvata cristata* and *Planorbis planorbis*. *Bithynia tentaculata* in particular thrives in large bodies of water and is rare in small closed ponds. *Hippeutis complanatus* is indicative of well-vegetated slow-moving water, while *Gyraulus albus* exploits most permanent aquatic habitats.

3.10.32 The presence of more marshy areas or possibly swales (see sediment descriptions) in the vicinity is suggested by the occurrence of *Lymnaea truncatula* and *Anisus leucostoma,* species which inhabit areas of seasonal desiccation. A number of the terrestrial species, including *Carychium minimum* and *Vallonia excentrica/ pulchella*, can also survive in damp marshy environments. The remaining terrestrial snails may indicate areas of long grass.

Table 50: Mollusc assessment from Trench 34

Sample	**<87>**	**<86>**	**<85>**	**<84>**	**<83>**
Context	**(98)**	**(90)**	**(89)**	**(88)**	**(87)**
Depth top (m OD)	**1.1**	**1.27**	**1.44**	**1.65**	**1.97**
Depth bottom (m OD)	**1.05**	**1.1**	**1.27**	**1.44**	**1.65**
Sediment Type	**tufaceous sand**	**organic alluvium**	**organic alluvium**	**possible tree throw fills /ridge/swale, hummocks**	**overbank alluvium**
Period		**Neolithic**			
Sample Size (litres)	**5**	**5**	**5**	**5**	**5**
Land snails					
Carychium minimum	-	-	-	1	-
Cochlicopa spp	-	-	-	2	1
Vertigo pygmaea	1	-	-	-	2
Vallonia excentrica/ pulchella	-	-	-	7	9
Discus rotundatus	-	-	-	-	+
Aegopinella pura	-	-	-	-	1
Aegopinella nitidula	-	-	-	1	1
Limicidae	-	-	-	-	1
Trichia hispida	-	-	-	2	5
Cepaea sp.	-	-	-	-	+
Fresh and Brackish Water Snails					
Valvata cristata	1	-	-	5	-
Valvata piscinalis	2	-	-	-	-
Bithynia tentaculata	2	-	-	1	-
Bithynia spp.	-	-	-	5	-
Bithynia opercula	-	-	-	3	-
Lymnaea truncatula	-	-	-	5	1
Planorbis planorbis	-	-	-	1	1
Anisus leucostoma	-	-	-	1	4
Bathyomphalus contortus	1	-	-	-	-
Gyraulus albus	1	-	-	5	-
Hippeutis complanatus	-	-	-	2	-
Pisidium spp.	-	-	-	4	-
Taxa	6	0	0	13	10
Total	8	0	0	41	26
% Shade - loving species	0	0	0	4.9	7.7
% Intermediate species	0	0	0	7.3	26.9
% Open country species	12.5	0	0	17.1	42.3
% Amphibious species	0	0	0	14.6	19.2
% Intermediate species	25	0	0	17.1	0
% Ditch species	12.5	0	0	14.6	3.9
% Moving water species	50	0	0	14.6	0
% Unassigned species	0	0	0	9.8	0

CONTEXT (87), SAMPLE <83>, OVERBANK ALLUVIUM

3.10.33 The freshwater molluscs represent 23% of the assemblage and are indicative of a marshy area with seasonal desiccation. The land snails are typical of a long grass environment with some seasonal flooding or patches of standing water.

DISCUSSION

3.10.34 The mollusc assemblage obtained from the basal deposit, context (98), is indicative of a permanently wet, densely vegetated channel edge environment with slow-moving water. This environment is also suggested by a number of the molluscs recorded in context (88), together with areas of marsh or swales, subjected to seasonal desiccation, and long grass in the vicinity. The permanently wet areas within the landscape are no longer indicated by the molluscs observed within context (87). These reflect an open area of long damp grass, with occasional flooding.

3.10.35 There are similarities between these assemblages and those analysed from sequences elsewhere in the development area. Although a Neolithic date has been obtained for a deposit towards the base of the sedimentary sequence (context (90)), the molluscs from the upper fill context (87) are more comparable with those recorded from the medieval fills at Trench 71, the 19th century deposit at Trench 52, and upper deposits at Trench 33.

3.11 Trench 35 (PDZ1 Site 25 Trench 10)

Introduction

3.11.1 This sequence, although of with relatively low apparent palaeoenvironmental potential, was selected for further work due to the presence of horse bone that had been suggested as being of possible Neolithic date. Macrofossil analysis was undertaken to clarify the context of the find, along with microfossil work from the monolith sample.

3.11.2 A probably peaty land suface was recorded, overlying gravel and overlain by fine clayey alluvium. Within this peaty land surface at c. 1.55-1.50m OD was an adult horse bone (a metatarsal). The bone was of some particular interest as it showed indications of cut marks potentially made by lithic tools (Howell *et al*. 2005, 21). The peat was thought to be contemporary with the radiocarbon dated sediment within Trench 34 (see above) that was Middle to Late Neolithic in date (2910–2490 cal BC; Beta-204037, 4160±80 BP); however subsequent dating of the horse bone has shown it to be dated 750-400 cal BC (SUERC-36296, 2425±30 BP) with a comparable date derived from seeds within the peat 760-410 cal BC (NZA-32949, 2462±35 BP) showing that infact this sequence is Late Bronze Age to Early Iron Age in date.

3.11.3 Given the absence of known horse remains from British Neolithic deposits, and the possibility that such animals were not present in the British Isles at this time, this made the deposit of particular interest. However, it has been speculated that the bone may have sunk down through the peats, raising the possibility that it was younger than the deposits from which it was recovered. As the bone was not yet available for analysis at the time, it was decided to analyse and date the peat itself (94) as it contained high numbers of waterlogged plant remains highly suitable for radiocarbon dating.

Sediments

3.11.4 No section drawing was available for this trench, and is only shown as a summary borehole diagram in Howell *et al.* (2005) and Spurr and Corcoran (2010). Sediment descriptions and interpretations can be found in Table 51.

Table 51: Sediment descriptions for Monolith <91>, Trench 35

Level (m OD)	Context	Sediment description	Interpretation
1.95 to 1.66	91, 92, 93	10YR4/ 1 dark grey to 10YR 5/ 1 dark greyish brown silty clay loam, heavily dried and concreted, rehydration difficult. Single distinct iron stain c.20mm diameter (?root). Wood fragment at 1.75m OD. Clear to sharp boundary,	alluvium
1.66 to 1.60	94	10YR4/ 1 dark grey sand silt loam, gritty, very small to small gravel inclusions increasing to base, boundary quite sharp with gravel below	'peaty land surface'
1.60 to 1.45	95	Rounded to sub-rounded gravel, larger at top and 2-30mm diameter. Little matrix.	gravel

Dating

3.11.5 A single radiocarbon dates has been obtained from Bulk Sample <93>, with an associated date on a metatarsal bone of *Equus* sp. (Table 52).

Table 52: Radiocarbon dates from Trench 35

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)	C:N	Calibrated date (95.4%, 2σ range)	Reliability of Date
<93> (94)	1.55 to 1.70	Plant material: *Alnus glutinosa* cone, 3 x *Crataegus monogyna* stones	NZA-32949	2462±35	-28.1			760-410 cal. BC	1
Interface of gravel (95) and silt (94)		Bone: *Equus* sp. metatarsal	SUERC-36296	2425±30	-22.6	6.6	3.2	750–400 cal BC	1

3.11.6 Radiocarbon dating of hawthorn stones from the deposit demonstrate that it is most probably Early to Middle Iron Age in date. Such a date is more in keeping with the finding of butchered horse bones, returning a comparable date of 750-400 cal BC (SUERC-36296, 2425±30 BP).

Plant macrofossils

3.11.7 Plant macrofossils were examined from three contexts, the silty peat from which the horse leg bone was recovered (94), the underlying gravels (95) and the overlying alluvial clays (93) (Table 53).

3.11.8 Waterlogged seeds were extremely rare in the samples above and below the silty peat, but relatively frequent within this context (94). The lowest sample from the basal gravels (95) had a single seed of hemp-agrimony (*Eupatorium cannabinum*), several seeds of rush (*Juncus* sp.) and a few fragments of seeds of sedge (*Carex* sp.). However, it seems probable that this material is derived from the overlying peat sample.

3.11.9 The sample from the peaty silts (94) was relatively rich in remains of wet woodland and scrub species, including those of alder (*Alnus glutinosa*) comprising fruits, catkins and cones, probable thorns and fruit-stones of hawthorn (*Crataegus monogyna*) and occasional seeds of elder (*Sambucus nigra*) and bramble (*Rubus* sp.). Seeds of hemp-nettle (*Galeopsis* sp.) and nipplewort (*Lapsana communis*) are found on the edge of scrub, in hedgerows and within field edges.

3.11.10 While such woody species remains were relatively common those of more open wetland species were more abundant, and included seeds of rush (*Juncus* sp.), sedge (*Carex* sp.), water-plantain (*Alisma plantago-aquatica*), common club-rush (*Schoenoplectus lacustris*), celery-leaved buttercup (*Ranunculus sceleratus*), mint (*Mentha* sp.) and a single seed of pond-weed (*Potamogeton* sp.).

3.11.11 Other species recovered comprised those of disturbed soils and nitrogen enriched soils as often found near settlements, arable fields and/ or associated animal trampling and included seeds of common nettle (*Urtica dioica*), fat-hen (*Chenopodium album*), many-seeded goosefoot (*C.* polyspermum), orache (*Atriplex* sp.), nightshade (*Solanum nigrum*), runch (*Raphanus raphanistrum*). Along with these species those of dock (*Rumex* sp.), and buttercup (*Ranunculus* subg. *Ranunculus*) can be found in rough wet grassland, settlement soils and the edge of arable fields.

3.11.12 Of some significance alongside the butchered horse leg-bone and the remains of charcoal were two charred glumes of hulled wheat (*Triticum dicoccum/ spelta*) and charred seeds of cleavers (*Galium aparine*) and dock (*Rumex* sp.).

Table 53: Plant macrofossils data from Trench 35

Sample		**<92>**	**<93>**	**<94>**
Context		**(93)**	**(94)**	**(95)**
Depth top (m OD)		**2**	**1.7**	**c.1.55**
Depth bottom (m OD)		**1.75**	**c.1.55**	**c.1.25**
Sediment Type		**alluvial clay?**	**Peats**	**Basal gravels**
Sample Size (litres)		**10-20**	**10-20**	**10-20**
Flot size (ml)		**20**	**250**	**10**
Ranunculus subg. *Ranunculus* (arb)	buttercup	-	4	-
Ranunculus sceleratus	celery-leaved buttercup	-	+	-
Urtica dioica	common nettle	+	+	-
Alnus glutinosa (fruits)	alder fruits	-	2	-
Alnus glutinosa (female catkins/ cones)	female catkins/ cones	-	3	-
Alnus glutinosa (male catkins, fragments)	alder male catkins	-	++	-
Chenopodium polyspermum	many-seeded goosefoot	-	3	-
Chenopodium album	fat-hen	-	2	-
Atriplex sp.	orache	-	1	-
Stellaria palustris (Retz)/ graminea	marsh/ lesser stitchwort	-	1	-
Rumex sp.	dock	-	1ch	-
Elantine hexandra/ *Hypericum* sp.	waterwort/ St. John's wort	-	3	-
Raphanus sativus/ *raphanistrum* (capsule)	radish/ charlock	-	1	-
R. raphanistrum ssp. *Raphanistrum* (capsule)	runch, charlock	-	1	-
Rubus sp.	bramble	1	6	-
Potentilla anserina	silverweed	-	1	-
Crataegus monogyna (fruit stones)	hawthorn berries	-	5	-
Crataegus monogyna (thorns)	hawthorn berries	-	1	-
Apium sp.	celery/ water-cress	-	1	-
Solanum nigrum	black nightshade	-	1	-
Galeopsis sp.	hemp-nettle	-	-	-
Lycopus europaeus	gypsywort	-	1	-
Mentha sp.	mint	-	+	-
Galium aparine	cleavers	-	1ch	-
Sambucus nigra	elder	-	2	-
Lapsana communis	nipplewort	-	2	-
Eupatorium cannabinum.	hemp acrimony	-	1	1
Alisma plantago-aquatica	water-plantain	-	1	-
Potamogeton sp.	pondweeds	-	1	-
Juncus sp.	rush	+	++	+
Schoenoplectus lacustris	common club-rush	-	2	-
Carex sp. (flat)	sedge (lenticular)	-	1	-
Carex sp. (trigonous)	sedge (trigonous)	+	++	1
Triticum spelt/ *dicoccum*	spelt/ emmer wheat glume bases	-	2ch	-
Typha latifolia/ *angustifolia*	bulrush	+	-	-
Wood and twigs indet.		-	+	-
Bud indet.		-	1	-
Charcoal	charred wood indet.	+	+	-

+C – denotes material that was preserved by charring. cf. compares with. Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more

3.11.13 The sample from the alluvial clays above (93) had many similar seeds including those of nettle, bramble, rush, and sedge, along with bulrush (*Typha latifolia*/ *angustifolia*). While it is possible that at least some of the material has been reworked from the underlying silty-peats, at least the presence of seeds of bulrush and the general absence of woody-shrub species along with the deposition of probable alluvial deposits indicate that it became increasingly open, and flooded in this area.

3.11.14 The silty peat indicates that during the Early-Middle Iron Age alder, with some woody scrub, was still present on the site. However, the presence of reasonable numbers of seeds of sedge and wetland species indicates an expanse of wet marsh and grassland vegetation. There are also some indicators of animals and potentially even settlement or fields in the presence of some common weeds of such habitats.

3.11.15 The remains of charred cereals, along with the butchered horse bone, would at least hint at settlement within the area and in this respect, combined with the roundhouse's at Trench 9 and Trench 24, would strongly hint at probable settlement upon the gravels stretching from Middle Bronze Age into the Early-Middle Iron Age. However, it should be noted that no further evidence was forthcoming for such settlement from excavation in the area immediately to the south-east.

Table 54: Pollen assemblage from Trench 35, Monolith <91>. Percentages (of TLP) are shown in brackets for the sample from 1.63m OD.

Sample	**<91>**	**<91>**	**<91>**
Depth (m OD)	**1.90**	**1.80**	**1.63**
Pinus sylvestris			16 (9.9)
Quercus			1 (0.6)
Betula		1	3 (1.9)
Alnus glutinosa		2	16 (9.9)
Tilia cordata		1	
Acer campestre			1 (0.6)
Corylus avellana-type		3	7 (4.3)
Salix			2 (1.2)
Ranunculus acris-type			1 (0.6)
Chenopodiaceae			2 (1.2)
Filipendula			2 (1.2)
Rosaceae undiff.			2 (1.2)
Apiaceae undiff.			1 (0.6)
Plantago lanceolata			1 (0.6)
Succisa pratensis			1 (0.6)
Lactuceae undiff.	2	1	1 (0.6)
Cyperaceae undiff.	2	28	45 (28.0)
Poaceae undiff.	1	26	59 (36.6)
Potamogeton natans-type	1		
Sparganium emersum-type	1	2	15 (8.5)
Polypodium		1	3 (1.3)
Pteridium aquilinum		5	14 (6.3)
Pteropsida (monolete) indet.	2	11	45 (20.2)
Trees	0	4	37 (23.0)
Shrubs & Climbers	0	3	9 (5.6)
Dwarf Shrubs & Herbs	5	55	115 (71.4)
Total Land Pollen Sum	5	62	161
Pollen Concentration (grains cm^{-3})	17057	22516	13557

Pollen

3.11.16 Pollen assessment was carried out on four samples from monolith <91> in Trench 35. Pollen preservation was found to be poor in the upper three samples taken from monolith <91> (absent in sample from 1.70m OD), with insufficient pollen was retrieved to enable full assessment with the exception of the sample from 1.63m OD.

Table 54 shows the pollen assemblage obtained from the three samples, with on the basal sample at 1.63m OD yielding sufficient pollen for full assessment counts.

3.11.17 The pollen sample from 1.63m OD shows an assemblage dominated by Poaceae (grasses) and Cyperaceae (sedges), with low amounts of *Pinus sylvestris* (pine), *Alnus glutinosa* (alder) and *Corylus avellana*-type (hazel) implying a largely open local environment. Other notable taxa present include *Sparganium emersum*-type (bur-reed), *Pteridium aquilinum* (bracken) and Pteropsida (monolete) indet. (fern spores).

Diatoms

3.11.18 Four samples were selected for assessment from monolith <91> at 1.63, 1.69, 1.79 and 1.91m OD, though diatoms were absent in all samples.

Ostracods and Foraminifera

3.11.19 Three samples from monolith <91> have been assessed for the presence, preservation and environmental significance of their ostracod content.

3.11.20 The samples assessed for their ostracod content were from 1.50, 1.73 and 1.85m OD. The content of the assessed samples is given in Table 55. Ostracods were not recovered from any of the samples. At 1.50m OD plant remains were noted and occasional broken molluscs. At 1.73m OD broken molluscs, plant remains, a seed and occasional charcoal were recovered. At 1.85m OD, plants, charcoal and a cladoceran egg case were recovered.

3.11.21 The lack of ostracods recovered from these samples inhibit any ecological interepretations. At 1.50m OD the coarse nature (sands and gravels) of the sediment may indicate higher energy deposition and possible destruction of fragile ostracod remains. At 1.73 and 1.85m OD some post depositional dissolution of ostracod remains may explain the absence of ostracods. The other remains are of interest although the molluscs were too fragmented for identification. Charcoal at 1.73 and 1.85m OD is a possible indication of human activity in the area.

Table 55: Microfaunal content of ostracod/ foraminifera from Trench 35

Monolith number	<91>	<91>	<91>
Depth (m OD)	1.85	1.73	1.5
Other remains			
Cladoceran egg case	X		
Molluscan remains		xx	x
Seeds		x	
Plant remains	xxx	xxx	xx
Charcoal	x	X	

x = 1 to 9 specimens; xx = 10 to 50 specimens; xxx = over 50 specimens

Molluscs

3.11.22 Three subsamples of 80-100ml were taken from monolith <91> at 1.64, 1.76 and 1.88 mOD. Only two shell were found in these samples, consisting of *Helicella itala* and *Pisidium* spp., at 1.76m OD.

3.12 Trench 43 (PDZ3 3.17/18)

Introduction

3.12.1 This trench contained a number of Late Bronze Age archaeological features including enclosure ditches, a roundhouse, refuse pits, occupation deposits and a cremation burial. Palaeoenvironmental invesitigations were therefore undertaken of the alluvial and soil sequences to help elucidate the local environment associated with activity in this location.

Dating

3.12.2 Nine radiocarbon dates were obtained from Table 56, of which only one associated with the palaeoenvironmental samples is discussed below are given. For a full listing of all radiocarbon dates see Appendix 1: Radiocarbon Dates.

Table 56: Selected radiocarbon dates from Trench 43

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<147> (628)	-	Seeds: 3 x *Menyanthes*, 3 x *Sparganium*	SUERC-34958	1145±35	-27	cal AD 770–980	1

Plant macrofossils

3.12.3 A total of eleven bulk samples with waterlogged material were examined from Trench 43, shown in Table 57. Initial radiocarbon dating and pottery analysis had suggested that the features might date to the Middle to Later Bronze Age. However, radiocarbon dating of plant macrofossils from three of these features; ditches 628 and 603 and posthole 512, associated with ditch 503/628, produced broadly contemporary Middle to Late Saxon dates. Ditch 628 provided a date of cal AD 770-980 (SUERC-34958, 1145±35 BP), although posthole 513 (512) that was sunk into this ditch yielded a slightly earlier date of cal AD 640-770 (SUERC-36231, 1335±30 BP) and that from ditch 603 produced a similar date of cal AD 610-770 (SUERC-36230, 1360±30 BP). It should be noted that earlier features, radiocarbon dated to the Late Bronze Age, had no waterlogged material and it is probable therefore that the watertable rose permanently and the area became increasing flooded at some point in the Iron Age to Romano-British period.

3.12.4 The samples were all broadly similar in the range of species recorded and the environments that these species portrayed. The ditches appeared to be very vegetated with probably permanent shallow standing to slowly following water within them, possibly being fed from nearby channels on occasion. Aquatics included those of stonewort (*Chara* sp.), water-crowfoot (*Ranunculus* subg. *Batrachium*), water-plantain (*Alisma plantago-aquatica*), lesser water-plantain (*Baldellia ranunculoides*), duckweed (*Lemna* sp.), arrowhead (*Sagittifolia sagittifolia*), water-starwort (*Callitriche* sp.), branched bur-reed (*Sparganium erectum*) and club-rush (*Schoenoplectus* sp.).

3.12.5 The environment beyond the ditch can be seen through the presence of seeds of many species characteristic of a marshy grassland pasture environment with some disturbance, most probably by animal trampling. This element includes seeds of rushes (*Juncus* sp.), sedges (*Carex* sp.), sweet-grass (*Glyceria* sp.), buttercup (*Ranunculus* sp.), marsh marigold (*Caltha palustris*), bogbean (*Menyanthes trifoliata*), mint (*Mentha* sp.) and dock (*Rumex* sp.). More disturbed elements, despite the evidence for the ditches, pits and postholes, were much less well represented, but included seeds of common nettle (*Urtica dioica*), fat-hen (*Chenopodium album*), orache (*Atriplex* sp.), swine-cress (*Coronopus squamatus*), knotgrass (*Polygonum aviculare*), and redshank/ pale persicaria (*Persicaria maculosa/ lapathifolium*).

3.12.6 Seeds of celery-leaved buttercup (*Ranunculus sceleratus*) were fairly common within the samples and this species is often found in bare or more trampled areas of estuarine or near-estuarine meadows and pastures. Other elements, such as water-droplet (*Oenanthe* sp.) and yellow flag (*Iris pseudacorus*) along with mint, sedge and rush, are likely to have lined the ditch itself.

3.12.7 Remains of scrub and woodland elements were rare, being almost absent from the samples, and it seems unlikely that the ditches were lined by more than occasional scrubs, such as elder (*Sambucus nigra*) and bramble (*Rubus* sp.).

Table 57: Waterlogged plant remains from Saxon ditches and pits, Trench 43

Sample		<106>	<147>	<103>	<102>	<105>	<104>	<135>	<121>	<120>	<136>	<137>
Context		(502)	(628)	(522)	(512)	(520)	(510)	(602)	(569)	(571)	(598)	(610)
Group			Ditch 503									
		16	72	17	18	33	34	59	9	10	61	70
Feature		Ditch	Ditch	Pit	Posthole	Posthole	Posthole	Ditch	Pit	Pit	Pit	Gully
Feature number		503	629	523	513	521	511	603	570	572	599	611
Sample Size (litres)		5	5	5	5	5	5	5	5	5	5	5
Flot size (ml)		>40	>40	>40	>40	>40	>40	>40	>40	>40	>40	>40
Chara (gametes)	stonewort	1	+	-	1	2	-	3	+	-	1	-
Bryophyta (leaf stem)	mosses	-	-	-	-	-	-	-	-	-	2	-
Bryophyta (capsule with calyptra)	mosses	+	+	-	-	-	-	-	-	-	1	-
Caltha palustris	common meadow rue	1	-	-	-	-	-	-	-	-	-	-
Ranunculus acris/ repens	buttercup	-	10	8	4	2	1	19	-	-	8	1
Ranunculus sceleratus	celery-leaved buttercup	1	1	2	2	2	-	++	-	-	4	-
Ranunculus lingua	greater spearwort	-	1	-	-	-	-	-	-	-	-	-
Ranunculus subg. *Batrachium*	water-crowfoots	2	-	2	-	-	1	1	1	-	2	1
Ficus carica	fig	-	-	-	-	-	1	-	-	-	-	-
Urtica dioica	common nettle	2	-	-	-	-	3	1	-	-	-	2
Chenopodium album	fathen	-	-	1	-	-	-	-	-	-	-	-
Atriplex sp.	orache	-	-	-	-	-	2	-	-	1	-	-
Stellaria sp.	stitchwort	-	-	-	-	-	1	-	-	-	-	-
Stellaria palustris	marsh/ lesser stitchwort	-	-	1	-	-	-	-	-	-	-	-
Persicaria maculosa/ lapathifolium	redshank/ pale persicaria	-	-	-	-	-	1	-	-	-	-	-
Polygonum aviculare	knotgrass	-	-	-	-	-	8	-	-	-	-	-
Rumex sp.	dock	1	-	1	-	-	-	-	-	-	-	-
Viola odorata/ hirta	sweet/ hairy violet	-	-	-	-	-	-	-	-	-	3	-
Brassicaceae (*Lepidium, Barbarea* type)	small indets. 1-2mm	-	-	-	-	-	1	-	-	1	-	-
Rorippa cf. nasturtium-aquaticum	narrow-fruited watercress	-	-	-	1	-	-	-	-	-	-	-
Coronopus squamatus	swine-cress	-	-	-	-	-	1	-	-	-	-	-
Rubus sp.	bramble	-	-	-	-	-	1	-	-	2	2	-
Potentilla sp.	cinquefoil/ tormentil	1	-	-	-	-	-	2	1	-	-	-
Myriophyllum sp.	water-milfoil	-	2	1	2	-	-	-	-	-	-	-
Oenanthe sp.	water-droplets	1	1	-	-	-	1	1	1	-	1	-
Oenanthe fluviatilis	water-dropworts	-	-	-	-	-	-	2	1	-	1	-

Sample		<106>	<147>	<103>	<102>	<105>	<104>	<135>	<121>	<120>	<136>	<137>
Context		(502)	(628)	(522)	(512)	(520)	(510)	(602)	(569)	(571)	(598)	(610)
Group			Ditch 503									
		16	72	17	18	33	34	59	9	10	61	70
Feature		Ditch	Ditch	Pit	Posthole	Posthole	Posthole	Ditch	Pit	Pit	Pit	Gully
Feature number		503	629	523	513	521	511	603	570	572	599	611
Sample Size (litres)		5	5	5	5	5	5	5	5	5	5	5
Flot size (ml)		>40	>40	>40	>40	>40	>40	>40	>40	>40	>40	>40
Apium graveolens	wild celery	1	-	-	-	-	-	-	-	-	-	-
Solanum nigrum	black nightshade	-	1	-	-	-	-	-	-	-	-	-
Menyanthes trifoliata	bogbean	2	3	2	1	3	3	-	-	-	-	-
Mentha sp.	mint	14	7	24	21	16	1	++	5	-	29	11
Callitriche sp.	water-starwort	1	2	17	1	1	-	+++	-	-	13	1
Callitriche stagnalis	common water-starwort	-	-	-	-	-	-	-	1	-	-	-
Plantago major	greater plantain	-	-	-	-	-	1	-	-	-	-	-
Galium sp.	cleavers	-	-	-	-	-	-	-	-	-	1	1
Sambucus nigra	elder	1	1	-	1	-	-	2	-	-	-	-
Sagittifolia sagittifolia	arrowhead (whole fruit)	-	-	-	-	-	-	-	1	-	-	-
Sagittifolia sagittifolia	arrowhead (inner)	1	1	1	-	1	-	1	-	-	-	-
Baldellia ranunculoides	lesser water plantain	-	1	-	-	-	-	1	1	-	-	-
Alisma plantago-aquatica	water-plantain	2	3	2	3	2	1	-	-	-	10	2
Lemna sp.	duckweeds	-	-	-	-	-	-	1	-	-	-	-
Juncus sp.	rush	2	++	1	-	+	-	++	1	-	15	-
Juncus sp. (capsule)	rush (capsule)	-	-	-	-	-	-	1	-	-	-	-
Eleocharis sp.	spike-rush	8	9	8	4	1	2	25	6	-	18	3
Schoenoplectus sp.	club rushes	1	5	2	3	-	1	-	-	-	-	-
Isolepis setacea	bristle club-rush	-	-	-	-	1	-	-	-	-	-	-
Carex sp. (flat)	sedge (lenticular)	2	2	1	3	-	-	1	-	-	3	-
Carex sp. (trigonous)	sedge (trigonous)	10	19	19	22	3	1	20	3	-	19	4
Carex cf. *hirta*	hairy sedge	-	-	-	2	-	-	-	-	-	-	-
Poaceae (*Glyceria*/ *Danthonia* type)		-	-	-	-	-	1	-	-	-	-	-
Glyceria sp.	sweet-grasses	-	1	-	-	-	-	-	3	-	-	-
Poa/Phleum sp.	meadow grass/ cats'-tails	-	-	-	1	-	-	-	-	-	-	-
Cereal grain indet.	cereal grain indet.	-	1	-	-	-	-	-	-	-	-	-
Triticum dicoccum/ spelta (glume base)		-	4	-	-	-	-	-	-	-	-	-

Sample		<106>	<147>	<103>	<102>	<105>	<104>	<135>	<121>	<120>	<136>	<137>
Context		(502)	(628)	(522)	(512)	(520)	(510)	(602)	(569)	(571)	(598)	(610)
Group			Ditch 503									
		16	72	17	18	33	34	59	9	10	61	70
Feature		Ditch	Ditch	Pit	Posthole	Posthole	Posthole	Ditch	Pit	Pit	Pit	Gully
Feature number		503	629	523	513	521	511	603	570	572	599	611
Sample Size (litres)		5	5	5	5	5	5	5	5	5	5	5
Flot size (ml)		>40	>40	>40	>40	>40	>40	>40	>40	>40	>40	>40
Triticum dicoccum (glume base)	emmer wheat	-	1	-	-	-	-	-	-	-	-	-
Sparganium erectum (fruit/achene)	branched bur-reed	2	5	-	2	-	-	-	-	-	-	1
Iris pseudacorus	yellow iris	1	4	-	2	-	-	-	-	-	-	-
Wood		-	-	-	-	-	-	-	-	++	-	-
charcoal		+	+	+	+	-	-	-	-	-	-	-
Worm cocoons		+	++	-	-	-	-	-	+	++	1	-
Cristatella mucedo	statoblasts	-	-	-	-	-	-	-	++	-	-	-

Insects

3.12.8 The two late Anglo-Saxon ditches (features 503 and 629) from Trench 43 produced relatively small faunas of insects which are difficult to interpret (Table 58). There are a few taxa, such as the ‘diving water beetle’ *Hygrotus decoratus* and the ‘whirligig’ *Gyrinus* spp., which are associated with slow or still waters and the presence of pasture is probably suggested by the *Aphodius* ‘dung beetle’ from ditch 629. These ditches appear to have contained relatively dense stands of waterside vegetation, clearly suggested by the numbers of ‘reed beetles’ recovered. *Donacia clavipes* is associated with common club-rush (*Schoenoplectus lactustris*), *D. simplex* with a range of water reeds and *Plateumaris braccata* with water reed (*Phragmites australis*), while the weevil *Notaris acridulus* is normally associated with stands of reed sweet-grass (*Glyceria maxima*). Water-millfoil (*Myriophyllum* – the food plant of *Phytobius canaliculatus*) also appears to have been present on the surface of the water in the ditches.

Table 58: Insect assemblage from Trench 43

Sample number		**<106>**	**<147>**	**Phytophage plant hosts (nomenclature follows that of Stace 1997)**
Context number		**(502)**	**(629)**	
(s) group		**16**	**72**	
Feature number		**503**	**628**	
Feature type		**Ditch**	**Ditch**	
Date		**Saxon**	**Saxon**	
Volume (l.)		**5**	**5**	
COLEOPTERA				
Carabidae				
Bembidion guttula (F.)		1	-	
Bembidion spp.		-	2	
Pterostichus strenuus (Panz.)		-	1	
Dytiscidae				
Hygrotus decoratus (Gyll.)	a	-	1	
Agabus spp	a	-	1	
Gyrinidae				
Gyrinus spp.	a	1	-	
Hydrophilidae				
Cercyon spp.		-	1	
Megasternum boletophagum (Marsh.)		-	1	
Staphylinidae				
Stenus spp.		1	3	
Lathrobium spp.		-	1	
Dryopidae				
Dryops spp.	a	-	1	
Nitidulidae				
Brachypterus urticae (F.)	p	-	1	*Urtica dioica* L. (stinging nettle)
Cryptophagidae				
Cryptophagus spp.	s	-	1	
Scarabaeidae				
Aphodius spp.	df	1	-	
Chyrsomelidae				

Sample number		**<106>**	**<147>**	**Phytophage plant hosts (nomenclature follows that of Stace 1997)**
Context number		**(502)**	**(629)**	
(s) group		**16**	**72**	
Feature number		**503**	**628**	
Feature type		**Ditch**	**Ditch**	
Date		**Saxon**	**Saxon**	
Volume (l.)		**5**	**5**	
Donacia clavipes (F.)	ws	2	3	*Schoenoplectus lactustris* (L.) Palla (common club-rush)
Donacia simplex (F.)	ws	-	3	Range of water reeds and rushes
Plateumaris braccata (Scop.)	ws	2	3	*Phragmites australis* (Cav.) Trin. ex Steud. (common reed)
Phaedon spp.	p	1	-	
Prasocuris phellandrii (L.)	ws	-	2	On aquatic Apiaceae (Umbellifers)
Curculionidae				
Apion spp.	p	1	-	
Sitona flavescens (Marsh.)	p	-	1	*Trifolium* species (Clover)
Notaris acridulus (L.)	ws	1	-	Often on *Glyceria maxima* (Hartm.) Holmb. (reed sweet-grass) and other *Glyceria* species (sweet-grasses)
Notaris spp.	ws	-	3	
Limnobaris pilistriata (Steph.)	ws	-	1	Juncaceae (rushes) and Cyperaceae (sedges)
Phytobius canaliculatus (Fahrs.)	a	-	4	*Myriophyllum spp.* (water-milfoils)
Ceutorhynchus spp.	p	1	-	
Gymnetron spp.	p	-	1	*Plantago lanceolata* L. (ribwort plantain)
Total number of individuals		13	35	
Total number of taxa		11	20	

Key to ecological groupings used
a= aquatic water beetles
aff= aquatic taxa normally associated with faster flowing waters
ws = waterside taxa often associated with emergent vegetation
df = taxa often associated with dung
p= taxa associated with grassland and open areas
l= taxa associated with trees
s= taxa normally associated with human settlement

3.13 Trench 44 (PDZ3 3.19)

Introduction

3.13.1 This trench contained a probable post-medieval ditch 1029 from which molluscs were analysed to help identify the nature of the local environment.

Molluscs

3.13.2 A series of two samples were selected for molluscan analysis from the post-medieval ditch 1029, results shown in Table 59. Shell numbers were too low within sample <218> to define the local environment. The moderate assemblage from sample <216> was dominated by the moving water species in particular *Valvata piscinalis*. These species favour large bodies of slowly flowing water with dense growths of aquatic plants.

Table 59: Mollusc assessment from Trench 44

Sample	<218>	<216>
Context	(1030)	(1030)
Feature	1029	1029
Sample size (litres)	5	5
Land snails		
Carychium cf. *minimum*	-	1
Carychium tridentatum	-	1
Vallonia pulchella/ excentrica	-	1
Aegopinella nitidula	-	2
Limicidae	1	3
Fresh and Brackish Water Snails		
Valvata cristata	-	14
Valvata piscinalis	-	34
Bithynia tentaculata	-	3
Bithynia spp.	1	5
Bithynia opercula	130	71
Lymnaea spp.	-	2
Gyraulus crista	-	21
Planorbids	-	2
Pisidium spp.	-	5
Taxa	2	11
Total	2	94
Shannon Index	0.693	1.78
Brillouin Index	0.347	1.62
Shannon - Brillouin Index	0.347	0.16
Delta 2	0.5	0.7748
Delta 4	0	3.6108
% Open country species	0	1.06
% Intermediate species	50	3.19
% Shade - loving species	0	4.26
% Unassigned species	0	0
% Amphibious species	0	0
% Intermediate species	0	22.34
% Ditch species	0	14.89
% Moving water species	50	44.68
% Unassigned species	0	9.57
Ratio of Bithynia apices to opercula	1:130	1:8.875

3.13.3 The other species present in significant percentages within the assemblage were *Valvata cristata* and *Gyraulus crista*. *Valvata cristata* is found in all kinds of well-vegetated aquatic habitats while *Gyraulus crista* is found in most lowland aquatic habitats apart from those susceptible to drying. The ratio of 8.9 opercula to one *Bithynia* apex may also be indicative of material from a flowing water environment. There is only a small presence of species likely to be exploiting damp long grass along the ditch edge. These appear to include the marsh species *Vallonia pulchella* and *Carychium minimum* and the shade-loving species *Aegopinella nitidula*.

3.13.4 The mollusc assemblage obtained from samples <216> is likely to be indicative of a permanently wet well vegetated flowing water environment within ditch 1029 during the post-medieval period.

3.14 Trench 46 (PDZ3 3.24)

Introduction

3.14.1 A single sample from an early 19th century channel deposit was investigated using molluscs.

Molluscs

3.14.2 A single sample was selected for molluscan analysis from the early 19th century channel fill (sample <2>, context (505), which abutts revetment 506, parallel with the modern day City Mill River.

Table 60: Mollusc assessment from Trench 46

Sample	<2>
Context	(505)
Feature	504
Sample size (litres)	5
Land snails	
Carychium spp.	1
Succinea/ Oxyloma spp.	3
Cochlicopa lubrica	1
Cochlicopa lubricella	1
Cochlicopa spp.	2
Vertigo cf. *substriata*	1
Vertigo pygmaea	1
Vertigo spp.	3
Vallonia costata	12
Vallonia pulchella/ excentrica	47
Vallonia spp.	2
Limacidae	56
Helicella itala	6
Trichia hispida	27
Fresh and Brackish Water Snails	
Theodoxus fluviatilis	1
Valvata cristata	4
Valvata piscinalis	1
Bithynia tentaculata	2
Bithynia spp.	9
Bithynia opercula	43
Bithynia/ Lymnaea spp.	7
Lymnaea truncatula	15
Lymnaea palustris	4
Lymnaea spp.	8
Planorbis planorbis	1
Anisus leucostoma	13
Pisidium spp.	2
Taxa	20
Total	222
% Open country species	31.98
% Intermediate species	39.19
% Shade - loving species	0.9
% Unassigned species	1.35
% Amphibious species	12.61
% Intermediate species	1.8
% Ditch species	2.25
% Moving water species	5.86
% Unassigned species	4.5

3.14.3 The moderate assemblage recovered from this channel fill (Table 60) was dominated by land snail species, with the freshwater groups accounting for 26% of the assemblage. There was no evidence for any tidal influences as no brackish water or marine species were recorded. The dominating species within the land snails were Limacidae, *Trichia hispida* and *Vallonia pulchella/excentrica*. These are all species which can live in areas of marsh and damp grassland. The major components of the fresh water groups were the amphibious species *Anisus leucostoma* and *Lymnaea* *truncatula*. These species favour marshy grassland and swampy pools subject to seasonal desiccation.

3.14.4 The assemblage appears to be indicative of an area of swampy marsh and damp grassland up against the revetment with occasional water flowing along the old river channel. The channel does not seem to have been permanently flowing during this period.

3.15 Trench 52 (PDZ3 3.31)

Introduction

3.15.1 This sequence was selected due to its high-potential organic alluvial deposits and location in an otherwise relatively unsampled area of Site. The sampled section is presented in Figure 19.

Sediments

3.15.2 Sediment descriptions and interpretations can be found in Table 61. Basal gravels were not observed in this trench, which reached a depth of 0.74m OD. The sampled sequence is from the north of the trench, where one of three sondages was excavated.

Table 61: Sediment descriptions for Monolith <9>, Trench 52

Level (m OD)	Context	Sediment description	Interpretation
2.48 to 2.30	43	10YR very dark grey clay loam, rare very small stones. Humic, fine subangular blocky peds, moderately developed. Clear boundary	Modern soil
2.30 to 2.15	56	10YR4/ 3 brown clay, with very many (c. 50%) mottles of 10YR3/ 6 dark yellowish brown medium to coarse % clear to diffuse. Stonefree. Some horizontal cracking, rare macropores (<0.5%), possible coarse blocky structure. Clear boundary. NB same context as below, just oxidised mottled upper surface.	Alluvium (clay; oxidised)
2.15 to 1.74	57	2.5Y4/ 2 dark greyish brown clay with occasional sharp iron stain. Stonefree. Occasional vertical fe mineralised rootlets c. 0.5-1mm diameter with very localised sharp iron staining. To the top (above 2.00m) has weakly developed medium blocky structure. Below 2m has a moderately well developed medium to coarse platy structure. No laminae observed. Clear non-erosional boundary.	Alluvium (clay)
1.74 to 1.53	58	10YR3/ 1 very dark grey silty clay loam, stonefree, platy structure as above but increasingly fine downwards in top 0.12m. Below this (1.62m OD) some slight fine lamination visible and becomes increasingly apparent down-profile. Laminae are fine (<1mm) Occasional horizontal fibrous plant material (especially at 1.56m OD). Clear non-erosional boundary, little or no colour change but textural difference.	Organic alluvium (clay loam)
1.53 to 1.37	59	10YR3/ 1 very dark grey silt loam. Very humic. Very fine white sand component visible without magnification. Occasional laminae, sometimes with humified horizontal plant material (unidentifiable).	Organic alluvium (silt loam)
1.37 to 1.16	60	10YR3/ 1 very dark grey silt loam. Very humic. As above but with significant component (c.1%) of mollusc fragments (all observed were freshwater; Pisidum, *Valvata macrostoma* and some *Bithynia* opercula). Occasional silicified *Chara* (stonewort) stem seen to top, increasing downwards (confirmed at x200 mag, distinct circular 12 celled stem). Visibly dense patches of *Chara* stem, including diagonal 'stripe' c. 30 % 10mm thick at 45 degree from 1.23–1.19m OD as well as scattered stems throughout c. 1%. Boundary sharp but interdigitated.	Organic alluvium (silt loam with freshwater mollusc fauna and *Chara*)
1.16 to 0.99	60	10YR3/ 2 very dark greyish brown silty clay – appears paler due to microscopic inclusions of fragmented possible *Chara* and very fine sand & v small shell frags. Not clear even at high mag, amorphous organic matter and some shell and few *Chara* stem observed however. Some lamina apparent to 1.10m OD, below this are unclear. Larger shell frags to 4mm below 1.10m OD. Sharp to clear boundary.	Organic alluvium (silty clay with freshwater mollusc fauna)
0.99 to 0.90	61	10YR 3/ 1 very dark grey humic clay. No inclusions or lamina observed.	Organic alluvium (clay)

3.15.3 The sediments sampled by monolith and starting from 0.90m OD are fine organic alluvia ranging from clay to silty loam and during description were noted to contain a range of biological inclusions indicative of freshwater, including molluscs (eg. *Pisidium*, *Valvata macrostoma* and some *Bithynia* opercula), and notably *Chara* (stonewort), the silicified stem remains of which were sufficiently plentiful to be picked out by eye. During initial evaluation these were identified as root fibres. Laminations were observed intermittently throughout.

3.15.4 These fine alluvial deposits, continuing to 1.74m OD, are indicative of a very slow moving or still-water environment such as a pond or backwater. Possible slightly raised levels of salinity are indicated by the presence of stonewort, although no marine involvement is suggested. The deposits appear to be uninterrupted by erosive contacts and as such may provide a continuous palaeoenvironmental sequence.

3.15.5 Above the organic alluvia from c. 2m OD a move to mineralogenic alluvium indicates the drying out of the pond and the resumption of deposition via overbank flooding in the form of an accretional floodplain soil as elsewhere on Site. A buried soil of probable post-medieval date is sealed by made ground deposits is present to 2.48m OD.

Dating

3.15.6 Four radiocarbon dates have been obtained from subsamples taken from Monolith <9> and Bulk Sample <10> (Table 62). These show the sediments date from the late Romano-British through to the Late Anglo-Saxon period.

Table 62: Radiocarbon dates from Trench 52

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<9> (58)	1.69	Sediment (humic acid)	SUERC-24522	1170±30	-29.0	cal AD 770–970	1
<9> (58)	1.62	Seeds: *Menyanthes*, *Ranunculus* subg. *Batrachium*, *Carex*	SUERC-24523	1165±30	-24.0	cal AD 770–970	1
<9> (58)	1.56	Sediment (humic acid)	SUERC-24524	1440±30	-25.4	cal AD 560–660	1
<10> (61)	0.90 to 0.99	Seeds: 8 x *Sagittaria*, *Schoenoplectrus*, *Sambucus nigra*	SUERC-24525	1710±30	-25.4	cal AD 250–410	1

Plant macrofossils

3.15.7 Seven samples from Trench 52 were examined for waterlogged plant macro-fossil material (Table 63). Seeds dated from the basal sample from context (61) indicated that the sequence begins around cal AD 250-410 (SUERC-24525, 1710±30 BP) while seeds from bulk sediments and seeds within context (58) about mid-way though the sequence provided dates in the late 8th to 10th century (SUERC-24524, SUERC-24523 and SUERC-24522). It is probable that the uppermost parts of the sequence extended into the 18th to 19th centuries, as the uppermost samples (contexts 56 and 43) contained frequent finds of coal.

3.15.8 The lowest three samples were dominated by stems and gametes of stonewort (*Chara* sp.) indicative of calcareous, slow moving water. In addition to these the lowest Romano-British sample mainly contained seeds of wetland or aquatic species, for example water-crowfoot (*Ranunculus* subg. *Batrachium*), water-milfoil (*Myriophyllum* sp.), waterdroplet (*Oenanthe* sp.), mint (*Mentha* sp.), common starwort (*Callitriche stagnalis*), bogbean (*Menyanthes trifoliata*), arrowhead (*Sagittifolia sagittifolia*), water-plantain (*Alisma plantago-aquatica*), sedge (*Carex* sp.), common spikerush (*Eleocharis palustris*), common club rush (*Schoenoplectus lacustruis*) and branched bur-reed (*Sparganium erectum*). Seeds of dryland species were relatively rare consisting of a few seeds of orache (*Atriplex* sp.) and elder (*Sambucus nigra*).

3.15.9 The sample above from context (60) was highly similar but also had seeds of yellow water-lily (*Nuphar lutea*), celery-leaved buttercup (*Ranunculus sceleratus*), marsh yellow cress (*Rorippa palustris*), narrow-fruited watercress (*Rorippa* cf. *nasturtium-aquaticum*), gypsywort (*Lycopus europaeus*), and rush (*Juncus* sp.). Dryland species were slightly more common and included buttercup (*Ranunculus* subg. *Ranunculus*), common nettle (*Urtica dioica*), and several other weedy species, dock (*Rumex* sp.), knotgrass (*Polygonum aviculare*), silverweed (*Potentilla anserina*), vervain (*Verbena officinalis*), thistle (*Caarduus/ Cirsium*) and parsley-piert (*Aphanes arvensis*).

Table 63: Waterlogged plant macrofossils from Trench 52

Sample		**<10>**	**<11>**	**<12>**	**<13>**	**<14>**	**<15>**	**<16>**
Context		**(61)**	**(60)**	**(59)**	**(58)**	**(57)**	**(56)**	**(43)**
Depth top (m OD)		**0.99**	**1.16**	**1.53**	**1.74**	**1.74**	**1.74**	**2.48**
Depth bottom (m OD)		**0.93+**	**0.99**	**1.37**	**1.53**	**1.53**	**1.53**	**2.3**
Sample Size (litres)		**5-10**	**5-10**	**5-10**	**5-10**	**5-10**	**5-10**	**5-10**
Flot size (ml)		**15**	**30**	**20**	**5**	**10**	**5**	**40**
Period/Date		**RB**	**-**	**-**	**E. Med**	**-**	**-**	**18-19th**
Chara stems	stonewort	+	++++	-	-	-	-	-
Chara (gametes)	stonewort	++	++++	++	-	+	-	-
Bryophyta (leaf stem)	mosses	+	-	-	-	-	-	-
Nuphar lutea	yellow water-lily	-	+	-	-	-	-	-
Ranunculus subg. *Ranunculus* (arb)	buttercup	-	+	-	+	+	-	+
Ranunculus sceleratus	celery-leaved buttercup	-	+	++	-	-	-	-
Ranunculus lingua	greater spearwort	-	-	cf. +	-	-	-	-
Ranunculus subg. *Batrachium*	water-crowfoots	++	+	-	+	+	-	-
Ficus carica	fig	-	-	-	-	+	-	++
Urtica dioica	common nettle	-	+	-	+	-	+	-
Betula sp.	birch	-	-	cf.1	-	-	-	-
Atriplex sp.	orache	+	-	-	-	-	-	-
Stellaria sp.	stitchwort	-	-	+	-	+	-	-
Polygonum aviculare	knotgrass	-	+	-	-	+	-	-
Rumex sp.	dock	-	+	-	-	-	-	-
Rorippa cf. *nasturtium-aquaticum*	narrow-fruited watercress	-	+	-	-	-	-	-
Rorippa palustris	marsh yellow-cress	-	+	-	-	-	-	-
Rubus sp.	bramble	-	-	-	-	+	-	++
Potentilla anserina	silverweed	-	+	-	-	-	-	-
Aphanes arvensis	parsley-piert	-	+	-	-	-	-	-
Myriophyllum sp.	water-milfoil	+	-	-	-	-	-	-
Myriophyllum spicatum	spiked water-milfoil	-	+	-	-	-	-	-
Vitis vinifera	grape-vine	-	-	-	-	-	-	+
Oenanthe sp.	water-droplets	cf.1	+	-	+	-	-	-
Apium sp.	celery/ water-cress	-	+	+	-	-	-	-
Cicuta virosa	cowbane	-	-	+	-	-	-	-
Menyanthes trifoliata	bogbean	+	-	++	+	+	-	-
Verbena officinalis	vervain	-	+	-	-	-	-	-
Lamium sp.	dead-nettle	-	-	-	-	-	-	+
Lycopus europaeus	gypsywort	-	+	+	+	-	-	-
Mentha sp.	mint	+	+	+	+	+	-	-
Mentha cf. *aquatica*	water mint	+	-	-	-	-	-	-
Callitriche stagnalis	common water-starwort	+	-	+	-	-	-	-
Sambucus nigra	elder	+	-	-	+	-	-	-
Carduus/ Cirsium sp.	thistle	-	+	-	-	-	-	-
Asteraceae, Taraxacum type	dandelion	-	-	-	-	-	-	+
Sagittifolia sagittifolia	arrowhead	++	++	+	-	-	-	-
Alisma plantago-aquatica	water-plantain	+	-	+	-	-	-	-
Potamogeton sp.	pondweeds	-	+	-	-	-	-	-
Najas, Zostera type	Naiads	-	-	cf. +	-	-	-	-
Juncus sp.	rush	-	+	++	+	+	-	-
Eleocharis palustris	common spike-rush	+	-	+	+	-	-	-
Schoenoplectus lacustris	common club-rush	+	+	+	-	-	-	-
Carex sp.	sedge	++	+	++	-	-	+	-
Glyceria sp.	sweet-grasses	-	-	-	+	-	-	-
Sparganium erectum (fruit/ achene)	branched bur-reed	+	+	+	-	-	-	-

Sample		**<10>**	**<11>**	**<12>**	**<13>**	**<14>**	**<15>**	**<16>**
Context		**(61)**	**(60)**	**(59)**	**(58)**	**(57)**	**(56)**	**(43)**
Depth top (m OD)		**0.99**	**1.16**	**1.53**	**1.74**	**1.74**	**1.74**	**2.48**
Depth bottom (m OD)		**0.93+**	**0.99**	**1.37**	**1.53**	**1.53**	**1.53**	**2.3**
Sample Size (litres)		**5-10**	**5-10**	**5-10**	**5-10**	**5-10**	**5-10**	**5-10**
Flot size (ml)		**15**	**30**	**20**	**5**	**10**	**5**	**40**
Period/Date		**RB**	**-**	**-**	**E. Med**	**-**	**-**	**18-19th**
Sparganium erectum (inner seed/ embryo)	branched bur-reed	+	-	-	-	-	-	-
Seed indet.		-	-	+	-	-	-	-
Indet. catkin bud scale		-	+	-	-	-	-	-
Charcoal	charred wood indet.	-	-	-	-	-	-	-

+C – denotes material that was preserved by charring. cf. compares with. Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more

3.15.10 The sample from context (59) varied slightly in that it contained many more seeds of bogbean, but was otherwise similar in composition regarding wetland species apart from several seeds of cowbane (*Cicuta virosa*), but it had fewer indicators of dryland weedy species.

3.15.11 The dated sample from context (58), covering the 8th to 10th centuries AD, unlike the lowest three samples had no evidence for *Chara* sp. Otherwise the composition was broadly similar with a few seeds of elder not seen in the previous two samples, and buttercup and nettle not seen in the sample immediately below it. That from (57) was again broadly similar with a few more weedy species including seeds of stitchwort (*Stellaria* sp.).

3.15.12 The two uppermost samples (contexts (57) and (43)) both contained seeds of fig (*Ficus carica*), and the uppermost sample also contained grape pips (*Vitis vinifera*) and was quite rich in seeds of bramble (*Rubus* sp.).

3.15.13 Both the Romano-British and Late Saxo-Norman environmental evidence indicates a wetland environment alongside a slow-moving watercourse. Arrowhead is a relatively uncommon wetland plant today, but has also been recovered from similarly dated deposits to the north of the Site in association with a Late Saxon logboat (Vaughan 1989), while it's recovery from a Roman fortress ditch in Devon (Straker *et al.* 1984) strengthens its association with slow-moving water with a muddy substrate. The general absence of dryland species suggests that such wetland was quite extensive, and that for much of the time the general area was underwater during at least the earliest phases. There are some indicators of rough pasture and disturbed soils, but the low numbers of seeds of such species certainly suggest that such dryland was not immediately adjacent to the site in the earliest phases.

3.15.14 The composition of the uppermost samples strongly suggests possible cess, manure/ sewage with the seeds of edible species namely fig, grape and bramble. The sample comes from a probable buried top-soil into which such material may have been mixed. While the remains are of some interest, their recent probable late 17th to 19th century date makes conventional radiocarbon dating unfeasible.

Pollen

3.15.15 Pollen assessment was carried out on nine samples from Monolith <9>. The pollen diagram (Figure 20) has been split into two local pollen assemblage zones (LPAZ), Tr52-1 and Tr52-2 – see Table 64 for LPAZ descriptions.

Table 64: Pollen zone descriptions for Trench 52, Monolith <9>

Zone	Depth (m OD)	Description
Tr52-2	1.575 to 2.03	Dominated by Poaceae (19-59%), *Quercus* (2-12%), *Corylus avellana*-type (2-12%) and Cyperaceae (15-34%). *Fagus sylvatica* (up to 1%), *Ulmus* (up to 1%), *Alnus glutinosa* (1-3%) and *Salix* (up to 1%) are also recorded. Herb/dwarf shrubs account for % TLP, with *Ranunculus acris*-type (1-2%), Chenopodiaceae (1-2%), Brassicaceae (1-2%), *Plantago lanceolata* (1%), *Solidago virgaurea*-type (1%), *Glyceria*-type (2-6%) and *Arrhenatherum*-type (1-2%). Other taxa present include *Polygonum* (up to 1%), *Rumex acetosella* (up to 1%), Apiaceae undiff. (up to 3%),and *Cichorium intybus*-type (up to 2%). Aquatic pollen consists of occurrences of *Nymphaea alba* (up to 1% TLP + aquatics), *Nuphar* (up to 1% TLP + aquatics), *Menyanthes trifoliate* (up to 1% TLP + aquatics), *Myriophyllum verticilliatum* (up to 1% TLP + aquatics), *Potamogeton natans*-type (up to 1% TLP + aquatics), *Sparganium emersum*-type (up to 4% TLP + aquatics) and *Typha latifolia* (up to 1% TLP + aquatics). *Polypodium* (up to 2% TLP + pteridophytes) and *Pteridium aquilinum* (1-4% TLP + pteridophytes). Pollen concentrations increase towards the top of the zone, from 46965 – 418118 grains cm^{-3}.
Tr52-1	0.93 to 1.575	Dominated by Poaceae (33-47%) with *Quercus* (9-12%), *Corylus avellana*-type (7-17%) and Cyperaceae (4-14%). *Alnus glutinosa* (16%) and Pteropsida (monolete) indet. (79% TLP + pteridophytes) are high in the basal sample, though reduced in overlying samples (1-4% and 5-15% TLP + pteridophytes respectively). *Ulmus* (up to 1%), *Fagus sylvatica* (up to 3%) and *Betula* (1-3%) are present in low amounts. Herb/dwarf shrubs include *Caltha palustris*-type (up to 4%), *Ranunculus acris*-type (2-8%), Chenopodiaceae (up to 2%), Apiaceae undiff. (up to 4%), *Gentianella campestris*-type (up to 2%), *Plantago lanceolata* (up to 2%), *Cichorium intybus*-type (up to 2%), *Solidago virgaurea*-type (2-4%) and *Glyceria*-type (up to 8%). Aquatic pollen consists of occurrences of *Nymphaea alba* (up to 1% TLP + aquatics), *Myriophyllum verticilliatum* (up to 10% TLP + aquatics), *Potamogeton natans*-type (up to 2% TLP + aquatics), *Sparganium emersum*-type (up to 5% TLP + aquatics) and *Tyhpa latifolia* (up to 3% TLP + aquatics) present. *Polypodium* (up to 2% TLP + pteridophytes), *Pteridium aquilinum* (up to 2% TLP + pteridophytes) and *Asplenium*-type (up to 1% TLP + pteridophytes) are also recorded. Pollen concentrations generally increase towards the top of the zone, from 122306 – 1477349 grains cm^{-3}.

3.15.16 LPAZ 52-1 shows a predominantly open floodplain environment dominated by Poaceae (grasses), though with a persistent presence of woodland taxa, including *Quercus* (oak) and *Corylus avellana*-type (hazel). *Alnus glutinosa* (alder) is also recorded throughout the zone, with a high presence at the base of the sequence suggesting it was locally present and then receeded alluvial minerogenic deposition increased. This peak in *A. glutinosa* coincides with high values for Pteropsida (monolete) indet. (fern spores) which was also part of the local understorey vegetation associated with the stands of *A. glutinosa*. The reduction in values in the overlying deposits suggests that it was no longer present on-site but instead the pollen was source from either individual trees locally present or else stands of alder woodland located elsewhere upon the floodplain. *Salix* (willow) was probably also a component of this floodplain woodland vegetation or present as isolated trees along the river banks.

3.15.17 The consistent presence of deciduous woodland taxa indicate some continuation of woodland in the wider area at this time. Herbs present also suggest the occurrence of a woodland edge in the local area, with the presence of taxa including *Stellaria holostea* (greater stichwort) and *Stachys*-type (woundwort), while grassland is reflected by the dominance of Poaceae and *Papaver rhoeas*-type (poppy), and waste/ disturbed ground indicated by *Urtica dioica* (common nettle), *Cichorium intybus*-type (dandelions/ chicory) and *Solidago virgaurea*-type (daisies).

3.15.18 Further evidence of ground disturbance is indicated by the presence of *Rumex acetosella* (sheep's sorrel) and *Plantago lanceolata* (ribwort plantain), which may indicate pastoral activity upon the floodplain. Local wetland vegetation is represented by the presence taxa including *Caltha palustris*-type (marsh marigold), *Ranunculus acris*-type (buttercup), *Rumex sanguineus*-type (wood dock), *Sium latifolium*-type (greater water parsnip), Cyperaceae (sedges) and *Glyceria*-type (sweet-grass). The aquatic pollen types indicate slow moving water, with *Nymphaea alba* (white water-lily), *Myriophyllum verticillatum* (whorled water milfoil) and *Potamogeton natans*-type (pondweed), surrounded on the margins by *Sparganium emersum*-type (bur-reed) and *Typha latifolia* (bulrush).

3.15.19 LPAZ Tr52-2 shows a different pollen assemblage coinciding with a change in the deposition environment from organic alluvium associated with LPAZ TR52-1 to alluvial clays. Aquatic pollen types are less abundant and no longer associated with the standing water/ pond environment found below, with low occurrences of *Menyanthes trifoliata* (bogbean), *Potamogeaton natans*-type and *Typha latifolia* recorded. Poaceae is found to be higher in this LPAZ, along with *Glyceria*-type and Cyperaceae. This probably represents an expansion of the floodplain associated with increased overbank flooding and alluvial deposition, with floodplain grassland and meadow abundant, with *Gentianella campestre*-type (field gentian) present, along with taxa associated with disturbed/ waste ground including *Cirsium*-type (thistle), *Cichorium intybus*-type and *Solidago virgaurea*-type. The reduction in the representation of woodland taxa is not necessarily due to woodland clearance but likely to be a result of floodplain expansion, resulting in the extension of the distance between the sample site and dryland edge with a greater contribution of pollen from local wetland plants (notably Poaceae). Disturbed ground is still implied by the persistence of *Rumex acetosella* and *Plantago lanceolata*, with *Pteridium aquilinum* (bracken) possibly also indicating disturbance or a fluvially derived pollen source, also reflected in the presence of low amounts of *Pinus sylvestris* (pine) pollen at the top of the sequence.

3.15.20 The pollen indicates a pond or still water environment with diverse wetland vegetation. At the base of the sequence, a local presence of *Alnus glutinosa* is indicated. Woodland taxa is well represented and either originates from small patches located upon dry areas of the floodplain or from the more distant dryland. The floodplain environment is largely open and likely to have been subject to pastoral activity. The deposition of alluvial clay marks a change in the local vegetation with the still water/ pond environment no longer represented and instead an environment dominated by wetland grasses and sedges with some reeds, with the floodplain remaining open and grass dominated. The reduction in woodland observed within the pollen assemblage is likely to be the result of wetland expansion rather than an actual reduction in the woodland itself.

3.15.21 Further investigation of this sequence has been recommended as it clearly indicates a change in the wetland vegetation during the Saxon period, with a mixture of different vegetation mosaics indicated. It also suggests that during the Late Romano-British period *Alnus glutinosa* was present on-site.

Diatoms

3.15.22 Eight samples were prepared from Monolith <9> (Figure 21). Diatoms are in extremely low numbers in the bottom sample (0.93m OD) from organic alluvium. Fragments of the freshwater taxa *Synedra ulna* and *Aulacoseira* sp. are present; however, diatom counting is not possible for this sample.

3.15.23 Diatoms are in very low numbers and poorly preserved at 1.65m OD. The diatoms present are *Synedra ulna*, *Cocconeis disculus*, *Aulacoseira* sp. (cf. *Aulacoseira italica* and auxospore), *Gyrosigma attenuatum*, *Gyrosigma* sp. *Ellerbeckia arenaria*, *Synedra capitata* and *Gomphonema* sp. These are non-planktonic freshwater diatoms and represent shallow water benthic and epiphytic habitats. *Ellerbeckia arenaria* is associated with both sandy sediments and semi-terrestrial habitats.

3.15.24 A sequence of four samples has been analysed for diatoms from 1.06 to 1.50m OD. These samples are from organic alluvium. In the three lower samples freshwater molluscs are present and at 1.18 and 1.34m OD *Chara* was identified. The diatoms in these samples are in high to moderate numbers and the quality of preservation is moderate to poor, with relatively high diatom species diversity. At the base of the sequence counted for diatoms (1.06 and 1.18m OD) the diatom flora is dominated by the freshwater epiphytes *Epithemia adnata* and *Cocconeis placentula* along with the freshwater halophile *Epithemia sorex*. However, a diverse assemblage of attached and benthic diatom taxa is present in small numbers and reflects a stable habitat. Open water planktonic diatoms, such as the halophile *Cyclotella meneghiniana*, are rare. Other, non-planktonic halophiles such as *Epithemia turgida, Gomphonema olivaceum* and *Navicula menisculus*, as well as some mesohalobous diatoms (*Anomoeoneis sphaerophora, Lyrella pygmaea, Navicula phyllepta, Rhopalodia gibberula*) indicate slightly saline conditions. However, there is no evidence for direct contact with tidal water.

3.15.25 The diatom assemblages of the upper two samples in the sequence of samples counted for diatoms (1.34 and 1.50m OD) remain diverse. The percentages of *Epithemia adnata* and *Epithemia sorex* decline, and there is a slight decline in the percentage of *Cocconeis placentula*. At the same time the numbers of opportunist taxa such as *Fragilaria pinnata, Fragilaria construens* var. *venter* and *Fragilaria brevistriata* increase. However, the flora remains diverse with a range of benthic and attached taxa present from freshwater and slightly saline habitats eg. *Achnanthes clevei, Amphora libyca, Amphora pediculus* and *Gomphonema angustatum*. Again open water diatom plankton is almost absent and diatoms that are associated with flowing water such as *Meridion circulare* and *Melosira varians* are present only in low numbers.

3.15.26 At 1.83m OD, an alluvial clay sample, an extremely low number of diatom fragments is present. One valve of the halophile *Melosira varians* was identified along with a frustule of *Amphora* sp. and an indeterminate pennate diatom species.

3.15.27 In the top sample from the alluvial clay at 2.03m OD a single broken central area of the freshwater halophile *Navicula lanceolata* is present along with another *Navicula* sp. The quality of preservation is very poor and diatom counting is not possible for this or the underlying sample.

Ostracods and Foraminifera

3.15.28 The ostracod content of the four samples is given in Table 65. The samples at 1.02 to 1.00m OD and 1.26 to 1.24m OD produced good non-marine ostracod faunas dominated by Candoniid ostracods including *Candona candida* and *Candona neglecta*. Species of the genera *Cyclocypris*, *Ilyocypris* and *Fabaeformiscandona* were also recovered at these levels. Other remains recovered from the samples included molluscs (opercula of *Bithynia*, and valves of *Pisidium*), cladoceran egg cases, rhizoliths, sponge spicules and radiate diatoms.

3.15.29 No ostracods were recovered from 1.62 to 1.60m OD and 1.90 to 1.92m OD. A few plant remains including stems and seeds (sedge, bogbean) were however retrieved at these levels.

3.15.30 The ostracods dominating the assemblages at 1.02 to 1.00m OD and 1.26 to 1.24m OD (*Candona candida*, *Candona neglecta* and *Ilyocypris gibba*) are known to inhabit a wide range of environments including springs, brooks, wells, ponds and ditches. *Candona candida* and *Candona neglecta* are known from the littoral and profundal zones of lakes. All three are also known to be tolerant of slightly brackish waters. *Candona candida* and *Candona neglecta* are not uncommon in the Baltic sea (Meisch 2000) with a maximum recorded salinity tolerance of 16‰ for *Candona neglecta* and 5.77‰ for *Candona candida* (Hiller 1972).

3.15.31 Despite this these taxa are indicative of non-marine "freshwater" environments, confirmed in this case by the absence of any commonly occurring brackish water taxa. *Candona candida* and *Candona neglecta* are both usually found in permanent water-bodies although the juveniles of *Candona candida* and the eggs, juveniles and adults of *Candona neglecta* are desiccation resistant. These taxa are often indicative of colder water and a "*candida* fauna" is often found in post-glacial sediments of small European water-bodies (Boomer 2002). The desiccation resistance of these taxa and parthenogenesis reproductive cycle of *Candona candida* make them suitable for pioneer colonisation of habitats.

Table 65: Microfaunal content of ostracod/ foraminifera samples from Trench 52

Sample	<9>	<9>	<9>	<9>
Depth (m OD)	**1.02 to 1.00**	**1.26 to 1.24**	**1.62 to 1.60**	**1.90 to 1.92**
Ostracoda				
Candona candida	xx	xx		
Candona sp.	x	x		
Candona neglecta	xx	xx		
Cyclocypris laevis		x		
Cyclocypris ovum	x			
Fabaeformiscandona sp.	x	xx		
Ilyocypris gibba		x		
Other remains				
Mollusc fragments		x		
Bithynia opercula	x	xx		
Bithynia		x		
Pisidium	x			
Cladoceran egg case		x		
Rhizoliths	x	x		
Charophyte oogonia	x	xxx		
Sponge spicules	x	x		
Radiate diatoms	xx	x		
Sedge seed			x	
Bogbean seed			x	
Plant stems/ roots				x

x = 1 to 9 specimens; xx = 10 to 50 specimens; xxx = over 50 specimens

3.15.32 Taken as a whole the ostracod faunas at 1.02 to 1.00m OD and 1.26 to 1.24m OD are indicative of a shallow, still or slow moving freshwater environment probably a stream or a brook. The faunas are dominated by adult specimens and no united carapaces were recovered indicating some transport, although the taphonomy of the specimens would indicate that they have not moved a great distance before being preserved.

Molluscs

3.15.33 Seven samples were examined for molluscan remains from the deposits at Trench 52 (Table 66). Shell numbers were very low apart from the basal layer, context (61). No brackish water or *in situ* marine shells were recovered. Fragments of mussel shell (*Mytilus edule*) were observed in the 19th century alluvial layer, context (43), and are likely to represent food waste.

3.15.34 Context (61), (sample <10>, organic alluvium, late Romano-British) was dominated by the fresh water species, in particular *Valvata piscinalis* and *Bithynia tentaculata*. *Theodoxus fluviatilis* was also recorded. These species are indicative of well oxygenated, densely vegetated flowing permanent water environments. The other species present in the assemblage favour areas of well vegetated slow-moving water such as at the channel margins.

3.15.35 The assemblage composition of these species, together with the high ratio of *Bithynia* operculum to apices (13:1) in this deposit, would appear to indicate a permanently wet, well vegetated relatively fast flowing riverine environment, with areas of slower flowing water on the channel edge.

Table 66: Mollusc Assemblages from Trench 52

Sample	<10>	<11>	<12>	<13>	<14>	<15>	<16>
Context	**(61)**	**(60)**	**(59)**	**(58)**	**(57)**	**(56)**	**(43)**
Depth top (m OD)	**0.99**	**1.16**	**1.53**	**1.74**	**2.15**	**2.3**	**2.48**
Depth bottom (m OD)	**0.93+**	**0.99**	**1.37**	**1.53**	**1.74**	**2.15**	**2.3**
Sediment Type	**organic alluvium**						**alluvium**
Date	**Late RB**			**Saxon**			**19th C.**
Land snails							
Vertigo pygmaea	-	-	1	-	-	-	-
Vallonia excentrical pulchella	-	-	-	-	-	1	2
Limicidae	4	-	-	-	-	-	-
Trichia hispida	-	-	1	-	-	-	-
Burrowing snails							
Cecilioides acicula	-	-	-	-	-	1	-
Fresh and Brackish Water Snails							
Theodoxus fluviatilis	1	-	-	-	-	-	-
Valvata cristata	1	-	-	-	-	-	-
Valvata piscinalis	7	2	-	-	-	1	-
Bithynia tentaculata	8	-	-	-	-	-	-
Bithynia spp.	5	-	-	-	-	-	-
Bithynia opercula	169	7	-	-	-	1	2
Lymnaea truncatula	-	-	-	-	-	2	2
Lymnaea cf. *stagnalis*	1	-	-	-	-	-	-
Lymnaea peregra	2	-	-	-	-	-	-
Lymnaea spp.	6	-	-	-	-	1	-
Planorbis planorbis	4	-	-	-	-	-	-
Anisus leucostoma	3	-	-	-	-	-	1
Gyraulus albus	4	-	-	-	-	-	-
Acroloxus lacustris	-	1	-	-	-	-	-
Pisidium spp.	3	1	-	-	-	-	-
Taxa	**11**	**3**	**2**	**0**	**0**	**3**	**3**
Total	**51**	**5**	**2**	**0**	**0**	**5**	**5**
% Open country species	**0**	**0**	**50**	**0**	**0**	**20**	**40**
% Intermediate species	**7.8**	**0**	**50**	**0**	**0**	**0**	**0**
% Shade - loving species	**0**	**0**	**0**	**0**	**0**	**0**	**0**
% Amphibious species	**5.9**	**0**	**0**	**0**	**0**	**40**	**60**
% Intermediate species	**11.8**	**0**	**0**	**0**	**0**	**0**	**0**
% Ditch species	**9.8**	**20**	**0**	**0**	**0**	**0**	**0**
% Moving water species	**43.1**	**40**	**0**	**0**	**0**	**20**	**0**
% Unassigned species	**21.6**	**40**	**0**	**0**	**0**	**20**	**0**
Marine shell							
Mytilus edule frags	-	-	-	-	-	-	1

3.15.36 Snail numbers are too low to determine the local environment reflected in the later deposits. As a very general comment, the upper deposits appear to indicate a drier deposit, with the majority of the shells either being the amphibious species, *Lymnaea truncatula* and *Anisus Leucostoma*, or terrestrial species, *Vallonia pulchella/*

excentrica, rather than moving water species. This could be compatible with an open environment with areas of standing water or seasonal flooding such as water meadows or moist pastures if these environments are indicated by the waterlogged plants and pollen analysis.

3.15.37 Overall, the mollusc assemblage obtained from the late Romano-British context (61) is indicative of a permanently wet well vegetated channel edge environment with a fast flowing water element. There are similarities between this assemblage and those observed in the Iron Age and possible Iron Age/ Romano-British deposits at Trench 71. It may be possible to draw inferences of the wider landscape and land use during this period, if further analytical works on molluscan sequences of this period in this area are conducted.

Insects

3.15.38 The insect taxa recovered are listed in Table 67. Samples that produced no insects are not included in these samples. The majority of the taxa present are beetles (Coleoptera) though the cases and head capsules of both cased and caseless caddis flies (Tricoptera) were seem in several samples.

3.15.39

Table 67: Insect assemblage from Trench 52

Sample number	**<31>**	**<10>**
Context number	**(58)**	**(61)**
Depth (m OD)	**1.53-1.74**	**0.93-0.99**
Coleoptera		
Hydraenidae		
Octhebius spp.	-	++
Helophorus spp.	+	-
Staphylinidae		
Oxytelus spp.	+	-
Xantholinus sp.	-	+
Philonthus spp.	+	-
Dryopidae		
Dryops spp.	-	+
Scarabaeidae		
Aphodius spp.	+	-
Chrysomelidae		
Phyllotreta spp.	-	+
Chrysomelidae		
Phyllotreta spp.	-	+
Curculionidae		
Apion spp	-	++
Sitona spp.	-	++
Notaris acridulus (L.)	+	-
Ceutorhynchus spp.	-	+
Degree of preservation	fragmented, eroded	moderate to good
Comparative size of faunas	small	moderate
Water conditions	none	slow flowing suggested by *Ochthebius* and *Dryops*
Landscape	*Notaris* is often found upon *Glyceria maxima* (Hartm.) Holmb. (reed sweet-grass) and other *Glyceria* species (sweet-grasses). *Aphodius* dung beetle may suggest grazing in area	*Sitona*, *Apion* and *Ceutorhynchus* may suggest rough ground or grassland. *Sitona* spp. is commonly found upon *Trifolium* (clover)
Overall potential of this location	poor	moderate

+ = 1-2 individuals, ++ = 2-5 individuals, +++= 5-10 individuals

3.15.40 The insect faunas recovered were small, fragmented and poorly preserved. The fauna recovered, however, do contain a few species that suggest that the area contained slow flowing water and bankside vegetation, and grazing land. The faunas therefore have a limited role in terms of archaeological interpretation and should only be used to confirm and supplement the results from other proxy environmental data.

3.16 Trench 54 (PDZ3 3.33)

Introduction

3.16.1 This trench was located on the southern edge of a raised gravel plateau area identified by the deposit modelling. Section drawings shown in Figure 22.

Sediments

3.16.2 Sediment descriptions and interpretations can be found in Table 68.

Table 68: Sediment descriptions for Monoliths <12> and <20>, Trench 54

Level (mOD)	Context	Sediment description	Interpretation
2.37 to 2.22	92	10YR3/ 2 very dark greyish brown clay loam, well developed coarse granular structure to top, 2% fine macropores, iron staining around rootlets. Clear boundary	Buried soil, likely modern/ post-medieval
2.22 to 1.83	70	2.5Y4/ 2 dark greyish brown silty clay loam, fine to medium distinct mottling iron staining, occ iron mineralised rootlet. Clear boundary	Overbank alluvium
1.83 to 1.64	72	10YR3/ 1 very dark brown clay loam, humic, weak blocky structure, iron staining around rootlets, clear boundary. Looks like humic channel edge/ marshy but weathered & dried.	Organic alluvium
1.64 to 1.36	73	10YR3/ 1 very dark grey clay loam, humic, with visible fine sand component (pale grey). Common freshwater mollusca. Sandier towards base – fining upwards sequence. Towards base is verging on sandy loam. Clear boundary	Organic alluvium – channel edge/ marsh
1.36 to 0.81	107, 108	10YR2/ 1 to 3/ 1 black to very dark grey clay, organic, massive, occasional waterlogged wood or root fragments. Hints of lamination, occasional siltier inwash (not pure silt, but increased pale grey silt component visible). Boundary sharp but interdigitated.	Organic alluvium, fining upwards
0.81 to 0.59	109	Brown loamy sand, fining upwards at base is quite coarse sand with occasional small stones. Wood/ root frags at 0.70m OD (possible strand line, but not definite). Organic clay loam lens as above at 0.67-0.68m OD. Sharp boundary	Organic alluvium on sand, fining upwards
0.59 to 0.53	110	Reddish black very woody peat with small gravel to base	Woody peat

3.16.3 A thin woody peat of Late Neolithic date directly overlay gravels, and was overlain in turn by an organic alluvial sequence of Late Iron Age to Anglo-Saxon date. The deposits are typical of channel-edge type conditions, and are overlain to the top of the sampled sequence by overbank alluvial deposits and a post-medieval buried soil.

Dating

3.16.4 Three radiocarbon dates have been obtained from waterlogged plant macrofosssils within three of the bulk samples (Table 69).

Table 69: Radiocarbon dates for Trench 54

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date 95.4%, 2σ range)	Reliability of Date
<34> (72)	1.83 to 1.64	Seeds: 10 x *Schoenoplectus*, *Cirsium*, 3 x *Ranunculus*, *Thalictrum*, *Menyanthes*	SUERC-31382	1175±30	-25.2	cal AD 770 - 970	1
<23> (107)	1.36 to 1.00	Seeds: 10 x *Carex* sp., *Oenanthe*, *Prunus*	SUERC-31381	2015±30	-28.1	100 cal BC - cal AD 70	1
<32> (110)	0.59 to 0.54	Plant material: 4 x *Alnus glutinosa* cones	SUERC-31380	4070±30	-27.4	2860 - 2490 cal BC	1

3.16.5 The returned dates indicate potentially three or more periods of accumulation of sediments and organic material. These are centred on the later Neolithic at the base, with Late Iron Age to early Romano-British within the middle of the sequence and Middle to Late Anglo-Saxon material at the top.

Plant Macrofossils

3.16.6 Fifteen samples from Trench 54, originally of 5 litres, were examined for waterlogged plant macrofossil material (see Table 70). Ten of the samples came from the longest available sequence in section 16 (Figure 22). A further two samples were examined from section 18 and two samples were examined from section 19. Finally there were three samples associated with possible natural rills, riveulets or possible man-made gullies. One came from the fill (104) of such a feature [103] in Section 19, while the other came from fill (106) associated with cut [105] in Section 21. The final sample came from context (102), through which both of these features were cut, and was taken from Section 19.

3.16.7 Several dates were available for the sequence associated with Section 16 and indicated that it spanned a relatively long – although not continuous - period of time including at least the Neolithic and the post-medieval periods.

3.16.8 Radiocarbon dates were available for three of the contexts and shown in (Table 69). The earliest, and lowest, dated was that from context (110) where cones of alder (*Alnus glutinosa*) were dated to the Late Neolithic, 2860-2490 cal BC (SUERC-31380, 4070±30 BP). Two of the samples came from deposits below this level and therefore probably predate the Late Neolithic and the material might even have been deposited within the Late Mesolithic.

3.16.9 Context (107) was dated though remains of sedges (*Carex* sp.), water-droplet (*Oenanthe* sp.) and sloe (*Prunus spinosa*) to the Late Iron Age/ early Romano-British 100 cal BC-cal AD 70 (SUERC-31381, 2015±30 BP). The uppermost date came from the dating of seeds of club-rush (*Schoenoplectus* sp.), thistles (*Carduus/ Cirsium* sp.), buttercup (*Ranunculus* sp.), common meadow-rue (*Thalictrum flavum*) and bogbean (*Menyanthes trifoliata*) in context (72). This yielded a Late Anglo-Saxon date of cal AD 770-970 (SUERC-31382, 1175±30 BP). It might be noted that a fragment of clay-pipe also came from this same context and was dated from AD 1580 to 1910 (Jarret in Payne and Corcoran 2008, 71).

3.16.10 Clay pipe-fragments were also found in the upper two most contexts ((70) and (71)) which were dated to AD 1840 (Jarrett in Payne and Corcoran 2008, 71). A fragment of coal within the uppermost deposit is also consistent with the late 19th century date.

3.16.11 While the contexts from Sections 18, 19 and 21 were not dated, context (107) was clearly identifiable spreading across the site and was equated with context (97) in Section 18 and context (102) in Section 19 and 21 and can be assigned a broad Late Iron Age/ early Romano-British date. The material from the cuts therefore post-dates this period and is most probably Romano-British to Anglo-Saxon in date as the sealing context (101) and likely equated with contexts (73) and (96), the former dated to the Romano-British to Early-Middle Anglo-Saxon period.

3.16.12 The four lowest samples within Section 16 were examined in detail, with full counts produced, and estimates of abundance made from context (109). The remaining samples were scanned and seeds/ fruits of individual species recorded according to relative abundance (Table 70).

3.16.13 The samples all contained a relatively high amount of material with those in the lower contexts of Section 16 containing the most material. The uppermost samples of probable modern date, as well as those from the Late Iron Age/ early Romano-British associated with contexts (107), (102), (97) and probably (96), had generally much less material within them.

3.16.14 The lowest samples were all fairly rich and broadly similar in composition. These comprised contexts (109), (110), (111) and (112). All contained remains of alder (*Alnus glutinosa*) and those from context (110) were dated to the Late Neolithic (110). The remains included fruits, male catkins and female catkins/ cones and probably trigs and branches which were most frequent in the lowest samples. Also present in the lower sample were fragments of alder roots with small nodules caused by the bacteria *Frankia*. Species more directly associated with fen-woodland within these samples included those of three-nerved sandwort (*Moehringia trinervia*), bittersweet (*Solanum dulcamara*), greater stitchwort (*Stellaria holostea*), bramble (*Rubus* sp.) and probable seeds of early dog-violet (*Viola reichenbachiana*). In addition, the sample from context (111) had shells of hazelnut (*Corylus avellana*) and indicates at least one to a few trees in close proximity to the locality to the sampled sequence at this time. Stones of sloe (*Prunus spinosa*) were also recorded in both this and the sample above, along with seeds of elder (*Sambucus nigra*). Seeds of birch (*Betula* sp.), that were also recorded albeit in low quantities in the pollen sequence from Section 16 (see *Pollen*), were also present. It seems more probable that only occasional trees of birch may have been locally present in drier patches of the local fen-woodland. Seeds of bugle (*Ajuga reptans*) were also common within (110) and (110) and are common in wet-grassland at the edge of fen-woodland.

3.16.15 Several seeds of *Stellaria* sp. were also present and may be of chickweed (*Stellaria media*) associated with disturbed environments, but also had characteristics (eg. small, more rounded and denser, more pronounced papillae) more in keeping with wood stitchwort (*Stellaria nemorum*).

3.16.16 The samples also had good evidence for more open areas of wet grassland and fen marshland, seen through the presence of seeds of buttercup (*Ranunculus* sp.) and silverweed/tormentil (*Potentilla* sp.) commonest in the uppermost sample (109) where alder remains were less frequent.

3.16.17 Seeds of species associated with disturbance were relatively common in the samples, but particularly frequent within the uppermost sample from this group (109). These included seeds of common nettle (*Urtica dioica*), red goosefoot (*Chenopodium rubrum*), many-seeded goosefoot (*Chenopodium polyspermum*), fat-hen (*Chenopodium album*), orache (*Atriplex* sp.) and dock (*Rumex* sp.). To this list may be added those of celery-leaved buttercup (*Ranunculus sceleratus*) associated with mud and shallow water in ditches, streams and along channel edges and redshank/pale persicaria (*Persicaria maculosa/ lapathifolium*) found often in damp waste ground next to water. Both thistles (*Carduus/ Cirsium* sp.) and prickly sow-thistle (*Sonchus asper* type) were also commoner in the uppermost sample and indicative of more disturbed open areas.

3.16.18 The uppermost sample from (109) also generally had better evidence for aquatics including larger numbers of gametes of stonewort (*Chara* sp.) and water-plantain (*Alisma plantago-aquatica*), as well as several seeds of yellow water-lily (*Nuphar lutea*), a few of water-pepper (*Persicaria hydropiper*), those of probable tasteless water-pepper (*Persicaria mitis*), water celery-leaved buttercup (*Ranunculus sceleratus*), wild celery (*Apium graveolens*), water-starwort (*Callitriche* sp.), horned pondweed (*Zannichellia palustris*) and fool's watercress (*Apium nodiflorum*). Seeds of mint (*Mentha* sp.) were also present in great numbers and may be associated with fens, and/ or disturbed wet ground, while those of gypsywort (*Lycopus europaeus*) are associated with general wet fens and marshland. This same sample also had a few seeds of sweetgrass (*Glyceria* sp.).

3.16.19 This same sample from (109) also had worm cocoons which is indicative of either the drying out of deposits and soil formation or the reworking of soil from elsewhere. It also contained some pupae cases of caddis fly and occasional statocysts of the *Plumatella*, a freshwater *Bryozoa* sp.

3.16.20 It might be noted that seeds of water-crowfoot (*Ranunculus* subg. *Batrachium*) were generally commoner in the lower two samples from this group (111) and (112), while those of branched bur-reed (*Sparganium erectum*), a species associated with slow flowing water in rivers and channels but also ponds, were most common in context (110), with still high numbers in the sample from the context above (109). Seeds of rushes (*Juncus* sp.), spikerush (*Eleocharis palustris*), common club-rush (*Schoenoplectus lacustris*), and sedges (*Carex* sp.) were also common in these samples.

3.16.21 These increased aquatic elements, along with the greater presence of seeds of plants associated with disturbance, suggest increased wetness and the decline in fen-woodland. It might be noted that many of the aquatics are associated with slow or still bodies of water and it may be that much of this more open environment also consisted of cut-off channels and temporary wet pools.

3.16.22 The sample from (108) was undated but can be ascribed to the Bronze Age to Iron Age from its position within the dated sequence from Section 16. The sample was broadly similar to the underlying samples, but the plant macrofossils, along with the pollen evidence (see *Pollen*), suggests that alder woodland had more or less disappeared locally from the floodplain at this time. Other than the general absence of remains of alder the sample is broadly similar to the underlying sample from (109) where alder was possibly already declining. Large numbers of seeds of nettle and occasional seeds of buttercup, characteristic of rough pasture and disturbed area, possibly relate to increase animal grazing were common in this sample. Seeds associated with aquatics and wetlands included sedges (*Carex* sp.) but also a few seeds of rushes (*Juncus* sp.) and water-crowfoot (*Ranunculus* subg. *Batrachium*). However, the general scarcity of such species and the absence of waterlogged material in the overlying samples may already indicate the onset of a less wet, and more seldom flooded local environment evident in the overlying contexts.

3.16.23 Three samples were examined from the Late Iron Age/ early Romano-British contexts (107), (97) and (102), and it seems probable that context (96) may be of broadly similar date. As mentioned above, these samples had generally little waterlogged material within them. The material included occasional gametes of stonewort (*Chara* sp.), occasional seeds of sedges (*Carex* sp.), water-droplet (*Oenanthe* sp.), mint (*Mentha* sp.) and water-crowfoot (*Ranunculus* subg. *Batrachium*). The only other seeds were a few seeds of small nettle (*Urtica dioica*) indicative of arable and wasteland and one of probable yarrow (*Achillea* sp.), indicative of meadows, pastures and streamside's.

3.16.24 The samples from the rivulets/ gullies (104) and (106) that cut through deposit (102) and from the overlying deposits (73) probably dating to the middle to late Romano-British to Middle Saxon period were broadly similar in their composition. Those from the rivulets/ gullies (104) and (106) were broadly similar to the Late Iron Age/ early Romano-British samples in the range of species, but contained greater quantities of material. In particular gametes of stonewort (*Chara* sp.) were very common along with river water-droplet (*Oenanthe fluviatilis*), pondweed (*Potamogeton* sp.), spiked water-milfoil (*Myriophyllum spicatum*) and water-crowfoot (*Ranunculus* subg. *Batrachium*) that were present in all the samples dated to this broad period and are all broadly indicative of slow moving to still water aquatic environments.

3.16.25 Seeds of celery-leaved buttercup (*Ranunculus sceleratus*) and water-starwort (*Callitriche* sp.) may be more directly tied to muddy ditches, slow streams and marshland and generally associated with likely environments around the rivulets/gullies. Golden dock (*Rumex maritimus*) was identified from the presence of whole fruits within (104) and is also associated with muddy substrata on the edges of channels and slow moving rivers and streams.

3.16.26 In terms of more terrestrial species seeds of buttercup (*Ranunculus* sp.), were present in most of these samples and can be seen as indicative of rough grassland, while those of tubular water-droplet (*Oenanthe fistulosa*), bogbean (*Menyanthes trifoliata*) and gypsywort (*Lycopus europaeus*) are more indicative of marshy fen grassland. Seeds of mint (*Mentha* sp.), most probably water-mint (*Mentha aquatica*), were also common and can also be associated with marsh and fens.

3.16.27 Seeds of common nettle (*Urtica dioica*) were present in both (104) and (96) and, along with those of many-seeded goosefoot (*Chenopodium polyspermum*) and orache (*Atriplex* sp.), are indicative of general disturbed soils during this period. Seeds of bramble (*Rubus* sp.) from both the rivulet/ gully samples may be associated with waste/ scrub growing along side them.

3.16.28 Additional seeds of birch (*Betula* sp.) were present in the deposits from one of the rivulets/ channels (104) but are more probably reworked from earlier deposits given the general absence of birch pollen in the upper deposits.

3.16.29 The sample from context (73) is likely to be Romano-British to Saxon in date but, unlike the aforementioned contexts (107), (102), (97) and (96), had more waterlogged material within it. This material included seeds of wet pastures and meadows, including buttercup (*Ranunculus* sp.), and fens marshland, represented by seeds of greater spearwort (*Ranunculus lingua*), celery-leaved buttercup (*Ranunculus sceleratus*), sweetgrass (*Glyceria* sp.) and also sedges (*Carex* sp.).

3.16.30 A few seeds indicative of disturbance included many-seeded goosefoot (*Chenopodium polyspermum*), orache (*Atriplex* sp.), dock (*Rumex* sp.) and knotgrass (*Polygonum aviculare*). Also present were seeds of similar aquatic species to those represented in the samples below, including river water-droplet (*Oenanthe fluviatilis*), branched bur-reed (*Sparganium erectum*), spiked water-milfoil (*Myriophyllum spicatum*) and water-crowfoot (*Ranunculus* subg. *Batrachium*).

3.16.31 The sample from context (72) was dated to the Late Anglo-Saxon period. The context also had a fragment of clay pipe dated from 1540 to the 19th century AD. As such while it is possible that most of the waterlogged material may indeed date to the Late Saxon period it is also possible that the sample contains both more recent and older reworked material which produced a mid-range date.

3.16.32 While a few of the seeds recorded in this sample were absent in the preceding samples, the waterlogged assemblage from this level was generally broadly similar to the proceeding samples of probable Roman to Early-Middle Saxon date. Seeds included those of mint (*Mentha* sp.), along with occasional seeds of buttercup, orache, common nettle, bogbean (*Menyanthes trifoliata*), rush, club-rush, sedge and common spikerush. Also recovered were a few seeds of common meadow-rue (*Thalictrum flavum*), arrowhead (*Sagittifolia sagittifolia*), woundwort (*Stachys* sp.) and/ or claries (*Galeopsis* sp.) and cowbane (*Cicuta virosa*). The sample also contained a single charred grain of oats (*Avena* sp.), which can be broadly related to general human activity in the area and is a frequent find of charred assemblages with cereal remains.

3.16.33 The uppermost samples had even less waterlogged material of a similar composition to the samples below indicative of wet grasslands, marshland and species of disturbed soils. Most of the seeds were however those of general wetlands, such as rushes (*Juncus* sp.), and common spikerush (*Eleocharis palustris*).

3.16.34 The evidence for alder carr is in keeping with the Neolithic date of these deposits, although there is a strong indication of the presence of wet-grassland and epansives of marshland, with some indication of disturbance (also seen in Trenches 33 and 34). The presence of hazel (*Corylus avellana*) within fen-carr, while more unusual, has been recorded from other deposits within the Lea Valley, most notably Victoria Dock Road (Barnett *et al.* 2010), dated to the Early Neolithic. The uppermost samples from this group, beginning in context (110) and more clearly seen in context (109), undoubtedly begin to show the transition from alder woodland to more open wet grassland/ marshland with probably increased evidence for flooding as well as disturbance.

3.16.35 The disappearance of alder within the samples and from the floodplain is only broadly dated to the Bronze Age/ Iron Age relating to context (108). It is likely that there is a hiatus or truncation prior to the deposition of this deposit and quite possibly after. From other deposits the disappearance of alder is broadly dated to the Early-Middle Bronze Age transition and it is probable that this change is similarly dated to the Middle-Late Bronze Age within this trench. This environment has generally little alder and appears to be open wet grassland and marshland with some elements of disturbance.

3.16.36 The general absence of material from the Late Iron Age/ early Romano-British contexts (107), (97) and (102), in comparison to the other samples, can be taken to indicate that either the deposit accumulated fairly rapidly, which would seem unlikely given the number of mollusc shells within them (see *Molluscs*), or more probably that the deposits were subjected to intermittent drying. This would imply that the water table at this time was relatively low and was elevated between the Middle to late Romano-British to Early Saxon period, accounting both for the higher presence of waterlogged material in the overlying deposits and those from the fills within the rivulets, possibly main made gullies that cut through this deposit. Indeed it would seem probable that the raised water-table can be directly related to the formation of these features whether man-made or natural in origin. It might be noted that context (96) in Section 18 also had generally little material and is probably also dated to the Late Iron Age to early Romano-British period.

3.16.37 The two overlying samples, dated to the Romano-British to Saxon period, from contexts (73) and (72) are again indicative of wet marshy grassland with some evidence of disturbance. The latter, as noted above, also has some evidence for human activity within the area, although the charred oat grain equally may date like the tobacco pipe to later 16th century to modern activity.

Table 70: Waterlogged plant macrofossils from Trench 54

Section		**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**18**	**18**	**19**	**19**	**21**
Sample		**<36>**	**<35>**	**<34>**	**<19>**	**<23>**	**<24>**	**<25>**	**<32>**	**<33>**	**<38>**	**<38>**	**<39>**	**<27>**	**<26>**	**<17>**
Context		**(70)**	**(71)**	**(72)**	**(73)**	**(107)**	**(108)**	**(109)**	**(110)**	**(111)**	**(112)**	**(96)**	**(97) [107]**	**(104)**	**102 [107]**	**(106)**
Depth top (m OD)		**2.22**	**2.00**	**1.83**	**1.64**	**1.36**	**1.00**	**0.81**	**0.59**	**0.54**	**0.46**	**1.65**	**1.25**	**1.50**	**.1.5**	**1.50**
Depth bottom (m OD)		**2.00**	**1.83**	**1.64**	**1.36**	**1.00**	**0.81**	**0.59**	**0.54**	**0.46**	**0.42**	**1.25**	**1.11**	**1.20**	**1.2**	**1.20**
Date		**1840 +**	**1840 +**	**AD 770-970**	**ESAX/ RB**	**100 BC-AD 70**			**2860-2490 BC**	**Neo?**	**Neo?**	**ERB?**	**100 BC-AD 70**	**ESAX/ RB**	**100 BC-AD 70**	**ESAX/ RB**
Chara (gametes)	stonewort	-	-	-	-	+	-	e.246	-	-	-	-	+	-		++
Bryophyta (leaf stem)	mosses	-	-	-	-	-	-	-	-	2	-	-	-	-		-
Nuphar lutea	yellow water-lily	-	-	-	-	-	-	37f.	-	-	-	-	-	-		-
Ranunculus subg. *Ranunculus* (arb)	buttercup	+	-	+	+	-	+	31	23	22	16	+	-	-		+
Ranunculus sardous	hairy buttercup	-	-	-	+	-	-	-	-	-	-	-	-	-		-
Ranunculus sceleratus	celery-leaved buttercup	+	-	+	+	-	-	e.40	10	1	-	-	+	+		+
Ranunculus lingua	greater spearwort	-	-	-	+	-	-	-	-	-	-	-	-	-		-
Ranunculus subg. *Batrachium*	water-crowfoots	-	-	+	+	1	+	e.5	15	99	53	-	+	-		++
Thalictrum flavum	common meadow-rue	-	1f.	1	-	-	-	-	1	-	-	-	-	-		-
Urtica dioica	common nettle	+	1	+	-	-	++	e.740	56	44	18	+	-	-		-
Urtica urens	small nettle	-	-	-	-	-	-	-	-	-	-	-	+	-		-
Betula sp.(seed)	birch	-	-	-	-	-	cf.1	e.4	2	1	2	-	-	-		-
Alnus glutinosa (fruits)	alder fruits	-	-	-	-	-	-	10	4	86	40	-	-	-		-
Alnus glutinosa (female catkins/ cones)	female catkins/ cones	-	-	-	-	-	-	4	7	194	8	-	-	-		-
Alnus glutinosa (male catkins)	alder male catkins	-	-	-	-	-	-	-	-	++	16	-	-	-		-
Alnus glutinosa roots + *Frankia*	bacteria on alder roots	-	-	-	-	-	-	-	-	-	1	-	-	-		-
Corylus avellana	hazelnut	-	-	-	-	-	-	-	-	9	-	-	-	-		-
Chenopodium rubrum	red goosefoot	-	-	-	-	-	-	-	-	1	-	-	-	-		-
Chenopodium polyspermum	many-seeded goosefoot	-	-	-	+	-	-	e.4	2	-	-	-	-	-		-
Chenopodium album	fat-hen	-	-	-	-	-	-	-	2	2	-	-	-	-		-
Atriplex sp.	orache	-	-	1	+	-	1	e.5	6	1	-	-	-	-		+
Stellaria nemorum/ media type	Wood chickweed/ stitchwort	-	-	-	-	-	-	e.16	5	5	-	-	-	-		-
Moehringia trinervia	three-nerved sandwort	-	-	-	-	-	-	-	-	3	-	-	-	-		-
Stellaria cf. *holostea*	greater stitchwort	-	-	-	-	-	-	-	-	2	1	-	-	-		-
Lychnis flos-cuculi	ragged-robin	-	-	-	-	-	-	-	1	-	-	-	-	-		-
Persicaria maculosa/ lapathifolium	redshank/ pale persicaria	-	-	-	-	-	1	4	-	-	-	-	-	-		-
Persicaria hydropiper	water-pepper	-	-	-	-	-	-	2	-	-	-	-	-	-		-

Section		**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**18**	**18**	**19**	**19**	**21**
Sample		**<36>**	**<35>**	**<34>**	**<19>**	**<23>**	**<24>**	**<25>**	**<32>**	**<33>**	**<38>**	**<38>**	**<39>**	**<27>**	**<26>**	**<17>**
Context		**(70)**	**(71)**	**(72)**	**(73)**	**(107)**	**(108)**	**(109)**	**(110)**	**(111)**	**(112)**	**(96)**	**(97) [107]**	**(104)**	**102 [107]**	**(106)**
Depth top (m OD)		**2.22**	**2.00**	**1.83**	**1.64**	**1.36**	**1.00**	**0.81**	**0.59**	**0.54**	**0.46**	**1.65**	**1.25**	**1.50**	**.1.5**	**1.50**
Depth bottom (m OD)		**2.00**	**1.83**	**1.64**	**1.36**	**1.00**	**0.81**	**0.59**	**0.54**	**0.46**	**0.42**	**1.25**	**1.11**	**1.20**	**1.2**	**1.20**
Date		**1840 +**	**1840 +**	**AD 770-970**	**ESAX/ RB**	**100 BC-AD 70**			**2860-2490 BC**	**Neo?**	**Neo?**	**ERB?**	**100 BC-AD 70**	**ESAX/ RB**	**100 BC-AD 70**	**ESAX/ RB**
Persicaria mitis	tasteless water-pepper	-	-	-	cf.+	-	-	e.4	1	-	-	-	-	-		-
Polygonum aviculare	knotgrass	-	-	-	+	-	-	-	1	-	-	-	+	-		-
Rumex sp.	dock	-	-	-	+	-	+	e.103	9	6	4	-	-	-		+
Rumex maritimus (whole fruit)	golden dock	-	-	-	-	-	-	-	-	-	-	-	-	-		-
Hypericum sp.	St. John's wort	-	-	-	-	-	-	e.4	-	-	-	-	-	-		-
Viola cf. *reichenbachiana*	early dog-violet	-	-	-	-	-	1	1	2	1	1	-	-	-		+
Salix catkin bud scale	willow bud scale	-	-	-	-	-	-	-	cf.1	-	-	-	-	-		-
Barbarea vulgaris	winter-cress	-	-	-	-	-	-	-	3	-	-	-	-	-		-
Rubus sp.	bramble	-	1	-	-	+	-	1	3	9	3	+	-	-		+
Rubus/ Rosa type sp. (thorn)	bramble/ rose type thorns	-	-	-	-	-	-	-	2	-	-	-	-	-		-
Potentilla sp.	cinquefoil/ tormentil	-	3	-	-	-	-	-	-	-	-	-	-	-		+
Potentilla anserina	silverweed	-	-	-	-	-	+	e.18	2	2	-	-	-	-		-
Potentilla erecta/ reptans	tormentil/ creeping cinquefoil	-	2	-	-	-	-	-	-	-	-	-	-	-		-
Aphanes arvensis	parsley-piert	-	-	-	-	-	-	-	-	1	-	-	-	-		-
Prunus spinosa	sloe	-	-	-	-	cf.1	-	-	1	2	-	-	-	-		-
Myriophyllum spicatum	spiked water-milfoil	-	-	-	+	-	-	-	-	-	-	-	-	-		-
Oenanthe sp.	water-droplets	-	-	+	+	+	-	2	3	cf.6	cf.4	-	-	-		-
Oenanthe fistulosa	tubular water-droplet	-	-	-	-	-	-	-	-	-	-	-	-	-		-
Oenanthe cf. *fistulosa/ silaifolia*	water-droplet	-	-	-	-	-	-	-	-	-	-	-	-	-		+
Oenanthe fluviatilis	River water-droplet	-	-	-	cf.++	-	-	-	-	-	?	-	-	-		-
Apium graveolens	wild celery	-	-	+	+	-	+	e.22	4	-	-	-	-	-		-
Apium nodiflorum	fool's watercress	-	-	-	-	-	-	e.32	-	-	-	-	-	-		-
Cicuta virosa	cowbane	-	-	2	-	-	-	-	-	-	-	-	-	-		-
Solanum dulcamara	bittersweet	-	-	-	-	-	-	-	5	-	-	-	-	-		-
Menyanthes trifoliata	bogbean	-	-	+	1	-	-	-	-	1?	-	-	-	-		+
Myosotis sp.	forget-me-nots	-	-	-	-	-	-	-	4	-	-	-	-	-		-
Stachys/ Galeopsis sp.	woundwort/ claries	-	-	+	-	-	-	1	1	1	-	-	-	-		+
Ajuga reptans	bugle	-	-	-	-	-	-	-	2	11	-	-	-	-		-

Section		16	16	16	16	16	16	16	16	16	16	18	18	19	19	21
Sample		**<36>**	**<35>**	**<34>**	**<19>**	**<23>**	**<24>**	**<25>**	**<32>**	**<33>**	**<38>**	**<38>**	**<39>**	**<27>**	**<26>**	**<17>**
Context		**(70)**	**(71)**	**(72)**	**(73)**	**(107)**	**(108)**	**(109)**	**(110)**	**(111)**	**(112)**	**(96)**	**(97) [107]**	**(104)**	**102 [107]**	**(106)**
Depth top (m OD)		**2.22**	**2.00**	**1.83**	**1.64**	**1.36**	**1.00**	**0.81**	**0.59**	**0.54**	**0.46**	**1.65**	**1.25**	**1.50**	**.1.5**	**1.50**
Depth bottom (m OD)		**2.00**	**1.83**	**1.64**	**1.36**	**1.00**	**0.81**	**0.59**	**0.54**	**0.46**	**0.42**	**1.25**	**1.11**	**1.20**	**1.2**	**1.20**
Date		**1840 +**	**1840 +**	**AD 770-970**	**ESAX/ RB**	**100 BC-AD 70**			**2860-2490 BC**	**Neo?**	**Neo?**	**ERB?**	**100 BC-AD 70**	**ESAX/ RB**	**100 BC-AD 70**	**ESAX/ RB**
Clinopodium acinos	basil thyme	-	-	-	-	-	-	e.4	-	-	-	-	-	-		-
Lycopus europaeus	gypsywort	-	2	-	-	-	+	e.41	6	3	1	+	-	-		-
Mentha sp.	mint	-	-	++	+	+	++	e.1640	26	9	7	++	+	-		++
Callitriche sp.	water-starwort	-	-	+	-	-	+	e.220	1	-	-	+	-	-		+
Plantago major	greater plantain	-	-	-	-	-	-	-	-	-	-	-	+	-		-
Sambucus nigra	elder	-	-	-	-	+	-	-	1	10	2	-	-	-		+
Achillea sp.	yarrow	-	-	-	-	-	-	-	-	-	-	-	+	-		-
Carduus/ Cirsium sp.	thistle	-	-	1	-	-	+	e.13	5	-	-	-	-	-		+
Sonchus asper type	prickly sow-thistle	-	-	-	-	-	+	e.31	2	-	-	-	-	-		-
Solidago/ Senecio types	goldenrods/ ragworts	-	1	1	-	-	-	-	-	-	-	-	-	-		-
Eupatorium cannabinum.	hemp-agrimony	-	-	-	+	-	-	e.4	1	-	-	-	-	-		-
Sagittifolia sagittifolia	arrowhead	-	-	+	-	-	-	-	-	-	-	-	-	-		-
Alisma plantago-aquatica	water-plantain	+	-	+	-	-	+	e.155	2	1	1	-	+	-		+
Potamogeton sp.	pondweeds	-	-	-	+	-	+	-	4	2	1	-	-	-		+
Zannichellia palustris	horned pondweed	-	-	-	-	-	-	e.8	3	-	-	-	-	-		-
Lemna sp.	duckweeds	-	-	-	-	-	-	-	1	-	-	-	-	-		-
Juncus sp.	rush	+	++	+	-	+	+	+	++	+	-	++	-	-		+
Eleocharis palustris	common spike-rush	+	-	+	-	-	-	-	2	-	-		-	-		+
Schoenoplectus lacustris	common club-rush	-	-	+	+	-	-	-	10	5	cf.2	+	-	-		+
Carex sp. (flat)	sedge (lenticular)	-	-	+	-	-	-	e.8	6	3	1	-	-	-		+
Carex sp. (trigonous)	sedge (trigonous)	-	1	-	+	++	+	e.7	22	5	4	+	-	-		-
Carex sp. (whole fruits trigonous)	sedge (trigonous)	-	-	-	-	-	-	-	-	-	-	-	-	-		++
Carex cf. *paniculata*	greater tussock sedge	-	-	-	-	-	-	-	-	-	2	+	-	-		-
Eleocharis/ Scirpus type	v. small (1mm) Cyperaceae	-	-	-	-	-	-	e.8	-	-	-	-	-	-		-
Glyceria sp.	sweet-grasses	-	-	-	+	-	+	cf.3	cf.1	-	-	-	-	-		-
Avena sp. (grain)	oat grain	-	-	1c	-	-	-	-	-	-	-	-	-	-		-
Molinia sp.	purple moor grass	-	-	-	-	-	-	1	-	-	-	-	-	-		-
Sparganium erectum (embryo)	branched bur-reed	-	-	+	+	-	cf.1	e.82	c.400	25	2	-	-	-		+

Section		**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**16**	**18**	**18**	**19**	**19**	**21**
Sample		**<36>**	**<35>**	**<34>**	**<19>**	**<23>**	**<24>**	**<25>**	**<32>**	**<33>**	**<38>**	**<38>**	**<39>**	**<27>**	**<26>**	**<17>**
Context		**(70)**	**(71)**	**(72)**	**(73)**	**(107)**	**(108)**	**(109)**	**(110)**	**(111)**	**(112)**	**(96)**	**(97) [107]**	**(104)**	**102 [107]**	**(106)**
Depth top (m OD)		**2.22**	**2.00**	**1.83**	**1.64**	**1.36**	**1.00**	**0.81**	**0.59**	**0.54**	**0.46**	**1.65**	**1.25**	**1.50**	**.1.5**	**1.50**
Depth bottom (m OD)		**2.00**	**1.83**	**1.64**	**1.36**	**1.00**	**0.81**	**0.59**	**0.54**	**0.46**	**0.42**	**1.25**	**1.11**	**1.20**	**1.2**	**1.20**
Date		**1840 +**	**1840 +**	**AD 770-970**	**ESAX/ RB**	**100 BC-AD 70**			**2860-2490 BC**	**Neo?**	**Neo?**	**ERB?**	**100 BC-AD 70**	**ESAX/ RB**	**100 BC-AD 70**	**ESAX/ RB**
Sparganium erectum (achene)	branched bur-reed	-	-	-	+	-	cf.1	4	3	1	2	-	+	-		+
Typha latifolia/ angustifolia	bulrush	-	-	-	-	-	-	-	-	+	cf.1	-	-	-		-
Indet seed	(Brassicaceae/ Cyperaceae)	-	-	-	1	-	-	-	-	-	-	-	-	-		-
Wood and twigs indet.	wood twigs and fragments	-	-	-	-	+	+	+	++	++++	++++	-	-	-		+
Charcoal		-	-	-	-	-	-	+	1	-	-	+	-	-		-
Tuber/ Rodent pellet?		-	-	-	-	-	-	-	-	2	-	-	-	-		-
Fish bone		-	-	-	-	-	-	-	1	2	-	-	-	-		-
Worm Cocoon		-	-	+	-	+	-	+	-	-	-	-	+	+		-
Trichoptera, pupae membrane	Caddis fly pupae case	-	-	-	1	-	-	e.4	-	-	-	-	-	-		-
Plumatella-type	freshwater Brytozoa	-	-	+	+	+	-	e.8	-	-	-	-	-	-		-
Coal.		+	-	-	-	-	-	-	-	-	-	-	-	-		-

$^{+}$c – denotes material that was preserved by charring. f. fragment. e. estimated count. cf. compares with. Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more.

Pollen

3.16.38 Pollen assessment was carried out on five samples from monolith <20> in Trench 54.

3.16.39 Results of the pollen assessment from monolith <20> are shown in Figure 23. Pollen preservation was found to generally be reasonable within all five samples, though three additional samples failed to yield sufficient pollen for counting. Two local pollen assemblage zones (LPAZ) have been recognised, using the prefix Tr54- to identify each one – see Table 71 for zone descriptons.

3.16.40 LPAZ Tr54-1 shows the local presence of *Alnus glutinosa* (alder) with Poaceae (grasses) and *Corylus avellana*-type (hazel) locally abundant. Taxa associated with the local wetland vegetation include *Salix* (willow), Cyperaceae (sedges), *Ranunculus acris*-type (buttercup), *Filipendula* (meadowsweet) and *Glyceria*-type (sweet-grass). The high presence of *Alnus glutinosa* coincides with the presence of a woody peat, indicating a local presence of alder on-site. A radiocarbon date upon *Alnus glutinosa* catkins from <32> gave a calibrated age of 2860–2490 cal BC (SUERC-31380, 4070±30 BP) for this context (110) indicating that it dates from the Late Neolithic. Local dryland woodland is indicated by the presence of *Quercus* (oak), *Corylus avellana*-type and *Tilia cordata* (small-leaved lime). These woodland taxa reduce during the LPAZ, along with reductions in *Alnus glutinosa*, as a result of increased alluvial deposition and change in the pollen source area, rather than necessarily being related to woodland clearance. An expansion of Poaceae and *Sparganium emersum*-type (bur-reeds) occurs which is attributed to the increasingly wet environment.

3.16.41 LPAZ Tr54-2 is dominated by Poaceae and Cyperaceae, with a strong presence *Glyceria*-type and *Sparganium emersum*-type indicating a locally wet environment, which is apparent in the ongoing deposition of organic alluvium deposits. Radiocarbon dating of adjacent bulk samples <23> and <34> indicate that the alluvium deposition dates between 100 cal BC–cal AD 70 (SUERC-31381, 2015±30 BP) and cal AD 770–970 (SUERC-31382, 1175±30 BP) consecutively. Given the earlier date of the woody peat at the base of the sequence and nature of alluvium deposition it is likely that there may be a number of chronological breaks within this sequence and therefore it does not provide a continuous record. The increases in *Cichorium intybus*-type (dandelion/ chicory), *Sorbus virgaurea*-type (daisies/ goldenrods) and Pteropsida (monolete) indet. (fern spores) and low pollen concentrations probably indicate the general poor pollen preservation and abundance within the centre of this sequence. These taxa are often well represented when other pollen types become too corroded for recognition, though could also be indicative of areas of waste or disturbed ground. There is a low presence of *Plantago lanceolata* (ribwort plantain) and *Plantago major* (greater plantain) though few other taxa which might be associated with anthropogenic activity. The presence of *Pteridium aquilinum* (bracken) may indicate areas of open woodland or disturbance, though *Pteridium* spores also have the ability to float (Traverse, 2007) and are often over-represented in alluvial deposits. Other taxa present which would be associated with the local wetland include *Salix*, *Ranunculus acris*-type, *Filipendula*, *Valeriana officinalis* (common valerian), *Nymphaea alba* (white water-lily), *Typha latifolia* (bulrush) and *Equisetum* (horsetails).

3.16.42 The pollen assemblage from this trench indicates a slow or still water environment with diverse wetland vegetation consisting of *Alnus glutinosa* giving way to a highly vegetated sedge-reed wetland community as the basal water level continues to rise along with increased overbank flooding and minerogenic sediment deposition. Woodland is represented and either originates from small patches located upon drier areas of the floodplain or the more distant dryland edge. The floodplain environment is largely open and likely to have been subject to pastoral activity. The deposition of the overbank alluvium coincides with a strengthening of the wetland signal.

Table 71: Pollen zone descriptions for Trench 54

Zone	Depth (m OD)	Description
Tr3.33-2	1.615 – 2.22	Dominated by Poaceae (28-35%) and Cyperaceae (30-39%). *Quercus* (1-6%), *Alnus glutinosa* (2-7%), *Corylus avellana*-type (2-7%) and *Salix* (1%) are present throughout the zone. Herb taxa include *Ranunculus acris*-type (1-2%), Chenopodiaceae (up to 1%), *Filipendula* (1-2%), Apiaceae undiff. (1-4%), *Plantago lanceolata* (up to 1%), *Cichorium intybus*-type (1-6%), *Arrhenatherum*-type (up to 3%) and *Glyceria*-type (up to 3%). Aquatics present include *Sparganium emersum*-type (4-12% TLP + aquatics) and *Typha latifolia* (up to 1% TLP + aquatics). Pteridophytes include *Equisetum* (up to 1% TLP + pteridophytes), *Pteridium aquilinum* (up to 5% TLP + pteridophytes), *Polypodium* (1-2% TLP + pteridophytes) and Pteropsida (monolete) indet. (5-15% TLP + pteridophytes). Pollen concentrations vary between 64266 and 1277603 grains cm^{-3}.
Tr3.33-1	1.28 – 1.615	Dominated by *Alnus glutinosa* (11-42%), *Corylus avellana*-type (5-14%) and Poaceae (6-31%). *Quercus* (3-5%), *Betula* (0.5-2%), *Tilia cordata* (1%) and *Salix* (1-2%) are present throughout the zone. Herb taxa include *Ranunculus acris*-type (1-3%), *Filipendula* (1%), Apiaceae undiff. (1-2%), *Cichorium intybus*-type (1%), Cyperaceae (3-11%) and *Glyceria*-type (1%). Aquatics present include *Sparganium emersum*-type (up to 5% TLP + aquatics) and *Typha latifolia* (up to 1% TLP + aquatics). Pteridophytes include *Polypodium* (1% TLP + pteridophytes) and Pteropsida (monolete) indet. (1-13% TLP + pteridophytes). Pollen concentrations reduce from 636110 to 18564 grains cm^{-3}.

Diatoms

3.16.43 Four slides were prepared for diatom analysis from Trench 54 (Table 72 and Table 73). Diatoms are absent from the two lower samples (0.54 and 0.70m OD). A low or very low number of diatoms are present in the samples from 1.34 and 1.50m OD. The diatom assemblages from these samples are shown in Table 72. The diatom assemblages are composed of freshwater non-planktonic taxa and the valves are poorly preserved. At 1.34m OD the most common diatom (several valves recorded) is the attached species *Gomphonema angustatum*, and there are epiphytes such as *Cocconeis placentula* and *Epithemia* sp. At 1.50m OD *Cocconeis placentula* is the most common diatom and there are also valves of *Navicula lanceolata, Fragilaria pinnata, Fragilaria brevistriata* and benthic taxa such as *Pinnularia legumen* and *Gyrosigma* sp. The poorly-preserved diatom assemblages at 1.34 and 1.50m OD indicate a shallow freshwater environment with no evidence of diatoms from estuarine habitats.

Table 72: Summary of diatom evaluation results for Trench 54

Sam. No.	Height (m OD)	Diatoms	Diatom numbers	Quality of preservation	Diversity	Assemblage type	Potential for % count
<27>	0.54	absent	-	-	-	-	none
<28>	0.70	absent	-	-	-	-	none
<29>	1.34	present	very low	very poor	very low	fw non-pk	none
<30>	1.50	present	low	very poor	moderate/ low	fw non-pk	low/some

(fw – freshwater, aero – aerophilous, non-planktonic – non-pk)

Ostracods and Foraminifera

3.16.44 Four samples taken from monolith <20> have been assessed for the presence, preservation and environmental significance of their ostracod content. The full results detailing the ostracod content of the four samples is given in Table 74. Ostracods were recovered from the sample at 1.44m OD but not from the samples at 0.62, 0.98 and 1.90m OD. The sample at 0.62m OD, in addition to no ostracods, contained no other environmental remains. At 0.98m OD no ostracods were present although the sample contained some broken and unidentifiable mollusc and plant remains. One sedge seed was identified from the sample.

3.16.45 At 1.44m OD ostracods were recovered in moderate numbers with the sample dominated by Candoniid ostracods including *Candona neglecta* and *Candona* *candida.* Other ostracods recovered in this sample included *Prionocypris zenkeri*, *Limnocytherina sanctipatricii*, *Cyclocypris ovum* and species of the genus *Fabaeformiscandona*. The sample also contained animal remains including *Bithynia* opercula, *Pisidium* and insect remains. Plant remains recovered from the sample included numerous Charophyte oogonia, radiate diatoms and occasional plant stems and remains including a sedge seed. At 1.90m OD no ostracods were recovered but broken molluscs and plant remains were recorded in the sample.

Table 73: Diatom species assessment for Trench 54

Sample	**<29>**	**<30>**
Depth (m OD)	**1.34**	**1.50**
Salinity Group/ Taxon		
Mesohalobous to Halophilous		
Navicula lanceolata		+
Oligohalobous Indifferent		
Cocconeis placentula	+	++
Diploneis ovalis	+	
Epithemia sp.	+	
Fragilaria brevistriata		+
Fragilaria pinnata		+
Gyrosigma sp.		+
Gomphonema angustatum	++	
Synedra ulna	+	+
Indifferent to Halophobous		
Pinnularia legumen		+
Unknown Salinity Preference		
Indeterminate pennate	+	

+ diatom present; ++ diatom more common

3.16.46 The sample at 1.44m OD however contained ostracods and other environmental remains which are worth some discussion. Candoniid ostracods which dominate the samples have been noted in other samples at the Olympic sites. The two numerically dominant taxa (*Candona candida* and *Candona neglegta*) are known to inhabit a wide range of environments including springs, brooks, wells, ponds and ditches. They are known from the littoral and profundal zones of lakes. Both are also known to be tolerant of slightly brackish waters. *Candona candida* and *Candona neglegta* are not uncommon in the Baltic Sea (Meisch 2000) with a maximum recorded salinity tolerance of 16% for *Candona neglecta* and 5.77% for *Candona candida* (Hiller 1972). Despite this, these taxa are indicative of non-marine “freshwater” environments which are confirmed in this case by the absence of any commonly occurring brackish water taxa. *Candona candida* and *Candona neglecta* are both usually found in permanent waterbodies although the juveniles of *Candona candida* and the eggs, juveniles and adults of *Candona neglecta* are dessication resistant. These taxa are often indicative of colder water and a “*candida* fauna” is often found in post-glacial sediments of small European waterbodies (Boomer 2002). The dessication resistance of these taxa and parthenogenetic reproductice cycle of *Candona candida* make them suitable for pioneer colonisation of habitats.

3.16.47 Other ostracods recovered in this sample in fewer numbers included *Prionocypris zenkeri*, *Limnocytherina sanctipatricii*, *Cyclocypris ovum* and species of the genus *Fabaeformiscandona*. *Prionocypris zenkeri* was represented by whole carapaces and juvenile forms and is therefore *in situ.* This ostracod prefers slow moving streams, lakes and dead arms of rivers with rich aquatic vegetation and a calcareous substrate and avoids deep and stagnant waters. Charophyte oogonia and plant remains were abundant in this sample. *Limnocytherina sanctipatricii* has a single occurrence in this sample and is found in lakes and small permanent waterbodies such as ponds and ditches. *Cyclocypris ovum* was present in small numbers and occurs in a wide range of habitats and is common in the littoral zone of lakes and also found in temporary waters, springs, slightly salty waters, waters enriched with iron oxide, and swampy habitats. *Fabaeformiscandona* were also recovered from this sample. This genus is known to inhabit non-marine environments although difficult to identify to species level as taxonomic differences are based upon the morphology and number of natatory setae which are rarely preserved in sub-fossil assemblages. Despite the non preservation of ostracod soft parts some more robust pieces of insect exoskeleton were noted within the sample.

3.16.48 In summary, the sample at 1.44m OD contains ostracods that are together indicative of a calcareous shallow, plant rich/ weedy slow moving or still waterbody with the *in situ Prionocypris zenkeri* the most significant ostracod taxon recovered. This interpretation is supported by the other ostracods and environmental remains within the sample.

Table 74: Microfaunal content of ostracod/ foraminifera samples from Trench 54

Sample number/monolith	**<20>**	**<20>**	**<20>**	**<20>**
Depth (mOD)	**0.62**	**0.98**	**1.44**	**1.9**
Ostracoda				
Candona candida			x	
Candona neglecta			xx	
Cyclocypris ovum			x	
Fabaeformiscandona sp.			x	
Limnocytherina sanctipatricii			x	
Prionocypris zenkeri			x	
Animal remains				
Molluscs		x		x
Bithynia opercula			xx	
Pisidium			x	
Insect bits			x	
Plant remains				
Charophyte oogonia			xx	
Radiate diatoms			xxx	
Sedge		x	x	
Plant stems/remains		xx	x	x

x = 1 to 9 specimens; xx = 10 to 50 specimens; xxx = over 50 specimens

Molluscs

INTRODUCTION

3.16.49 Ten samples from section 16, two samples from section 18, two samples from section 19 and a single sample from section 21 were selected for molluscan analysis from Trench 54. The results were tabulated in Table 75 and Table 76, and histograms produced (Figure 24). The sediments of the sample sequence through section 16 have been described in Table 68. The assemblages were dominated by fresh water and terrestrial species throughout the sequence.

SECTION 16

Context (112), Sample <38>, Organic clay and Context (111), Sample <33>, Alluvial silty sand

3.16.50 Shell numbers are too low to determine the local environment reflected in these deposits.

Context (110), Sample <32>, Woody peat

3.16.51 The moderate mollusc assemblage retrieved from this deposit was dominated by the moving water and ditch species groups, in particular shells of *Pisidium* spp., *Valvata cristata* and *Valvata piscinalis*. This combination of species may indicate a large body of flowing water with dense growths of aquatic plants. The high ratio of *Bithynia* opercula to apices, 54 opercula to every apex, is indicative of the transport of material from a relatively fast flowing water environment. The presence of *Theodoxus fluviatilis* within the assemblage may also point towards a faster flowing water element and a fully riverine environment (Boycott 1936, 141). A small proportion of the molluscs appear to be species which would exploit the marshy river edge and possibly areas of meadow/ damp pasture in the vicinity.

Context (109), Sample <25>, Organic alluvium

3.16.52 This assemblage comprised fresh-water and terrestrial species. Within the fresh-water element, the moving water element and ditch species groups decreased, represented by a decline in *Pisidium* spp., *Valvata piscinalis* and *Valvata cristata* in particular, while the intermediate fresh-water species increased, in particular *Lymnaea peregra*. There were still a number of amphibious species together with larger proportions of the marsh-loving group, especially *Vallonia pulchella/ excentrica*, and of Limicidae and *Trichia hispida*, which favour long grass. The complete assemblage may depict a well-vegetated water environment, slower flowing than previously, with an increased exploitation of the marshy channel margins and areas of meadow/damp pasture.

Context (108), Sample <24>, Organic alluvium

3.16.53 The mollusc assemblage from this deposit was similar to that from context (109). There was an increase in the moving-water group, mainly represented by the presence of more *Pisidium* valves. This was mirrored by a decrease in the numbers of shells of the ditch species group. This may be indicative of a slow-flowing well-vegetated channel edge environment, with marshy areas along the river edge in a local open landscape of probable meadow/ damp pasture.

Context (107), Sample <23>, Organic alluvium

3.16.54 Fewer snails were recovered from this deposit. There was a marked increase in the amphibious species, namely *Lymnaea truncatula* and *Anisus leucostoma*, while the other fresh-water groups declined. *Lymnaea peregra* and Limicidae were also significant in number within this deposit. *Lymnaea truncatula* and *Anisus leucostoma*, favour marshy grassland and swampy pools subject to seasonal desiccation. *Lymnaea peregra* can also survive in this environment, as it occurs in all kinds of aquatic environments.

3.16.55 A slow-flowing, almost stagnant, well-vegetated channel within an open landscape of meadow/ damp pasture, subject to frequent flooding or seasonal standing water is indicated by this assemblage.

Context (73), Sample <19>, Organic alluvium

3.16.56 This was the richest deposit in terms of shell numbers and species diversity within the sequence of samples from section 16 and the mollusc assemblage mainly comprised fresh-water species. There is a significant change in the assemblage composition to that of context (107). The moving water species were the dominant group within the fresh-water groups, in particular *Valvata piscinalis, Pisidium* spp. and *Bithynia tentaculata*, which can all favour large bodies of slowly flowing water with dense growths of aquatic plants. The presence, albeit in a small quantity, of *Theodoxus fluviatilis* within the assemblage may be indicative of a faster flowing water element and a fully riverine environment once more (Boycott 1936, 141). This increase of movement is also indicated by the recovery of more *Bithynia* opercula.

3.16.57 The other species present in the assemblage in significant numbers included *Valvata cristata, Planorbis planorbis* and *Gyraulus albus*, which are found in all kinds of well-vegetated aquatic habitats, together with *Lymnaea truncatula* and *Anisus leucostoma*, which are indicative of marshy grassland and seasonally desiccating swampy pools. It appears that the channel had become more active again, as the mollusc assemblage indicates a faster flowing well-vegetated channel environment with a decreasing exploitation of the marshy channel margins and open areas of meadow/ damp pasture in the vicinity.

Context (72), Sample <34>, Organic alluvium

3.16.58 The assemblage is too small to enable a very detailed interpretation of the nature of both the aquatic environment and local landscape. The assemblage is dominated by the moving water species *Valvata piscinalis* and *Bithynia tentaculata*, the amphibious species *Lymnaea truncatula* and Limicidae, an intermediate species. The species present would be compatible with a well-vegetated flowing channel within an open landscape of meadow/ damp pasture with more marshy areas on the channel margins or swampy pools. The channel is likely to be faster flowing, as a large number of *Bithynia* opercula were recovered, at a ratio of 40 opercula to each apex. This is also indicated by the presence of *Theodoxus fluviatilis*, a species which thrives in a fully riverine environment.

Context (71), Sample <35> Organic alluvium and Context (71), Sample <36> Overbank alluvium

3.16.59 No shells were retrieved from these deposits.

SECTION 18

Context (97), Sample <39>, Alluvial clay

3.16.60 This assemblage was dominated by the marsh-loving species, in particular *Vallonia pulchella/ excentrica*, and the intermediate terrestrial species, particularly Limicidae and *Trichia hispida*. A small number of the species within the assemblage may have exploited vegetated areas on the channel edge and marshy grassland or swampy pools subject to seasonal desiccation.

3.16.61 The snails are indicative of a stagnant, or very slow-flowing, well-vegetated channel with marshy margins within an open landscape of meadow/damp pasture, subject to frequent flooding or seasonal standing water.

Context (96), Sample <38>, possible early soil horizon

3.16.62 Snail numbers are too low to determine the local environment reflected in this deposit.

SECTION 19

Context (102), Sample <26>, Alluvial clay

3.16.63 The predominant species within this assemblage were *Lymnaea truncatula*, *Vallonia pulchella/ excentrica*, Limicidae and *Trichia hispida*. There was also a small element of ditch and intermediate fresh-water species within the assemblage.

3.16.64 This assemblage is indicative of a stagnant or very slow- flowing well-vegetated channel within an open landscape of meadow/damp pasture, subject to frequent flooding or seasonal standing water.

Context (104), Sample <27>, Fill of rivulet/ gully [103]

3.16.65 The assemblage was dominated by the moving water and ditch species fresh-water groups, mainly comprised *Bithynia tentaculata*, *Pisidium* spp. and *Planorbis planorbis.* Although *Lymnaea truncatula*, *Vallonia pulchella/ excentrica*, Limicidae and *Trichia hispida* are still present within the assemblage, these species have all declined from the levels recorded in the alluvial clay context (102), cut by this rivulet/ gully. This may depict a much more active well-vegetated channel with a marshy edge environment in the vicinity of an open landscape of meadow/ damp pasture.

Section 21: Context (106), Sample<17>, Fill of rivulet/gully [105]

3.16.66 This gully/rivulet is also cut through the alluvial clay deposit (102). The mollusc assemblage obtained from this rivulet/gully is similar to that observed from rivulet/ gully [103] and is indicative of the same environment.

DISCUSSION

3.16.67 The mollusc assemblages from Section 16 appear to reflect fluctuations within the channel environment and surrounding landscape. The snails from the lower deposit, context (110), of Late Neolithic date are indicative of a relatively fast flowing well-vegetated channel with marshy river edges within in an open landscape of possible damp grassland. This open landscape is evident throughout the history of the channel to a greater or lesser extent. Over time this well-vegetated channel became slower-flowing and there was an increase in the marshy channel margins and areas of meadow/damp pasture in the vicinity as indicated by the assemblages from deposits (109) and (108). During the Late Iron Age/ early Romano-British period (context (107)) the channel is likely to have become slow-flowing, almost stagnant, with adjoining meadow/ damp pasture which were subjected to frequent flooding or seasonal standing water. By the Romano-British to Early/ Middle Anglo-Saxon period (context (73)) the channel had become more active again with a faster flowing aquatic environment.

3.16.68 The mollusc assemblage from context (97), Section 18, from the Late Iron Age/ early Romano-British period depicts a stagnant or very slow-flowing well vegetated channel within a local landscape of meadow/ damp pasture subject to frequent flooding or seasonal standing water. This environment is also reflected by the assemblage from context (102). This is similar to the environment reflected in the main sequence during this period.

3.16.69 This stagnant or very slow-flowing channel appears to have been cut by a series of small much more active rivulets/ gullies with marshy edge environments as is shown by the mollusc assemblages from contexts (104) and (106).

Table 75: Mollusc assessment from Trench 54, Section 16

Sample	**<38>**	**<33>**	**<32>**	**<25>**	**<24>**	**<23>**	**<19>**	**<34>**	**<35>**	**<36>**
Context	**(112)**	**(111)**	**(110)**	**(109)**	**(108)**	**(107)**	**(73)**	**(72)**	**(71)**	**(70)**
Depth top (m OD)	**0.46**	**0.54**	**0.59**	**0.81**	**1**	**1.36**	**1.64**	**1.83**	**2**	**2.22**
Depth bottom (m OD)	**0.42**	**0.46**	**0.54**	**0.59**	**0.81**	**1**	**1.36**	**1.64**	**1.83**	**2**
Sediment Type	**organic clay**	**alluvial silty sand**	**woody peat**	**organic alluvium**					**overbank alluvium**	
Feature	**Layer**	**Layer**	**Layer**	**Layer**	**Layer**	**Layer**	**Layer**	**Layer**	**Layer**	**Layer**
Sample size (litres)	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
Land snails										
Carychium cf. *minimum*	-	-	3	8	2	1	2	-	-	-
Carychium sp.	-	-	-	2	2	-	-	-	-	-
Succinea/ Oxyloma spp.	-	-	2	5	-	-	2	-	-	-
Cochlicopa lubricella	-	-	-	-	-	-	1	-	-	-
Cochlicopa spp.	-	-	1	2	-	-	-	-	-	-
Vertigo pygmaea	-	-	-	-	-	1	1	-	-	-
Pupilla muscorum	-	-	-	-	-	-	1	-	-	-
Vallonia costata	-	-	1	-	-	-	2	-	-	-
Vallonia excentrica/ pulchella	-	-	3	26	12	6	24	1	-	-
Aegopinella nitidula	-	-	1	5	2	-	3	-	-	-
Limicidae	-	1	1	9	17	7	23	8	-	-
Helicella itala	-	-	-	-	-	-	1	-	-	-
Trichia hispida	-	-	-	6	8	5	6	1	-	-
Cepaea/ Arianta sp.	-	-	1	-	+	-	+	+	-	-
Fresh Water Snails										
Theodoxus fluviatilis	-	-	+	-	-	-	1	1	-	-
Valvata cristata	-	+	46	10	9	3	57	1	-	-
Valvata piscinalis	-	-	25	3	-	3	104	4	-	-
Bithynia tentaculata	-	-	-	-	-	-	14	-	-	-
Bithynia spp.	-	-	3	3	4	2	44	9	-	-
Bithynia opercula	-	17	196	20	18	7	408	363	-	-
Lymnaea truncatula	-	-	2	10	5	12	25	-	-	-
Lymnaea palustris	-	-	-	1	1	-	-	-	-	-
Lymnaea peregra	-	-	-	12	7	5	9	-	-	-
Lymnaea spp.	-	-	13	35	27	6	18	3	-	-
Planorbis planorbis	-	-	1	7	3	-	23	1	-	-
Anisus leucostoma	-	-	14	1	-	6	31	-	-	-
Bathyomphalus contortus	-	-	-	-	-	-	1	-	-	-
Gyraulus albus	-	-	-	-	-	-	26	-	-	-
Gyraulus crista	-	-	12	-	-	-	6	-	-	-
Ancylus fluviatilis	-	-	9	-	-	-	1	-	-	-
Acroloxus lacustris	-	-	4	1	-	-	2	-	-	-
Pisidium amnicum	-	-	1	1	3	-	4	1	-	-
Pisidium spp.	-	1	38	25	28	4	96	1	-	-
Taxa	0	2	17	17	12	12	25	10	0	0
Total	0	2	180	172	130	61	528	31	0	0
% Shade - loving species	0	0	1.67	8.72	4.62	1.64	0.95	0	0	0
% Intermediate species	0	50	1.67	9.88	19.23	19.67	5.68	29.03	0	0
% Open country species	0	0	2.22	15.12	9.23	11.48	5.49	3.23	0	0
% Marsh loving species	0	0	1.11	2.91	0	0	0.38	0	0	0
% Amphibious species	0	0	8.89	6.4	3.85	29.51	10.61	0	0	0
% Intermediate species	0	0	6.67	7.56	6.15	8.2	7.95	0	0	0
% Ditch species	0	0	28.33	10.47	9.23	4.92	15.53	6.45	0	0
% Moving water species	0	0	21.11	4.07	5.38	8.2	31.82	48.39	0	0
% Unassigned species	0	50	28.33	34.88	42.31	16.39	21.59	12.9	0	0

Table 76: Mollusc Assessment from Trench 54, Sections 18,19 and 21

Section	<18>	<18>	<19>	<19>	<21>
Sample	(39)	(38)	(26)	(27)	(17)
Context	97	96	102	104	106
Depth top (m OD)	1.25	1.65	-	-	-
Depth bottom (m OD)	1.12	1.25			
Sediment Type	alluvial clay	?early soil horizon	alluvial clay	fill	fill
Feature	Layer	Layer	Layer	Gully/Riv 103	Gully/Riv 105
Sample size (litres)	5	5	5	5	5
Land snails					
Carychium cf. *minimum*	6	-	6	12	8
Carychium spp.	1	-	4	-	1
Succinea/ Oxyloma spp.	3	-	5	5	3
Cochlicopa lubricella	1	-	1	1	-
Cochlicopa spp.	8	-	7	-	2
Vertigo pygmaea	-	-	1	4	1
Vertigo spp.	-	-	-	-	1
Vallonia costata	5	-	9	4	9
Vallonia excentrica/ pulchella	59	-	54	34	32
Vitrina pellucida	-	-	-	-	1
Vitrea spp.	-	-	-	-	2
Aegopinella nitidula	3	-	4	2	1
Limicidae	66	1	51	56	66
Helicella itala	3	-	6	1	1
Trichia hispida	40	-	53	13	12
Cepaea/ Arianta sp.	2	-	1	1	1
Fresh Water Snails					
Valvata cristata	2	-	1	26	43
Valvata piscinalis	-	-	1	14	16
Bithynia tentaculata	-	-	-	36	48
Bithynia spp.	5	-	-	55	86
Bithynia opercula	10	-	3	359	406
Lymnaea truncatula	12	-	29	23	29
Lymnaea palustris	-	-	-	11	7
Lymnaea peregra	5	-	2	13	11
Lymnaea spp.	21	-	18	15	37
Planorbis planorbis	1	-	3	44	33
Planorbis carinatus	-	-	-	-	11
Anisus leucostoma	5	-	8	35	32
Bathyomphalus contortus	-	-	-	6	-
Gyraulus albus	2	-	-	7	9
Hippeutis complanatus	-	-	-	2	1
Planorbarius corneus	-	-	-	-	1
Acroloxus lacustris	-	-	-	2	3
Pisidium amnicum	-	-	-	3	15
Pisidium spp.	-	-	-	42	109
Taxa	17	1	17	24	28
Total	250	1	264	467	635
% Shade - loving species	4	0	5.3	3	1.89
% Intermediate species	46.8	100	42.8	15.2	12.91

Section	<18>	<18>	<19>	<19>	<21>
Sample	(39)	(38)	(26)	(27)	(17)
Context	97	96	102	104	106
Depth top (m OD)	1.25	1.65	-	-	-
Depth bottom (m OD)	1.12	1.25			
Sediment Type	alluvial clay	?early soil horizon	alluvial clay	fill	fill
Feature	Layer	Layer	Layer	Gully/Riv 103	Gully/Riv 105
Sample size (litres)	5	5	5	5	5
% Open country species	26.8	0	26.52	9.21	6.93
% Marsh loving species	1.2	0	1.89	1.07	0.47
% Amphibious species	6.8	0	14.02	12.42	9.61
% Intermediate species	2.8	0	0.76	8.35	4.72
% Ditch species	1.2	0	1.52	15.42	14.17
% Moving water species	2	0	0.38	23.13	25.98
% Unassigned species	8.4	0	6.82	12.21	23.15

3.17 Trench 56 (PDZ3 3.35/ 36)

Introduction

3.17.1 Trench 56 lay between the River Lea and Pudding Mill River. The evaluation trench revealed a prehistoric land surface, an early ditch and, at the trench's southern end, a possible wattle structure. As the archaeological sequence was considered to require further investigation, the trench was subject to excavation without being enlarged. This revealed that the possible structure lay within a shallow hollow sealed by a layer containing charred emmer wheat and rye which subsequent radiocarbon dating has shown to be Late Saxon/ early medieval period.

Sediments

3.17.2 Sediment samples from monolith <65> were found to be too poorly preserved (very dried out and fragmented) to enable any meaningful description to be made. As a result, the sediment descriptions from Payne and Spurr (2009, Table 7) are given in Table 77.

Table 77: Sediment descriptions for Monolith <65>, Trench 56 (taken from Payne and Spurr 2009, Table 7)

Level (m OD)	Context	Sedimentary description
2.63 to 2.23	193 194 195	Firm grey brown SILTY CLAY, with Fe concretions and occasional coarse sand. This unit becomes softer and grittier at the base (195). Contact with unit below is clear and horizontal.
2.23 to 2.05	196 199 200	Very dark brown, firm organic SILTY CLAY with sand and fine gravel. Wood fragment at base. Contact with unit below is clear and sloping
2.05 to 1.99	198	Moderately consolidated lens of yellowy orange (iron stained) gritty sand. Contact with unit below is clean and sloping.
1.99 to 1.81	197	Firm, mid brownish grey SILTY CLAY with gravel and sand. Occasional Fe concretion. Contact with unit below is clear and horizontal.
1.81 to base	262	Firm, mid greyish brown SILTY CLAY with coarse sand and angular to rounded gravel.

Dating

3.17.3 Severn radiocarbon dates were obtained from Trench 56 (Table 78).

Table 78: Radiocarbon dates from Trench 56

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<77> (143)	2.06	Sediment (acid wash)	Beta-250527	1790±40	-28.1	cal AD 120–350	2
<65> (196)	2.17	Sediment (acid wash)	Beta-250528	1590±40	-27.8	cal AD 390–570	3
<65> (193)	2.56	Sediment (acid wash)	Beta-250529	1180±40	-27.1	cal AD 710–980	3
<77> (215)	1.72	Sediment (acid wash)	Beta-252889	2310±40	-27.1	510–200 cal BC	2
<67> (199)	-	Charred cereal: 2 x *Triticum dicoccum/ spelta* grains	SUERC-34943	985±35	-22.6	cal AD 980–1160	1
<67> (199)	-	Charred *Triticum dicoccum* (spikelet forks)	SUERC-36288	970±30	-25.3	cal AD 1010–1160	1
<66> (200)	-	14 x *Ranunculus* sp., *Bidens* tri, 10 x *Eleocharis* sp., *Carex* trig, *Carex* flat, 2 x *Sonchus asper*	SUERC-35335	905±30	-26.9	cal AD 1030–1210	1

3.17.4 The possible wattle-lined pit was found capped by alluvial deposits which initial dating of bulk sediments from the overlying alluvium provided two dates in stratigraphic and chronological order: context (196) was dated cal AD 390–570 (Beta-250528, 1590±40 BP), and was overlain by context (193), dated cal AD 710–980 (Beta-250529, 1180±40 BP) (see Figure 25. This would suggest the pit was

Romano-British or earlier in origin. However, dating of seeds in the base of the pit (context (200)) gave a date of cal AD 1030–1210 (SUERC-35335, 905±30 BP) overlain by two dates upon cereal grains and spikelet forks of cal AD 980–1160 (SUERC-34943, 985±35 BP) and cal AD 1010–1160 (SUERC-36288, 970±30 BP), implying the pit is much later and of Late Saxon/ early medieval date. Given the context of the pit in relation to the overlying alluvium, and the cereals came from a botanically rich assemblage, it would support the conclusion that the material dated is *in situ* and not intrusive. A description of the plant assemblage from this feature is provided in Powell (2012; Chapter 7).

Pollen

3.17.5 Three pollen samples were taken from monolith <65>.The pollen assemblage (Figure 26) is dominated by Poaceae (31-37%) and Cyperaceae (26-47%). Tree and shrub taxa are only present in low amounts, including *Quercus* (1%), *Betula* (up to 1%), *Alnus glutinosa* (1-2%), *Corylus avellana*-type (up to 5%), *Salix* (up to 2%) and *Sambucus nigra* (up to 1%). Dwarf shrub and herb taxa include *Ranunculus acris*-type (up to 2%), Chenopodiaceae (1-4%), *Polygonum* (up to 1%), Lactuceae undiff. (up to 2%) and *Solidago virgaurea*-type (1-2%). *Cerealia*-type (1-5%) pollen grains were also present, though the large grain Poaceae assemblage was dominated by wild grasses including *Glyceria*-type (up to 4%) and *Arrhenatherum*-type (2-11%), with *Bromus hordeaceus*-type (up to 2%) present at the top of the sequence. Aquatic taxa included *Lemna* (up to 1% TLP + aquatics), *Sparganium emersum*-type (up to 3-8% TLP + aquatics) and *Typha latifolia* (up to 1% TLP + aquatics). *Polypodium* (1-2% TLP + pteridophytes), *Pteridium aquilinum* (up to 1-5% TLP + pteridophytes) and Pteropsida (monolete.) indet. (up to 5-10% TLP + pteridophytes) were also present. Pollen concentrations increased towards the top of the sequence, ranging from 53571 to 220989 grains cm^{-3}.

3.17.6 The pollen assemblage from this sequence can be interpreted as indicating a largely open environment with limited woodland cover. Local damp grassland is implied by the presence of grasses such as *Glyceria*-type and *Arrhenatherum*-type, with much of the Poaceae, Cyperaceae and *Sparganium emersum*-type also likely to be associated with this type of environment. Some *Cerealia*-type are also found towards the top of the sequence which might suggest some nearby cultivation or simply on-site processing is unclear.

Insects

3.17.7 A single very small insect fauna was recovered from a wicker lined feature (239) of Anglo-Saxon/ Saxo-Norman date in Trench 56 (Table 79). It is one of the few samples from the Olympic site which contains a number of taxa that are commonly found in archaeological settlement particularly in dry materials such as hay and straw; such as the mycetophagid *Typhaea stercorea* and the range of cryptophagids and lathridiids recovered. Though these species may indicate that such material was incorporated into this feature they can also be found in nature away from human habitation (Smith 2000b). There are also indications that this feature may have been flooded since the 'water beetles' *Haliplus* sp., *Cercyon* cf. *tristis*, the elmid *Dryops* spp. are all associated with slow flowing water. Additionally, the weevil *Notaris acridulus*, which is associated with reed sweet-grass (*Glyceria maxima*), was also recovered.

Table 79: Insect assemblage from Trench 56

Sample number		**<66>**	**Phytophage plant hosts (nomenclature follows that of Stace 1997)**
Context number		**(200)**	
Feature number		**239**	
Feature type		**Wattle lined pit**	
Date		**Saxon/ Saxo-Norman**	
Volume (l.)		**10**	
COLEOPTERA			
Carabidae			
Clivina fossor (L.)		1	
Bembidion lampros (Hbst.)		1	
Bembidion genei Küster		1	
Bembidion guttula (F.)		1	
Halididae			
Haliplus spp.	a	2	
Hydraenidae			
Helophorus spp.	a	3	
Hydrophilidae			
Cercyon cf. *tristis* (Ill.)		1	
Megasternum boletophagum (Marsh.)		2	
Staphylinidae			
Aploderus caelatus (Grav.)	df	1	
Oxytelus rugosus (F.)	df	1	
Lathrobium spp.		1	
Xantholinus spp.		2	
Philonthus spp.		1	
Throscidae			
Throscus spp.	ws	1	
Dryopidae			
Dryops spp.	a	1	
Cryptophagidae			
Cryptophagus spp.	s	4	
Atomaria spp.	s	2	
Lathridiidae			
Enicmus minutus (Group)	s	3	
Corticaria/ corticarina spp.		9	
Mycetophagidae			
Typhaea stercorea (L.)	s	1	
Anthicidae			
Anthicus spp.		1	
Scarabaeidae			
Aphodius ater (Geer)	df	1	
Curculionidae			
Apion spp.	p	2	
Sitona flavescens (Marsh.)	p	1	*Trifolium* species (Clover)
Sitona spp.	p	2	
Notaris acridulus (L.)	ws	3	Often on *Glyceria maxima* (reed sweet-grass) and other *Glyceria* species (sweet-grasses)
Cidnorhinus quadrimaculatus (L.)	p	1	*Urtica dioica* (stinging nettle)

Sample number		**<66>**	**Phytophage plant hosts (nomenclature follows that of Stace 1997)**
Context number		**(200)**	
Feature number		**239**	
Feature type		**Wattle lined pit**	
Date		**Saxon/ Saxo-Norman**	
Volume (l.)		**10**	
Total number of individuals		48	
Total number of taxa		26	

Key to ecological groupings used
a= aquatic water beetles
aff= aquatic taxa normally associated with faster flowing waters
ws = waterside taxa often associated with emergent vegetation
df = taxa often associated with dung
p= taxa associated with grassland and open areas
l= taxa associated with trees
s= taxa normally associated with human settlement

3.18 Trench 58 (PDZ3 3.38)

Introduction

3.18.1 Trench 58 lay west of Marshgate Lane and immediately east of the former course of Pudding Mill River. The evaluation trench revealed a sequence of ditches and water channels, with associated timber structures and wattle linings considered to be of possible Saxon to post-medieval date. Radiocarbon dating indicated Romano-British and late medieval dates for the timber structures, and the main channel may have been an early course of a mill stream.

Sediments

3.18.2 A series of five monoliths were described from this Trench, shown in Table 80, Table 81, Table 82, Table 83 andTable 84. With the exception of monolith <200> (taken from the Sondage), the remainder of the monoliths are shown on the section drawing in Figure 27.

Table 80: Sediment descriptions for Monolith <200>, Trench 58

Level (m OD)	Context	Sediment description	Interpretation
2.23 to 2.13	144	10YR4/ 3 brown silty clay loam, very dried and concreted. Sharp boundary	Silting
2.13 to 1.97	145	Very loose orange brown tufaceous sand with very abundant mollusc fragments. Sharp boundary.	Active channel deposit
1.97 to 1.91	145	10YR4/ 3 brown silty clay loam, very dried and concreted. Sharp boundary	Silting
1.91 to 1.88	145	Very loose orange brown tufaceous sand and larger nodules, c. 3mm. Mollusc fragments. Sharp boundary.	Active channel deposit
1.88 to 1.84	146	10YR4/ 2 dark grayish brown silty clay loam, sharp boundary	Silting
1.84 to 1.78	146	Loose sand and small gravel	Active channel deposit
1.78 to 1.73	146	10YR4/ 2 dark grayish brown silty clay loam	Silting

Table 81: Sediment descriptions for Monolith <206>, Trench 58

Level (m OD)	Context	Sediment description	Interpretation
3.26 to 3.06	(131) (132)	10YR3/ 1 very dark grey silty clay. Compact, breaking in to blocky peds. Fairly calcareous on contact with HCl with sparse mollusc shell fragments, whole *Theodoxus fluviatilis*. Sparse mottles of Fe staining, probably deposited around roots or other inclusions. Rare pores 0.1%. Abrupt boundary	Silting
3.06 to 3.04	(132)	10YR4/ 1 dark grey sandy silt loam. Rough and gritty made up mainly of medium to coarse sand with tufa. Highly calcareous on contact with HCl. No visible mollusc shell fragments. Abrupt boundary.	Silting
3.04 to 2.89	(132)	10YR3/ 1 very dark grey silty clay, similar to top portion of profile but with regular inwashes (up to 10mm wide) of paler more calcareous material. Rare charcoal flecks and moderate mollusc shell fragments throughout. Whole *Theodoxus Fluviatilis* observed. Sharp wavy boundary.	Silting
2.89 to 2.83	(54)	Well sorted coarse sandy gravel (up to 1cm). Heavily Fe stained (2.5YR3/ 6 dark red) with moderate mollusc shell fragments. Sharp boundary.	Active channel
2.83 to 2.77	(54)	10YR4/ 4 dark yellowish brown coarse sand becoming finer down profile with some fine gravel, poorly sorted. Faint Fe staining that disappears in the top 20mm of the profile. Some mollusc shell fragments, *Bithynia* opercula observed.	Active channel

Table 82: Sediment descriptions for Monolith <211>, Trench 58

Level (m OD)	Context	Sediment description	Interpretation
2.43 to 2.29	74	10YR4/ 2 dark greyish brown clay to silty clay loam	Silting
2.29 to 2.02	281	10YR4/ 3 brown silty clay loam, with mollusc fragments	Silting
2.02 to 1.93	288	Orangey brown coarse tufaceous sand, highly calcareous, with molluscs	Active channel

Table 83: Sediment descriptions for Monolith <231>, Trench 58

Level (m OD)	Context	Sediment description	Interpretation
2.19-1.96	392	10YR5/ 3 brown silty clay loam, mollusc rich, bands of sandier/ more mollusc rich material, occasional chunks of waterlogged wood/ root. Sharp boundary	Slow moving/ marginal water
1.96-1.86	424	Coarse sand, very mollusc rich, with some dark grey silty clay loam matrix, occ. gravel up to 30mm, rounded, more granular/ gravelly at top	Active channel
1.86-1.79		10YR4/ 2 dark greyish brown clay with occasional rounded pebble	

Table 84: Sediment descriptions for Monoliths <41> and <42>, Trench 58

Level (m OD)	Context	Sediment description	Interpretation
2.91 to 2.55	43	10YR6/ 4 light yellowish brown sandy silt loam, very common molluscs, clear boundary.	Lowish energy active channel margins
2.55 to 2.20	30	10YR5/ 3 brown grittly silt loam to silty clay loam, very common molluscs. Interdigitated with layer below.	Lowish energy active channel margins
2.20 to 2.01	26	10YR3/ 2 very dark greyish brown clay loam, very humic, some molluscs but many less than above.	Silting/ ?channel edge

Radiocarbon

3.18.3 Six radiocarbon dates were obtained from Trench 58 (Table 85).

Table 85: Radiocarbon dates from Trench 58

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<40> (27)	1.65	Sediment (acid wash)	Beta-250978	5350±40	-26.2	4330–4050 cal BC	2
<41> (26)	2.08	Sediment (acid wash)	Beta-250979	1490±40	-29.3	cal AD 430–650	2
<43> (33)	3.5	Sediment (acid wash)	Beta-250980	3270±40	-26	1640–1440 cal BC	3
<42> (23)	2.9	Sediment (acid wash)	Beta-250981	2600±40	-26.3	840–560 cal BC	3
Timber 234	-	Worked wood: *Salix/ Populus* sp.	SUERC-36580	315±35	-27.3	cal AD 1470–1650	1
Timber 280	-	Worked wood: *Betula* sp.	SUERC-36581	1795±35	-27.1	cal AD 120–340	1

Plant macrofossils

3.18.4 A total of seven samples were examined from Trench 58, shown in Table 86. The earliest came from Romano-British channel 42 (146) and associated with timber 280 which was dated to cal AD 120-340 (SUERC-36581, 1795±35 BP). Two further samples came from Anglo-Saxon channel deposits SG51 (26) and SG10 (423), the former having been dated on sediment to cal AD 430-650 (Beta-250979, 1490±40 BP). The remaining samples were dated to the post-medieval period, with the three from SG 24 (122), SG26:137 (132) and SG35: 282 (281) probably dating to between AD 1650 to 1800, and the last from SG43 (144) potentially dates to the 18th to 19th century.

3.18.5 The Romano-British sample from context (146) shows that the channel quite possibly had permanent to semi-permanent standing water with seeds of water-crowfoot (*Ranunculus* subg. *Batrachium*), water starwort (*Callitriche* sp.), and branched bur-reed (*Sparganium erectum*), although species within all these groups may have tolerated occasional drying out of the channel. The edges of the channel appear largely overgrown with common nettles (*Urtica dioica*), bramble (*Rubus* sp.), and a lot of evidence for scrub or hedgerow in the form of seeds of elder (*Sambucus nigra*). Beyond this evidence for scrub there is some evidence for disturbed wet open pasture and/ or wasteland, including buttercup (*Ranunculus* sp.), mint (*Mentha* sp.), sedges (*Carex* sp.), ground-ivy (*Glechoma hederacea*), dead-nettle (*Lamium* sp.), black nightshade (*Solanum* sp.), thistles (*Carduus/ Cirsium* sp.), and violet (*Viola* sp.), although all may have grown in the shade of hedges or scrub.

3.18.6 The Anglo-Saxon samples from SG51 (26) and SG10 (423) demonstrated a much greater degree of openness, being dominated by seeds of species of wet-marshy pasture/grassland; buttercup (*Ranunculus* sp.), that were very abundant, and dock (*Rumex* sp.), sedges (*Carex* sp.), lesser celandine (*Ranunculus ficaria*), celery-leaved buttercup (*Ranunculus sceleratus*), winter-cress (*Barbarea vulgaris*) and hemp-agrimony (*Eupatorium cannabinum*).

3.18.7 There is great evidence for human and/ or animal disturbance in these samples, with species of disturbed and nitrogen enriched soils, including orache (*Atriplex* sp.), common nettle (*Urtica dioica*) and cleavers (*Galium aparine*). While most of the species are of open ground, occasional bud and catkin scales of willow (*Salix* sp.), elder (*Sambucus nigra*) did indicate some limited scrub in the area. Additionally there is much greater evidence for a more permanent, probably larger channel area with great numbers of seeds of branched bur-reed (*Sparganium erectum*), along with club-rush (*Schoenoplectus* sp.), stonewort (*Chara* sp.), pondweed (*Potamogeton* sp.), water-crowfoot (*Ranunculus* subg. *Batrachium*) and statoblasts of *Plumatella* sp.

3.18.8 The post-medieval samples indicated a broadly similar open environment to that seen in the Saxon samples, although seeds of elder were very common in SG 24 (122). Species of wasteland, disturbed soils and grassy areas were still well represented and included those of sow-thistle (*Sonchus* sp.) and common nettle (*Urtica dioica*). Of some interest were several seeds of cow-parsley (*Anthriscus sylvestris*) in context (281), a species which today is a common sight along river banks, but not recorded in any of the earlier samples from the Olympic Park site. Godwin (1984) records it as doubtfully native and it may be in part that its absence from these earlier samples is due to it being introduced relatively recently. However, it is possible that more stable, drier grassy river banks, which were kept clear of grazing animals, might have allowed it to flourish in places where it had been formerly absent.

3.18.9 As with the Saxon period there is generally good evidence during this period for vegetation in the water along the channel edge in the form of many seeds of branched bur-reed (*Sparganium erectum*) and club-rush (*Schoenoplectus* sp.), as well as seeds of pondweed (*Potamogeton* sp.). Statoblasts of the bryozoa *Plumatella* sp. were also common and are likely to indicate relatively slow flowing conditions and vegetated parts of the channel.

Table 86: Waterlogged plant remains from Anglo-Saxon ditches and pits, Trench 58

Sample		<0>	<1>	<2>	<3>	<4>	<5>	<6>
Context		(203)	(213)	(208)	(210)	(228)	(8)	(201)
Group		Channel	Channel	Channel	Layer	Channel	Channel	Layer
Period		SG43	SG35: 282	SG26 :137	SG24	SG10	SG51	
Sample Size (litres)		144	281	132	122	423	26	146
Flot size (ml)		pre 1900	after c. .AD 1650-1800			Saxon		RB
Chara sp.	stonewort	-	-	-	-	-	+	-
Nuphar lutea	yellow water-lily	+	+	-	1	-	-	-
Ceratophyllum demersum	rigid hornwort	+	-	-	-	-	-	-
Ranunculus acris/ repens)	buttercup	+	+	+	++	-	+++	+
Ranunculus sceleratus	celery-leaved buttercup	-	-	-	+	-	+	-
Ranunculus ficaria	lesser celandine	-	-	-	-	-	+	+
Ranunculus subg. *Batrachium*	water-crowfoots	+	+	-	+	-	+	+
Ficus carica	fig	-	-	+	-	-	-	-
Urtica dioica	common nettle	-	++	+++	++	-	+	+++
Atriplex sp.	orache	+	++	+	-	-	+	-
Stellaria media/nemorum	common/ wood stitchwort	-	+	-	-	-	+	-
Persicaria maculosa/ lapathifolium	redshank/ pale persicaria	-	+	+	-	-	-	-
Persicaria hydropiper	water-pepper	+	+	-	+	-	-	-
Persicaria mitis	tasteless water-pepper	-	+	-	-	-	-	-
Rumex sp.	dock	-	++	-	-	-	++	-
Rumex conglomeratus (whole fruit)	clustered dock	+	-	+	-	-	-	-
Viola odorata/ hirta	sweet/hairy violet	-	-	-	-	-	-	+
Salix catkin bud scale	willow bud scale	+	-	+	+	-	+	-
Barbarea vulgaris	winter-cress	+	+	+	-	-	+	-
Rorippa cf. *nasturtium-aquaticum*	narrow-fruited water-cress	-	-	+	-	-	-	-
Brassica cf. *nigra*	black mustard	+	-	-	-	-	-	-
Rubus sp.	bramble	+	-	-	+	-	+	++
Potentilla sp.	cinquefoil/ tormentil	-	-	+	-	-	-	-
Fragaria vesca	strawberry	-	+	-	-	-	-	-
Prunus spinosa	sloe	-	-	+	-	-	-	-
Anthriscus sylvestris	cow parsley	-	++	-	-	-	-	-
Oenanthe fluviatilis	water-dropwort	-	++	+	+	-	-	-
Apium nodiflorum	fool's watercress	-	++	-	-	-	+	-

Sample		<0>	<1>	<2>	<3>	<4>	<5>	<6>
Context		(203)	(213)	(208)	(210)	(228)	(8)	(201)
Group		Channel	Channel	Channel	Layer	Channel	Channel	Layer
Period		SG43	SG35: 282	SG26 :137	SG24	SG10	SG51	
Sample Size (litres)		144	281	132	122	423	26	146
Flot size (ml)		pre 1900	after c. .AD 1650-1800			Saxon		RB
Pastinaca sativa	wild parsnip	-	-	-	-	-	+	-
Solanum nigrum	black nightshade	-	-	+	-	-	-	+
Menyanthes trifoliata	bogbean	-	+	-	-	-	-	-
Stachys cf. *arvensis*	hedge woundwort	-	-	-	-	-	-	+
Lamium sp.	dead nettle	+	-	-	-	-	-	-
Ajuga reptans	bugle	-	+	-	-	-	-	-
Glechoma hederacea	ground-ivy	-	-	+	-	-	-	+
Lycopus europaeus	gypsywort	-	-	-	-	-	-	+
Mentha sp.	mint	-	-	+	-	-	-	++
Callitriche sp.	water-starwort	-	-	-	-	-	-	+
Galium sp.	cleavers	-	-	-	-	-	+	-
Sambucus nigra	elder	-	-	-	+++	-	+	+++
Carduus/ Cirsium sp.	thistle	+	+	+	++	-	+	+
Sonchus arvensis/ oleraceus type	sow-thistle	-	-	-	++	-	-	-
Sonchus asper type	prickly sow-thistle	+	+	+	-	-	-	-
Eupatorium cannabinum.	hemp-agrimony	-	-	-	-	-	1	-
Potamogeton sp.	pond weed	-	+	++	-	+	1	-
Schoenoplectus sp.	club rushes	+	++	-	++	-	+	-
Carex sp. (flat)	sedge (lenticular)	-	-	-	-	-	+	-
Carex sp. (trigonous)	sedge (trigonous)	+	-	+	+	-	+	+
Triticum aestivum(grain)	hulled wheat	1	-	-	-	-	-	-
Sparganium erectum (fruit/achene)	branched bur-reed	-	-	-	+	-	+	+
Sparganium erectum (embryo)	branched bur-reed	-	+++	++++	++++	-	+++	++
Buds indet.	shrub/tree buds	-	-	flower	2	-	-	-
Earthworm (Oligochaeta) cocoons	earthworm cocoons	-	-	-	-	-	++	-
Plumatella sp.	Bryozoan statoblasts	-	-	+++	+++	-	+	-

Diatoms

3.18.10 Diatom evaluation of these samples indicates that only two of the seventeen newly prepared samples are suitable for percentage diatom analysis (Table 87). Percentage diatom counting has been carried out on these two samples and is reported shown in Figure 28. The diatom composition of five poorly preserved diatomaceous samples is shown in Table 88.

3.18.11 An extremely small number of indeterminate fragments are present in samples from monolith <211> at 2.35m OD and monlith <200>) at 2.18m OD, so no further analysis was possible. However, a single rapheless valve fragment of the epiphytic freshwater species *Cocconeis placentula* was identified in sample from monolith <211> at 2.35m OD.

3.18.12 The most common diatoms present in the poorly-preserved diatom assemblages shown in Table 88 contain species similar to those found in the samples for which percentage counting was possible. The most common diatoms are freshwater (oligohalobous indifferent), non-planktonic diatoms that are associated with shallow water; benthic, epiphytic and epilithic habitats eg. *Gyrosigma attenuatum, Amphora pediculus, Cocconeis placentula* and *Synedra ulna*. Exceptionally in monolith <211> at 2.10m OD and 2.20m, OD there are traces of estuarine diatoms. A very small number of valves of the polyhalobous species *Rhaphoneis surirella* and *Paralia sulcata* (2.20m OD) are present with possible fragments of the brackish-marine (mesohalobous), benthic species *Diploneis didyma*.

Table 87: Diatom evaluation results from Trench 58

Sam. No.	Depth (m OD)	Diatoms	Diatom numbers	Quality of preservation	Diversity	Assemblage type	Potential for % count
<211>	2.10	present	low	v poor	moderate	fw (mar bk)	none
<211>	2.20	present	v low	v poor	moderate	mar bk fw	none
<211>	2.35	ex few	ex low	ex poor	-	cf *C. placentula* frag	none
<41>	2.10	present	moderate			see Figure 3	count
<42>	2.79	present	v low	v poor	v low	fw	none
<206>	2.96	present	moderate			see Figure 3	count
<206>	3.06	present	v low	poor	low	fw	none
<200>	2.18	ex few	ex low	ex poor		2 indet fragments	none
<231>	1.89	present	v low	v poor	mod	fw	none

(fw – freshwater, bk - brackish, mar – marine, aero – aerophilous, non-planktonic – non-pk)

3.18.13 The two samples that were analysed for diatoms (Figure 28) were taken from separate monolith sequences; Monolith <41>, and Monolith <206> (see Table 87).

3.18.14 Monolith <41> at 2.10m OD is dominated by non-planktonic oligohalobous indifferent diatoms such as the epiphyte *Cocconeis placentula* which comprises almost 25% of the assemblage. Other common taxa are *Fragilaria* spp. and the large benthic diatoms *Gyrosigma attenuatum* and *Gyrosigma acuminatum*. Other non-plankton includes *Achnanthes* spp. and *Amphora* spp., *Synedra ulna* and *Cocconeis pediculus*. A number of halophiles are present eg. *Navicula lanceolata, Gomphonema olivaceum, Melosira varians* and *Rhoicosphaenia curvata*, but these diatoms reflect the non-marine salt concentration in the water and are not necessarily indicative of estuarine contact. No marine or brackish-marine diatoms are present. Aerophilous diatoms form a small component of the assemblage and may reflect fluctuating water levels or bank erosion. The aerophilous taxa include *Navicula mutica, Ellerbeckia arenaria, Hantzschia amphioxys* and *Navicula contenta*.

Table 88: Diatom species assessment for the top two samples from Trench 58

Sample	<211>	<211>	<42>	<206>	<231>
Depth (m OD)	**2.10**	**2.20**	**2.79**	**3.06**	**1.89**
Diatom Species					
Achnanthes clevei	+				+
Achnanthes minutissima	+				
Amphora libyca			+		+
Amphora pediculus	++				
Cocconeis disculus					+
Cocconeis placentula	+	+	+	+	+
Cyclotella sp.					cf
Cymbella (*Reimeria*) *sinuata*	+				+
Cymbella sp.	+				
Diploneis didyma	cf	cf			
Ellerbeckia arenaria		+		+	
Epithemia sp.	+				
Fragilaria brevistriata	+				
Fragilaria construens	+	+			
Fragilaria pinnata	+		+		
Gyrosigma acuminatum					+
Gyrosigma attenuatum	++	+	+	+	+
Inderminate pennate sp.	+				
Navicula sp.	+				+
Nitzschia navicularis		+			
Paralia sulcata		+			
Pinnularia sp.			+	+	
Rhaphoneis surirella	+	+			
Rhoicosphaenia curvata			cf		
Synedra ulna	+	+	+	+	+
Unknown diatom fragments	+	+	+	+	+

3.18.15 Monolith <206> at 2.96m OD is also dominated by the freshwater epiphyte *Cocconeis placentula* which comprises almost 45% of the diatom assemblage. The halophobous species *Cocconeis pediculus* forms about 7% of the assemblage. The non-planktonic flora is composed of a range of *Amphora* spp., *Cymbella* spp. and *Fragilaria* spp. Benthic, epipelic taxa include *Caloneis silicula, Cymatopleura elliptica* and *Navicula tripunctata*. The aerophillic taxa recorded in Monolith <41> are not present here. The halophiles *Gomphonema olivaceum* and *Rhoicosphaenia curvata* are present .

Ostracods and Foraminifera

3.18.16 Nine samples were taken from monoliths <41> (at 2.11m OD), <42> (at 2.77m OD), <200> (at 2.18m OD), <206> (at 2.97 and 3.07m OD), <211> (at 2.11, 2.21 and 2.36m OD) and <231> (at 1.91m OD). The sampled sediments are thought to be of Romano-British (<41> and <231>), post-medieval (<206> and <211>) and modern date, later than *c*. AD 1900 (<42> and <200>). The full results of the ostracod content of the nine samples is given in Table 89 and are summarised below, grouped by monolith number.

MONOLITH <41>

3.18.17 At 2.11m OD a good ostracod assemblage was recovered dominated by *Candona neglecta* with other species recorded including *Candona candida*, *Darwinula stevensoni*, *Fabaeformiscandona* sp., *Herepetocypris reptans* and *Limocythere* sp. Other remains recorded within the sample included molluscs (mostly opercula of *Bithynia*), plant remains and tufa.

MONOLITH <42>

3.18.18 At 2.77m OD the ostracod assemblage recovered was dominated by *Candona neglecta* with other species recorded including *Candona candida* and *Darwinula* *stevensoni*. Other remains within the sample included molluscs, fish bone, charcoal, coal and tufa.

Monolith <200>

3.18.19 At 2.18m OD the ostracod assemblage recovered was dominated by *Candona neglecta* with other species recorded including *Candona candida, Ilyocypris bradyi* and *Limnocythere inopinata*. Other remains recorded within the sample included molluscs (Planorbids and opercula of *Bithynia*), plant remains and charcoal.

Monolith <206>

3.18.20 At 2.97m OD the ostracod assemblage recovered was dominated by *Candona neglecta* with other species recorded including *Candona candida, Herpetocypris* sp. and *Limnocythere inopinata*. Other remains within the sample included molluscs and plant remains.

3.18.21 At 3.07m OD the ostracod assemblage recovered was dominated by *Limnocythere inopinata* with other species recorded including, *Candona candida, Candona neglecta* and *Darwinula stevensoni.* Other remains within the sample included molluscs and plant remains.

Monolith <211>

3.18.22 At 2.11m OD very few ostracods were recovered. One broken specimen and a singular valve of *Fabaeformiscandona* sp. were recovered. Other remains within the sample included Molluscs (including *Theodoxus fluviatilis*) and plant remains.

3.18.23 At 2.21m OD a small ostracod assemblage was recovered including *Ilyocypris bradyi* and *Limnocythere* sp.. Other remains of note within the sample included molluscs (including *Theodoxus fluviatilis*), plant remains and slag.

3.18.24 At 2.36m OD no ostracods were recovered within this sample. Other remains within this sample included molluscs, cladoceran egg cases, fish bone and plant remains.

Monolith <M231>

3.18.25 One sample at 1.91m OD contained a relatively diverse assemblage of ostrcods including both adults and instars of *Limnocythere inopinata* and other mainly adult specimens of *Candona candida*, *Candona neglecta*, *Fabaeformiscandona* sp. and *Herpetocypris reptans*. Other remains within the sample included molluscs (opercula of *Bithynia*, *Lymnaea* spp., *Pisidium* spp., Planorbids and *Theodoxus fluviatilis*), charcoal and plant remains including a sloe (*Prunus spinosa*) stone.

Discussion

3.18.26 All of the samples contain remains indicative of deposition non-marine “freshwater” environments. Candonid ostracods including *Candona candida* and *Fabaeformiscandona* sp. were common within the samples with the species *Candona neglecta* often predominant. This ostracod, although known to inhabit a wide range of freshwater environments, is widespread in spring fed waters including ponds and brooks (Meisch 2000). A full discussion of ecological preferences of Candonid ostracods is given in the Trench 118.

3.18.27 The Romano-British samples from monoliths <41> and <231> contained relatively diverse non-marine ostracod assemblages. The species *Herpetocypris reptans* was noteably recorded in these samples but in no others from this trench. The species is known from a wide variety of freshwater environments. The sample in monolith <41> was dominated by the taxon *Candona neglecta* and included both adult and instar stages indicative of an autochthonous assemblage. The ostracod species recorded in both samples and the other molluscan and plant remains recorded are together indicative of a vegetated slow moving, shallow freshwater environment at these levels.

Table 89: Microfaunal content of ostracod/ foraminifera from Trench 58

Monolith	**<41>**	**<42>**	**<200>**	**<206>**	**<206>**	**<211>**	**<211>**	**<211>**	**<231>**
Depth (m OD)	**2.11**	**2.77**	**2.18**	**2.97**	**3.07**	**2.11**	**2.21**	**2.36**	**1.91**
Ostracoda									
Candona candida	x	xx	x	x	x				x
Candona neglecta	xx	x	xx	xx	x				x
Candona spp.	x								x
Darwinula stevnsoni	x	x			x				x
Fabaeformiscandona sp.	x					o			x
Herpetocypris reptans	x								x
Herpetocypris sp.				x					
Ilyocypris bradyi			x				x		
Limnocythere inopinata			x	xx	xx				x
Limnocythere sp.	x				x		o		
Broken/unid.			x		x	o	o		x
Other remains									
Molluscs		xx		xx	x	xx	xx	xx	xx
Bithynia opercula	x	xx	x	x	x		x		x
Bithynia apices	o								
Lymnaea sp.			x						x
Pisidium spp.				x	x				x
Planorbids	x	x	xx	x					x
Theodoxus fluviatilis		x				x	x		x
Cladoceran egg case								x	
Fish bone		x						x	
Plant remains	xxx	x	xxx	xxx	xx	xx	xx	xxx	xxx
Charcoal		x	x	x					x
Charophyte oogonia	x		x		x				o
Coal		x							
Prunus spinosa									o
Seeds	x			x			x	x	xx
Fossil foraminifera							o	o	
Slag							x		
Tufa	xxxx	xxxx	xxx	x	xx				

o = 1 speciment; x = 2 to 9 specimens; xx = 10 to 50 specimens; xxx = over 50 specimens

3.18.28 The post-medieval samples within monolith <206> were relatively more productive than those in <211>, and whilst containing Candoniid ostracods, the predominant taxon within both samples was *Limnocythere inopinata.* This ostracod, whilst known from a wide range of shallow freshwater environments (ponds, lakes, brooks and rivers) is more tolerant of alkaline waters than any other ostracod (Meisch 2000). The samples within monolith <211> contained very few ostracods, although at 2.21m OD two specimens of *Ilyocypris bradyi* were recorded, although likely redeposited, these ostracods are often associated with spring fed waters. Some slag indicative of human activity was also recorded in this sample.

3.18.29 The samples within the more modern sediments (post c. AD 1900) from monoliths <42> and <200> contained freshwater ostracod faunas dominated by the taxa *Candona candida* and *Candona neglecta.* These and the other remains within the samples are indicative of deposition within shallow, slow moving, vegetated freshwaterbody. Charcoal indicative of human activity in the area was recorded within both samples.

Molluscs

3.18.30 A series of nine samples were selected for molluscan analysis from Trench 58. The assemblages were dominated by fresh water species with no brackish water species recovered. Snail numbers were generally very high. Results are given in Table 90 and shown as histograms on Figure 29.

CONTEXT (27), SAMPLE <46>, SG50, BLUE CLAY, LATE MESOLITHIC

3.18.31 Shell numbers are too low to determine the local environment reflected in this deposit, but the shells were all those of fresh-water species.

CONTEXT (26), SAMPLE <8>, SG51, CHANNEL FILL, VERY DARK GREYISH BROWN CLAY LOAM, ANGLO-SAXON

3.18.32 The large mollusc assemblage retrieved from this deposit was dominated by the moving water species group, in particular shells of *Valvata piscinalis* and *Bithynia*. This combination of species may indicate a large body of flowing water with dense growths of aquatic plants. The low ratio of *Bithynia* operculum to apices, 0.91 opercula to every apex, is indicative of the transport of material from a very slowly flowing water environment, possibly at the channel edge. The presence of *Theodoxus fluviatilis*, representing 7% of the assemblage, may point towards a faster flowing water element and a fully riverine environment (Boycott 1936, 141). A small proportion of the molluscs appear to be species which would exploit the marshy river edge and possibly areas of damp grassland in the vicinity. The occurrence of *Clausilia bidentata* is noteworthy, as this species is 'common in woods, on rocks, walls and in established hedges' (Davies 2008, 178) and may be indicative of a small woodland environment, even just a single tree, in the vicinity.

CONTEXT (423), SAMPLE <228>, SG10, CHANNEL FILL, BLACK SILTY CLAY, ANGLO-SAXON

3.18.33 The mollusc assemblage recovered from this channel deposit was again dominated by the moving species group, in particular shells of *Valvata piscinalis*, *Bithynia* and *Theodoxus fluviatilis*. This mollusc assemblage appears to reflect a faster flowing water channel environment than that seen in context (26), particularly as there was a relatively high ratio of 4.5 *Bithynia* opercula to every apex. Again a small proportion of the molluscs appear to be species which would exploit the marshy river edge and possibly areas of damp grassland in the vicinity.

CONTEXT (122), SAMPLE <210>, SG24, CHANNEL BANK, ALLUVIAL CLAY, AFTER C. AD 1650-1800

3.18.34 The very large mollusc assemblage retrieved from this deposit was dominated by the moving species group, in particular shells of *Bithynia* (41%) and *Valvata piscinalis* (28%). *Theodoxus fluviatilis* was also recovered, representing 6% of the assemblage. There was also a low ratio of *Bithynia* operculum to apices, 0.48 opercula to every apex. This mollusc assemblage may indicate a slow flowing well vegetated channel edge environment, again with small patches of marshy river edge environments and possibly areas of damp grassland in the vicinity.

CONTEXT (132), SAMPLE <208>, SG26, CHANNEL FILL, BROWN SILTY CLAY LOAM, AFTER C. AD 1650-1800

3.18.35 Although the smaller mollusc assemblage recovered from this deposit was dominated by the moving species group, in particular shells of *Valvata piscinalis* and *Bithynia*, there was also a marked decrease in the number of *Bithynia*, down to 19% from 41%. There was also an increase in the proportion of the molluscs likely to have been exploiting the well-vegetated channel edge and possible patches of marshy river edge environments and areas of damp grassland in the vicinity. The general aquatic environment appears to have been one of slowly flowing well-vegetated water.

CONTEXT (281), SAMPLE <213>, SG35, CHANNEL FILL, ALLUVIAL CLAY, AFTER C. AD 1650-1800

3.18.36 The large mollusc assemblage recovered from this channel deposit was again dominated by the moving species group, in particular shells of *Valvata piscinalis*, *Bithynia* and *Theodoxus fluviatilis*. Other noteworthy species present were *Viviparus viviparus* and *Viviparus contectus*. *Viviparus viviparus* is 'restricted to large deep bodies of still or slowly moving, well-oxygenated water in major lowland rivers, canalized waterways and canals' while *Viviparus contectus* 'favours large bodies of well-oxygenated, hard water over muddy substrates in major lowland rivers, canals and drainage ditches' (Kerney 1999, 25-6). There was a decrease in the number of species likely to have been exploiting possible patches of marshy river edge environments and areas of damp grassland in the vicinity. The general aquatic environment appears to have been one of slowly flowing well-oxygenated water, with less vegetation than in context (132).

CONTEXT (74), SAMPLE <212>, SG39, CHANNEL FILL, DARK GREYISH BROWN CLAY TO SILTY CLAY LOAM, AFTER C. AD 1650-1800

3.18.37 There was an increase in the moving-water species group, which again dominated the mollusc assemblage recorded from this channel deposit. *Theodoxus fluviatilis* and *Valvata piscinalis* were the predominant species. The increased presence of *Trichia hispida* may be reflective of an increase of open grassland in the immediate vicinity. The occurrence of *Macrogastra rolphii* is noteworthy, as this species is 'largely restricted to ground litter and moss in damp woodlands, hedgerows and roadside banks' (Davies 2008, 178) and may be indicative of a small wooded environment in the vicinity. The general aquatic environment appears to have been one of slowly flowing well-oxygenated water, again with less vegetation than in context (132) but probably faster flowing than that reflected in context (281).

CONTEXT (144), SAMPLE <203>, SG43, CHANNEL FILL, BROWN SILTY CLAY LOAM, PRE AD 1900

3.18.38 The large mollusc assemblage was dominated by the moving-water species, with *Valvata piscinalis* and *Bithynia* being dominant. There was a decrease in the species likely to be exploiting any marshy patches and open grassland in the vicinity of the channel edge. *Vertigo antivertigo* thrives in such marshy environments. The general aquatic environment appears to have been one of slowly flowing well-oxygenated and well-vegetated water, probably slower flowing than in context (74).

CONTEXT 43, SAMPLE <49>, SG44, CHANNEL FILL, LIGHT YELLOWISH BROWN SANDY SILT LOAM, PRE AD 1900

3.18.39 *Valvata piscinalis* and *Bithynia* dominated the large mollusc assemblage, where the moving-water species represented 65% of the assemblage, which was a decrease from 73% in context 144. There was also a significant number of shells of *Ancylus fluviatilis*, which favours faster flowing clean water. There was a slight increase in the species likely to be exploiting any marshy patches and open grassland in the vicinity of the channel edge. *Vertigo moulinsiana* thrives in such marshy environments with tall vegetation such as *Phragmites* or *Glyceria*. The general aquatic environment appears to have been one of generally slowly flowing well-oxygenated water, probably less vegetated than in context (144), with some areas of faster flowing water.

DISCUSSION

3.18.40 The mollusc assemblages appear to reflect changing fluctuations within the environment of the channels, in terms of water-flow and levels of vegetation, though do indicate that the channels also were likely to contain moving water.

3.18.41 During the Anglo-Saxon period there appears to be a channel with relatively fast flowing, well-oxygenated and well-vegetated water with possibly small marshy patches on the channel edge in a local area of damp grassland, with the indication of maybe a few trees in the vicinity.

3.18.42 The channel has moved by c. AD 1650-1800 and undergoes a number of shifts during this period. Again the molluscs indicate a channel environment of well-oxygenated flowing water in local landscape of open, probably damp, grassland with a few areas of marshier ground on the channel edge. There is an indication that the levels of vegetation fluctuated and the water speed increased at times during the period. This may be reflective of the degree of use of the channel, which appears to connect the City River and Pudding Mill River during this period. The occurrence of *Viviparus viviparus* and *Viviparus contectus* within context (281) may mark the onset of a greater use of this channel within a wider water-management scheme, as the channel became less densely vegetated.

3.18.43 This trend of a channel with flowing water, which fluctuates in speed and levels of vegetation, appears to continue in the pre- AD 1900 phase of the site.

Table 90: Mollusc Assessment from Trench 58

Sample	<46>	<8>	<228>	<210>	<208>	<213>	<212>	<203>	<49>
Context	**(27)**	**(26)**	**(423)**	**(122)**	**(132)**	**(281)**	**(74)**	**(144)**	**(43)**
Feature					**137**	**282**	**76**		
Feature Type	**Layer**	**Channel**	**Channel**	**Layer**	**Channel**	**Channel recut**	**Channel recut**	**Channel**	**Channel**
Group/ sub group	**SG50**	**SG51**	**SG10**	**SG24**	**SG26**	**SG35**	**SG39**	**SG43**	**SG44**
Sample size (litres)	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
Phase	**Late Mesolithic**	**Saxon**	**Saxon**	**after c.1650-1800**	**after c.1650-1800**	**after c.1650-1800**	**after c.1650-1800**	**pre 1900**	**pre 1900**
Land snails									
Carychium cf. *minimum*	-	1	-	9	-	4	-	1	1
Carychium tridentatum	-	-	-	4	-	3	-	-	2
Carychium spp.	-	3	-	10	1	2	-	-	-
Succinea/ Oxyloma spp.	-	7	4	13	1	12	2	3	20
Cochlicopa lubrica	-	-	-	1	-	1	-	1	2
Cochlicopa lubricella	-	-	-	1	-	-	-	-	-
Cochlicopa spp.	-	-	2	3	-	5	1	3	6
Vertigo cf. *antivertigo*	-	-	-	-	-	-	-	1	-
Vertigo cf. *substriata*	-	-	-	-	-	-	-	-	-
Vertigo pygmaea	-	-	2	2	-	-	-	-	3
Vertigo cf. *moulinsiana*	-	-	-	-	-	-	-	-	1
Vertigo spp.	-	-	-	1	-	1	-	1	-
Pupilla muscorum	-	-	-	-	-	1	3	-	6
Vallonia costata	-	2	2	6	2	4	1	4	33
Vallonia pulchella/ excentrica	-	7	5	34	3	23	2	14	48
Vallonia spp.	-	-	1	-	-	-	1	2	2
Punctum pygmaeum	-	-	-	1	-	-	-	-	2
Discus rotundatus	-	-	-	5	-	5	2	-	1
Vitrina pellucida	-	-	-	-	-	2	1	-	-
Vitrea spp.	-	-	-	5	1	3	-	1	3
Nesovitrea hammonis	-	-	-	-	-	-	-	-	1
Aegopinella pura	-	-	-	-	-	1	-	-	3
Aegopinella nitidula	-	-	-	6	-	4	-	-	8
Oxychilus cellarius	-	-	-	1	-	-	-	-	2

Sample	**<46>**	**<8>**	**<228>**	**<210>**	**<208>**	**<213>**	**<212>**	**<203>**	**<49>**
Context	**(27)**	**(26)**	**(423)**	**(122)**	**(132)**	**(281)**	**(74)**	**(144)**	**(43)**
Feature					**137**	**282**	**76**		
Feature Type	**Layer**	**Channel**	**Channel**	**Layer**	**Channel**	**Channel recut**	**Channel recut**	**Channel**	**Channel**
Group/ sub group	**SG50**	**SG51**	**SG10**	**SG24**	**SG26**	**SG35**	**SG39**	**SG43**	**SG44**
Sample size (litres)	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
Phase	**Late Mesolithic**	**Saxon**	**Saxon**	**after c.1650-1800**	**after c.1650-1800**	**after c.1650-1800**	**after c.1650-1800**	**pre 1900**	**pre 1900**
Limacidae	-	3	6	3	3	2	-	6	4
Euconulus fulvus	-	-	-	2	-	-	-	-	-
cf. *Macrogastra rolphii*	-	-	-	-	-	-	1	-	-
Clausilia bidentata	-	1	-	-	-	-	-	-	-
Helicella itala	-	-	1	1	-	2	-	2	13
Trichia hispida	-	6	10	11	4	43	12	25	72
Cepaea nemoralis	-	-	-	-	-	1	-	-	-
Cepaea hortensis	-	-	-	1	-	1	-	1	-
Cepaea/ Arianta sp.	-	-	-	3	-	3	-	-	1
Burrowing snails									
Cecilioides acicula	-	-	-	-	1	-	1	-	7
Fresh and Brackish Water Snails									
Theodoxus fluviatilis	-	110	108	367	8	135	46	110	97
Viviparus viviparus	-	-	-	-	-	2	-	-	-
Viviparus contectus	-	-	-	-	-	3	-	-	-
Valvata cristata	-	37	46	95	6	31	2	55	223
Valvata piscinalis	4	568	223	1641	54	362	58	317	725
Bithynia tentaculata	2	50	33	605	4	95	11	58	172
Bithynia leachii	-	5	4	60	-	5	2	2	16
Bithynia spp.	1	305	94	1539	33	175	12	147	398
Bithynia opercula	-	326	723	1123	165	233	98	450	147
Bithynia/ Lymnaea spp.	-	-	44	130	-	-	-	-	163
Aplexa hypnorum	-	1	-	-	-	-	-	-	-
Physa spp.	-	1	-	-	-	-	-	-	-
Lymnaea truncatula	-	7	4	35	3	12	1	7	23
Lymnaea glabra	-	1	-	-	-	2	-	2	-

Sample	<46>	<8>	<228>	<210>	<208>	<213>	<212>	<203>	<49>
Context	(27)	(26)	(423)	(122)	(132)	(281)	(74)	(144)	(43)
Feature					137	282	76		
Feature Type	Layer	Channel	Channel	Layer	Channel	Channel recut	Channel recut	Channel	Channel
Group/ sub group	SG50	SG51	SG10	SG24	SG26	SG35	SG39	SG43	SG44
Sample size (litres)	5	5	5	5	5	5	5	5	5
Phase	Late Mesolithic	Saxon	Saxon	after c.1650-1800	after c.1650-1800	after c.1650-1800	after c.1650-1800	pre 1900	pre 1900
Lymnaea palustris	-	6	-	36	1	2	-	5	12
Lymnaea cf. *stagnalis*	-	-	-	-	-	-	-	-	-
Lymnaea cf. *auricularia*	-	-	-	17	-	3	-	2	-
Lymnaea peregra	-	28	32	206	3	62	11	30	78
cf. *Myxas glutinosa*	-	-	-	-	-	-	-	1	-
Lymnaea spp.	-	40	5	97	11	64	-	11	52
Planorbis planorbis	3	98	23	164	10	36	4	36	144
Planorbis carinatus	-	26	7	123	1	40	2	9	45
Anisus leucostoma	-	14	4	82	4	9	-	10	29
Anisus vortex	-	-	-	26	-	-	-	-	-
Bathyomphalus contortus	-	3	-	4	-	1	-	-	3
Gyraulus albus	-	12	7	105	3	24	2	15	140
Gyraulus crista	-	25	14	46	5	10	1	6	45
Hippeutis complanatus	-	1	2	6	-	-	-	1	1
Planorbarius corneus	-	-	-	-	-	1	1	-	1
Planorbids	-	56	9	95	8	43	2	10	55
Ancylus fluviatilis	-	15	5	19	3	8	2	11	10
Acroloxus lacustris	-	2	-	7	1	1	-	-	-
Pisidium cf. *amnicum*	-	5	5	22	2	17	4	12	3
Pisidium spp.	1	144	46	270	22	67	21	26	58
Taxa	4	28	23	38	22	40	23	30	37
Total	11	1591	753	5920	197	1331	213	948	2713
% Open country species	0	0.57	1.46	0.74	2.54	2.33	3.29	2.43	3.87
% Intermediate species	0	0.57	2.39	0.44	3.55	4.36	7.51	3.9	3.24
% Shade - loving species	0	0.31	0	0.68	1.02	1.65	1.41	0.21	0.74
% Unassigned species	0	0.44	0.53	0.22	0.51	0.9	0.94	0.42	0.77

Sample	**<46>**	**<8>**	**<228>**	**<210>**	**<208>**	**<213>**	**<212>**	**<203>**	**<49>**
Context	**(27)**	**(26)**	**(423)**	**(122)**	**(132)**	**(281)**	**(74)**	**(144)**	**(43)**
Feature					**137**	**282**	**76**		
Feature Type	**Layer**	**Channel**	**Channel**	**Layer**	**Channel**	**Channel recut**	**Channel recut**	**Channel**	**Channel**
Group/ sub group	**SG50**	**SG51**	**SG10**	**SG24**	**SG26**	**SG35**	**SG39**	**SG43**	**SG44**
Sample size (litres)	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**
Phase	**Late Mesolithic**	**Saxon**	**Saxon**	**after c.1650-1800**	**after c.1650-1800**	**after c.1650-1800**	**after c.1650-1800**	**pre 1900**	**pre 1900**
% Amphibious species	0	1.38	1.06	1.98	3.55	1.58	0.47	1.79	1.92
% Intermediate species	0	4.71	7.97	6.81	6.09	7.44	6.57	6.01	10.28
% Ditch species	27.27	10.25	10.09	6.57	9.14	8.11	3.76	10.55	11.5
% Moving water species	63.64	66.5	65.6	74.04	52.79	59.8	63.38	69.3	58.61
% Unassigned species	9.09	15.21	10.89	8.53	20.81	13.9	13.15	5.49	9.1

Insects

3.18.44 The relatively small insect fauna from the Romano-British/ Anglo-Saxon channel in Trench 58 (Table 91) suggests that the channel contained relatively fast flowing water. This is indicated by the small number of 'elmid' riffle beetles such as *Elmis aenea, Oulimnius, Limnebius volckmari* and *Riolus subviolaceus*. However, other water beetles, such *Hydraena britteni* and *Cercyon ustulatus*, are associated with slower water conditions (see Hansen 1987) as is the weevil *Limnobaris pilistriatus* which is usually linked with sedges and rushes (Koch 1992). There is limited evidence that both pasture and grassland were in the area when this channel infilled, indicated by the recovery of a small number of *Aphodius* 'dung beetles' and a number of plant feeding weevils that are associated with grassland such as *Sitona waterhousei,* associated with bird's foot trefoil (*Lotus pedunculatus* and *L. corniculatus*), *S. flavescens* and *Hypera* spp., with clover (*Trifolium* spp.), *S. sulcifrons* with medicks and vetches (*Medicago* spp. and *Vicia* spp.), and *Mecinus pyraster* with ribwort plantain (*Plantago lanceolata*). Apart from a recovery of a single *Curculio* 'nut weevil', there are no indicators for woodland in the nearby landscape.

Table 91: Insect assemblage from Trench 58

Sample number		**<228>**	**Phytophage plant hosts (nomenclature follows that of Stace 1997)**
Context number		**(423)**	
(s) group		**SG 10**	
Feature number		**Silt clay**	
Feature type		**Channel**	
Date		**Romano-British**	
Volume (l.)		**5**	
COLEOPTERA			
Carabidae			
Clivina fossor (L.)		2	
Dyschirius globosus (Hbst.)		1	
Bembidion doris (Panz.)		1	
B. guttula (F.)		1	
Bembidion spp.		4	
Pterostichus strenuus (Panz.)		1	
Amara spp.		2	
Hydraenidae			
Hydraena britteni (Joy)	a	1	
Helophorus spp.	a	1	
Hydrophilidae			
Cercyon ustulatus (Preyssl.)	a	1	
Megasternum boletophagum (Marsh.)		3	
Cryptopleurum minutum (F.)	df	1	
Staphylinidae			
Trogophloeus spp.		1	
Oxytelus rugosus (F.)	df	1	
Stenus spp.		1	
Paederus spp.		1	
Stilicus orbiculatus (Payk.)		1	
Lathrobium spp.		2	
Xantholinus spp.		2	
Philonthus spp.		1	
Tachinus spp.		1	
Aleocharinidae Gen. and spp. indet.		1	

Sample number		**<228>**	**Phytophage plant hosts (nomenclature follows that of Stace 1997)**
Context number		**(423)**	
(s) group		**SG 10**	
Feature number		**Silt clay**	
Feature type		**Channel**	
Date		**Romano-British**	
Volume (l.)		**5**	
Dryopidae			
Elmis aenea (Müll.)	aff	3	
Oulimnius spp.	aff	2	
Limnius volckmari (Panz.)	aff	1	
Riolus subviolaceus (Müll.)	aff	2	
Endomychidae			
Mycetaea hirta (Marsh.)	s	1	
Scarabaeidae			
Aphodius spp.	df	2	
Scolytidae			
Leperisinus varius (F.)	l	1	Mainly on *Fraxinus* (Ash)
Curculionidae			
Apion spp.	p	3	
Sitona sulcifrons (Thunb.)	p	3	On *Medicago* (medicks), *Trifolium* (clover) and *Vicia* (vetches)
Sitona flavescens (Marsh.)	p	1	*Trifolium* species (Clover)
Sitona waterhousei (Walt.)	p	1	*Lotus pedunculatus* and *L. corniculatus* (lesser and greater bird's foot trefoil)
Sitona spp.	p	1	
Curculio spp.	l	1	
Alophus triguttatus (F.)	p	1	
Hypera spp.	p	1	Mainly *Trifolium* spp. (clover)
Limnobaris pilistriata (Steph.)	ws	2	Juncaeae (rushes) and Cyperaceae (sedges)
Mecinus pyraster (Hbst.)	p	1	*Plantago lanceolata* (ribwort plantain)
Total number of individuals		58	
Total number of taxa		39	
% aquatic (a)		5.2	
% aquatic fast flowing (aff)		13.8	
% waterside (ws)		3.4	
% dung/ foul (df)		8.9	
% woodland/ dead wood (l)		4.4	
% pasture (p)		26.7	
% synanthropic (s)		2.2	

Key to ecological groupings used
a= aquatic water beetles
aff= aquatic taxa normally associated with faster flowing waters
ws = waterside taxa often associated with emergent vegetation
df = taxa often associated with dung
p= taxa associated with grassland and open areas
l= taxa associated with trees
s= taxa normally associated with human settlement

3.19 Trench 59 (PDZ3 3.39)

Introduction

3.19.1 Trench 59, *c.* 60 south of Trench 58 (above), lay on the site of a former factory west of Marshgate Lane. The evaluation trench revealed a north-east–south-west aligned ditch of Romano-British date, and a north–south timber channel revetment against which lay the partly exposed, but well preserved remains of a clinker-built boat. In order to fully excavate the boat and to further investigate the surrounding features, the base of the trench was enlarged to an area of *c.* 135 m².

3.19.2 The timber revetment, which was exposed for over 7 m, supported the eastern bank of the former course of Pudding Mill River, its pile and plank construction indicating a date between the late 17th century and the early 19th century. This lay next to Nobshill Mill, a wind-powered corn mill that occupied the site for a short period in the second half of the 19th century. The timber boat, built in the early 19th century as a light rowing boat, possibly a ship's tender or a river taxi, but subsequently twice modified for different uses, was fully excavated and recovered. Monolith sample sequence <226> was taken from the northern end of the trench, and samples Romano-British ditch fills sealed by later alluvial deposits, shown in Figure 30.

Sediments

3.19.3 Sediment descriptions and interpretations can be found in in Table 92

Table 92: Sediment descriptions for Monolith <226>, Trench 59

Level (m OD)	Context	Sediment description	Interpretation
2.09 to 1.95	427	10YR3/ 1 very dark grey clay loam with occasional shell fragments and manganese speckling. Some sandy areas at base. Contact with unit below is clear and horizontal.	Alluvium
1.95 to 1.82	318	10YR3/ 2 very dark greyish brown claywith occasional shell fragments, rootlets and small flint clasts. Contact with unit below is clear and horizontal.	Alluvium
1.82 to 1.59	312	10YR4/ 3 brown silty clay loamwith occasional shell fragments and flint clasts. Exhibits iron staining at the top of the unit. Contact with unit below is clear and horizontal.	Alluvium
1.59 to 1.43	312	10YR3/ 1 very dark grey clay loam, speckled with sand, clear boundary	Ditch fills
1.43 to 1.17	315 / 395	10YR3/ 2 very dark greyish brown silty clay loam, with sandy areas at base and charcoal flecks.	Ditch fills
Below 1.17	313	(Not seen in monolith) - Fine-medium SAND with strong iron staining.	Pleistocene

Dating

3.19.4 Four radiocarbon dates were obtained from Trench 59 (Table 93). The date date at 1.21m OD was obtained from bulk sediments and is very unreliable; the ditch is well dated from pottery evidence however.

Table 93: Radiocarbon dates from Trench 59

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<225> (311)	1.87	Sediment (acid wash)	Beta-251398	1120±40	-29.2	cal AD 780–1020	2
<225> (311)	1.95	Sediment (acid wash)	Beta-251399	660±40	-28.5	cal AD 1270–1400	2
<226> (315)	1.21	Sediment (acid wash)	Beta-251400	2100±40	-27.8	350–1 cal BC	3
<226> (312)	1.82	Sediment (acid wash)	Beta-251401	1540±40	-27.3	cal AD 420–610	2

Pollen

3.19.5 Three pollen samples were taken from monolith <226>. The pollen assemblage (Figure 31) is dominated by Poaceae (grasses; 31-36%) and Brassicaceae (cabbage and mustard family; 7-31%). Tree and shrub taxa are only present in low amounts, including *Pinus* (pine; 1-5%), *Quercus* (oak; 1-3%), *Alnus glutinosa* (alder; 3-5%) and *Corylus avellana*-type (hazel; 1-7%). Dwarf shrub and herb taxa include *Ranunculus acris*-type (buttercup; up to 1-2%), Chenopodiaceae (goosefoots and oraches ; 1-5%), *Rumex obtusifolius*-type (broad-leaved dock; up to 3%), *Rumex sanguineus*-type (wood dock; 3-5%), *Limonium* (sea lavender ; up to 1%), *Filipendula* (meadowsweet; 2-3%), *Plantago lanceolata* (ribwort plantain; up to 5%), *Cichorium intybus*-type (dandelion/ chicory ; 3-9%), Cyperaceae (sedges; 6-16%) and *Glyceria*-type (sweet-grass; up to 1%). Aquatic taxa included *Nymphaea alba* (white water-lily; up to 1% TLP + aquatics), *Hydrocharis morsus*-type (frogbit; up to 1% TLP + aquatics) and *Sparganium emersum*-type (bur-reeds; up to 3-7% TLP + aquatics). *Polypodium* (polypody; up to 2% TLP + pteridophytes), *Pteridium aquilinum* (bracken; up to 3-4% TLP + pteridophytes) and Pteropsida (monolete.) indet. (fern spores; up to 8-19% TLP + pteridophytes) were also present. Pollen concentrations range between 15343 and 51507 grains cm^{-3}.

3.19.6 The pollen assemblage from this sequence can be interpreted as indicating a largely open environment with limited woodland cover, though taxa such as *Hypericum perforatum*-type (perforate St John's-wort) and *Vicia sylvatica*-type (wood vetch) may imply some localised woodland cover. Increases in Brassicaceae towards the top of the sequence may indicate either differential preservation or a local dominance in the herb vegetation. Local damp grassland is implied by the presence of *Rumex sanguineus*-type, *Rumex obtusifolius*-type, *Mentha*-type (mint), *Glyceria*-type and *Arrhenatherum*-type (false oat-grass/ reed sweet-grass), with much of the Poaceae, Cyperaceae and *Sparganium emersum*-type also likely to be associated with this type of environment. The presence of *Limonium* could suggest some local salt-marsh development or connection with brackish water (such as transportation on storm surges). Some local disturbance, possibly associated with grazing, could be implied by the presence of *Plantago lanceolata* and *Pteridium aquilinum*.

Table 94: Mollusc Assessment from Trench 59

Sample	<2000>	<220>
Context	(2004)	(310)
Feature	Fill 2004	Alluvium, 2016
Feature Type	Ditch, 2005	Layer
Group/ sub group	4	5
Sample size (litres)	5	5
Phase	M-L Iron Age	E Saxon - M/L medieval
Fresh and Brackish Water Snails		
Valvata piscinalis	1	-
Bithynia opercula	10	-
Pisidium cf. *amnicum*	-	1
Pisidium spp.	1	1
Taxa	2	1
Total	2	2
% Open country species	0	0
% Intermediate species	0	0
% Shade - loving species	0	0
% Unassigned species	0	0
% Amphibious species	0	0
% Intermediate species	0	0
% Ditch species	0	0
% Moving water species	50	50
% Unassigned species	50	50

Table 95: Insect assemblage from Trench 59

Sample number		**<227>**	**Phytophage plant hosts (nomenclature follows that of Stace 1997)**
Context number		**(395)**	
(s) group		**4**	
Feature number		**2004**	
Feature type		**Ditch**	
Date		**Late Iron Age**	
Volume (l.)		**5**	
COLEOPTERA			
Carabidae			
Clivina fossor (L.)		1	
Dyschirius globosus (Hbst.)		1	
Bembidion lampros (Hbst.)		1	
Bembidion spp.		2	
Pterostichus nigrita (Payk.)	ws	1	
Hydrophilidae			
Megasternum boletophagum (Marsh.)		1	
Histeridae			
Acritus nigricornis (Hoffm.)	df	1	
Paralister purpurascens (Hbst.)	df	1	
Staphylinidae			
Lathrobium spp.		1	
Xantholinus spp.		1	
Throscidae			
Throscus spp.	ws	1	
Nitidulidae			
Brachypterus urticae (F.)	p	1	*Urtica dioica* (stinging nettle)
Scarabaeidae			
Aphodius spp.	df	4	
Chyrsomelidae			
Chaetocnema concinna (Marsh.)	p	2	
Curculionidae			
Apion spp.	p	1	
Sitona spp.	p	1	
Notaris acridulus (L.)	ws	1	Often on *Glyceria maxima* (reed sweet-grass) and other *Glyceria* species (sweet-grasses)
Total number of individuals		22	
Total number of taxa		17	

Key to ecological groupings used
a= aquatic water beetles
aff= aquatic taxa normally associated with faster flowing waters
ws = waterside taxa often associated with emergent vegetation
df = taxa often associated with dung
p= taxa associated with grassland and open areas
l= taxa associated with trees
s= taxa normally associated with human settlement

Molluscs

3.19.7 Two samples were selected for molluscan analysis from the Middle-Late Iron Age ditch 2005 and the Early Anglo-Saxon to mid/ late medieval alluvial layer 2016. Very few shells were recovered from both deposits (listed in Table 94), so little information on the local environment can be ascertained. All the shells recorded were moving water species. There was a relatively high number of *Bithynia* opercula present in the ditch sample, possibly indicating the occurrence of flowing water within this feature.

3.19.8 The very small mollusc assemblages are indicative of the presence of freshwater environments during these periods.

Insects

3.19.9 A single sample from a Late Iron Age ditch (feature 2004) from Trench 59 (Table 95) produced a very small insect fauna including a limited number of *Aphodius granarius* dung beetles, which may suggest pasture in the area.

3.20 Trench 65 (PDZ4 4.21)

Introduction

3.20.1 Trench 65 contained channel-related deposits and was targeted to elucidate the nature and date of alluvial activity in this area of Site, and to sample the potentially valuable palaeoenvironmental sequence.

3.20.2 Although not secorded in the trench section, examination of the archive and the samples combined with dating results clearly demonstrate the presence of an early historic channel in the sampled section. Monolith <6> lies within this channel, whilst <1> lies outside it to the east in older sediments. The sampled section is presented in Figure 32.

Sediments

3.20.3 Sediment descriptions and interpretations can be found in Table 96.

Table 96: Sediment descriptions for Monoliths <1> and <6>, Trench 65

Level (m OD)	Context	Sediment description	Interpretation
		SAMPLE <1>	
2.92 to 2.52	1	10YR4/ 1 dark grey clay, common medium distinct clear strong brown mottles, mainly sub-vertical representing iron staining from oxidation around rootholes. Stonefree, massive. Diffuse boundary.	Alluvium (likely overbank)
2.52 to 2.26	1	10YR3/ 1 very dark grey clay/ silty clay, mottled as above, with ferric oxide concretions around the roots also. Some mineral replaced rootlets. Weak fine to medium blocky structure. Rare gravel inclusions to top, clear non-erosive boundary.	Alluvium (clay)
2.26 to 2.15	2	10YR2/ 1 black clay, humic, some slight lamination to top. Sharp boundary	Organic alluvium (humic clay)
2.15 to 2.10	4	10YR4/ 1 grey silty clay, gritty, common v small stones. From section appears to be top of gravel.	Gravel (sandy)
		SEQUENCE CONTINUES 6m WEST (SAMPLE <6>)	
2.50 to 2.41	1	10YR3/ 2 very dark greyish brown silty clay, stonefree, occasional fine rootlets. Clear boundary.	Organic alluvium
2.41 to 2.03	2	10YR3/ 1 very dark grey clay loam, visibly humic, occ fine rootlet. From 2.34m OD down freshwater mollusca visible, also occasional sand input (not solid layer but increased sand content visible as flecking, eg. at 2.33m OD). Appears to have weak platy structure in places, some lamination observed. Sharp boundary.	Organic alluvium (humic clay loam)
2.03 to 2.00	3	10YR5/ 1 grey sandy loam, speckled appearance from white sand input.	Alluvium (sandy loam)

3.20.4 There are essentially two separate sequences sampled in this section (Figure 32). Monolith <1> (in two parts, <M1> above and <M2> below, mislabelled during evaluation report as <1> and <2>) to the east of the trench sampled a humic black clay 0.11m thick overlying relatively high gravel at 2.15m OD. This black clay has been radiocarbon dated to the Late Mesolithic period (SUERC-4531, see dating below). This is overlain by mineralogenic alluvium, the upper portion of which (to 2.92m OD) is overbank flooding material and represents a much later accretionary floodplain soil.

3.20.5 Monolith <6>, in the central part of the trench, sampled the upper part of a sandy loam to 2.03m OD, above which to 2.50m OD humic alluvia with freshwater molluscs were recorded. Below the sandy loam and observed during excavation only was a humic clay, which graded into a peat below. Rapid inundation prevented monolith sampling of these lower deposits (to c. 0.8m OD). Clearly these deposits are considerably lower than that of the adjacent gravel, indicating the presence of a channel feature (discussed further below).

3.20.6 A radiocarbon date from the peat below the level of <6> returned a Romano-British date.

3.20.7 It may be of significance that the probable Mesolithic humic black clay resembles quite closely similar deposits which have been associated with (earlier) Mesolithic archaeological sites at Three Ways Wharf, Uxbridge (Lewis and Rackham 2011) and in the Kennet Valley at Ufton Green (Chisham 2004).

Dating

3.20.8 Three radiocarbon dates have been obtained from Monoliths <1> and <6> and Bulk Sample <3> (Table 97).

Table 97: Radiocarbon dates from Trench 65

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<6> (2b)	2.40	Sediment (humic acid)	SUERC-24532	1545±30	-23.3	cal AD 420–590	1
<1> (2a)	2.18	Sediment (humic acid)	SUERC-24531	7130±35	-25.4	6070–5920 cal BC	2
<3> (3)	<2.00	Seeds: 23 x *Schoenoplectrus lacustris*	SUERC-25617	1795±40	-26.3	cal AD 90–350	1

Plant macrofossils

3.20.9 Three samples were examined from the evaluation, although only one was deemed to contain reasonable quantities of waterlogged plant macrofossils for analysis, that from context (3) in the base of the channel (Table 98).

3.20.10 This sample from context (3) was radiocarbon dated on seeds of common club-rush (*Schoenoplectus lacustris*) to the Romano-British period, cal AD 90-350 (SUERC-25617, 1795±40 BP). A radiocarbon date from directly above this sample within the channel dates the sediments above (2b) to the Early Anglo-Saxon period cal AD 420–590 (SUERC-24531, 1545±30 BP).

3.20.11 Unfortunately, due to the lack of context division inside and outside of the channel feature, it is unclear whether the remaining bulks came from this part of context (2 (2b)) or that to the east dated to the Mesolithic. It is quite probable that the Mesolithic deposits may have dried out and no waterlogged material would have survived in this part of the sequence. However, it is also possible that the sample above (sample <4> from context (2a/ b?)) does in fact come from the channel and demonstrates that these upper deposits have not remained waterlogged since the Saxon period.

3.20.12 The lowest channel deposit (3) had, as might be expected, many species indicative of slow-moving water including gametes of stonewort (*Chara* sp.), several seeds of water-crowfoot (*Ranunculus* subg. *Batrachium*), probable water mint (*Mentha aquatica*), arrowhead (*Sagittifolia sagittifolia*), water-plantain (*Alisma plantago-aquatica*), rush (*Juncus* sp.), sedge (*Carex* sp.), common club-rush (*Schoenoplectus lacustris*) and one to two seeds of seed of water-lily (*Nuphar lutea*), mares-tail (*Hippuris vulgaris*), horn-pondweed (*Zannichellia palustris*) and pondweed (*Potamogeton* sp.).

3.20.13 The finding of a few ephippium of water-flea (*Daphnia* sp.) would also confirm this picture of very slow moving water, which was potentially even still or stagnant in places and/ or for short-periods.

3.20.14 Other seeds are more typical of the edges of ditches, streams and cannels such as small water pepper (*Persicaria minor*), golden dock (*Rumex maritimus*), mint (*Mentha* sp.) and seeds of water-droplet (*Oenanthe* sp.).

Table 98: Waterlogged plant macrofossils from Trench Trench 65

Sample		**<7>**	**<4>**	**<3>**
Context		**(3)**	**(2(a/ b?))**	**(1(a/ b?))**
Depth top (m OD)		**2.03**	**2.26-2.41**	**2.5-2.92**
Depth bottom (m OD)		**0.9**	**2.03-2.15**	**2.26-2.41**
Sediment Type		**alluvium sandy loam**	**lower clay**	**upper clay**
Sample Size (litres)		**5**	**5**	**5**
Flot size (ml)		**1000**	**10**	**5**
Date		**AD 90-350**		**AD 420-590**
Chara (gametes)	stonewort	+	-	-
Nuphar lutea	yellow water-lily	1	-	-
Ranunculus subg. *Ranunculus* (arb)	buttercup	6	-	-
Ranunculus subg. *Batrachium*	water-crowfoots	+	-	-
Urtica dioica	common nettle	1	-	-
Chenopodium rubrum	red goosefoot	cf.1	-	-
Chenopodium album	fat-hen	1	-	-
Atriplex sp.	orache	2	-	-
Stellaria sp.	stitchwort	1	-	-
Persicaria minor	small water-pepper	1	-	-
Rumex maritimus (whole fruit)	golden dock	1	-	-
Potentilla anserina	silverweed	2	-	-
Potentilla erecta/ reptans	tormentil/ creeping cinquefoil	2	-	-
Rosa sp.	rose	1	-	-
Oenanthe sp.	water-droplets	cf.2	-	-
Lycopus europaeus	gypsywort	1	-	-
Mentha sp.	mint	2	-	-
Mentha cf. *aquatica*	water mint	++	-	-
Hippuris vulgaris	mare's-tail	1	-	-
Carduus/ Cirsium sp.	thistle	1	-	-
Sonchus asper type	prickly sow-thistle	1	-	-
Sagittifolia sagittifolia	arrowhead	++	-	-
Alisma plantago-aquatica	water-plantain	4	-	-
Potamogeton sp.	pondweeds	2	-	-
Zannichellia palustris	horned pondweed	2	-	-
Juncus sp.	rush	+	-	-
Schoenoplectus lacustris	common club-rush	++	-	-
Carex sp. (flat)	sedge (lenticular)	++	-	-
Carex sp. (trigonous)	sedge (trigonous)	++	-	-
Glyceria sp.	sweet-grasses	cf.1	-	-
Charcoal	charred wood indet.	1frg	-	-
Daphnia sp. (*Ephippium*)	water flea	+	-	-

+C – denotes material that was preserved by charring. cf. compares with. Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more

3.20.15 Seeds of rough pasture, arable fields and disturbed soils were also present although formed a minor component. These included buttercup (*Ranunculus* subg. *Ranunculus*), common nettle (*Urtica dioica*), red goosefoot (*Chenopodium rubrum*), fat-hen (*Chenopodium album*), orache (*Atriplex* sp.), stitchwort *Stellaria* sp.), cinquefoil (*Potentilla* sp.), thistle (*Carduus/ Cirsium* sp.), prickly sow-thistle (*Sonchus asper*).

3.20.16 The impression provided is one of very slow moving to still water in a quite highly vegetated channel. The species growing either side of the channel, whose seeds made it into the water, indicate probable rough slightly over-grown grassland or rough pasture either side. There is little to no evidence for more wooded shrub or hedgerows growing along side the channel, and the presence of Chenopodiaceae may also point to patches of bare mud and possible animal trampling in the vicinity.

Pollen

3.20.17 Pollen assessment was carried out on eight samples from two monoliths in Trench 65: Monolith <1> and <6>. Pollen preservation was found to be poor in all four samples from Monolith <1>, with a very limited pollen assemblage only available from two of the four samples, shown in Table 99. Low pollen counts were due to low pollen concentrations within the sample residue making full assessment counts uneconomical due to the time required to obtain a minimum count of 100 TLP. The interpretation of these two samples should therefore be treated with caution.

3.20.18 Both samples are dominated by Cyperaceae (sedges), Poaceae (grasses) and Pteropsida (monolete) indet. (fern spores). Tree pollen is low with the main tree types represented being *Betula* (birch) and *Quercus* (oak). The high values of *Cichorium intybus*-type (dandelion/ chicory) in the sample from 2.52m OD may be an indication of differential pollen preservation as this pollen grain is often present in higher quantities in poorly preserved pollen assemblages as a result of fluctuating water tables and soil aeration. The overlying sediment (context (1)) contains distinct mottling of the alluvial clay supporting the idea of poor pollen preservation. In summary the sequence from monolith <1> indicates a pollen assemblage dominated by open land taxa associated with the floodplain environment, with a local presence of sedges, grass, with reeds also recorded.

3.20.19 The pollen assemblage obtained from monolith <1> is inconsistent with the environment expected for the radiocarbon date at 2.18m OD of 6070–5920 cal BC (SUERC-24532, 7130±35 BP). It would be expected that the environment of this date would be dominated by arboreal taxa, as found in the sequence from Trench 71. It is therefore suggested that this radiocarbon date is erroneous. However, as the pollen was very poorly preserved, the likelihood of reworked older material contaminating the sample (older seeds) is probable.

3.20.20 Results of the pollen assessment from monolith <6> are shown in Figure 33. A low pollen count was retrieved from the basal sample (2.09m OD), so its interpretation must be treated with some caution. However, the pollen assemblage from this sample is comparable with those from the overlying samples where higher counts were obtained. No zonation of the pollen diagram has been undertaken as the four samples are similar in nature and no meaningful division of the diagram can be made.

3.20.21 The pollen assemblage is dominated by Poaceae (grasses; 22-32%) and Cyperaceae (13-57%), with *Corylus avellana*-type (hazel; 4-12%) and *Quercus* (oak; 2-11%). Tree and shrub/climber pollen attains a maximum of 29% TLP, though the majority of the sequence is dominated by dwarf shrub/ herb taxa. *Betula* (birch; up to 3%) and *Alnus glutinosa* (alder; 1-4%), with occurrences of *Tilia cordata* (small leaved lime; up to 2%) and *Fraxinus excelsior* (ash; up to 1%), are also present. *Salix* (willow) is also present in low amounts (up to 1%).

3.20.22 Dwarf shrub/ herb taxa accounts for 71-89% TLP, with taxa present including *Ranunculus acris*-type (buttercup; up to 4%), *Polygonum* (knotgrass; up to 2 %), *Rumex sanguineus*-type (wood dock; up to 1%), Apiaceae undiff. (1-3%), *Bupleureum* (up to 1%), *Plantago lanceolata* (ribwort plantain; up to 7%) and *Cichorium intybus*-type (dandelion/ chicory; 1-2%). *Prunella vulgaris*-type (selfheal) is present in high amounts (18%) at 2.23m OD only. *Glyceria*-type is present throughout (1-4%), though a single occurrence of *Cerealia*-type is found at 2.47m

OD. *Sparganium emersum*-type (bur-reed) is present throughout (4-11% TLP + aquatics), with occurrences of *Myriophyllum verticillatum* (water milfoil; up to 1% TLP + aquatics), *Sagittaria sagittifolia* (arrowhead; up to 1% TLP + aquatics), *Potamogeaton natans*-type (pondweed; up to 1% TLP + aquatics) and *Typha latifolia* (bulrush; up to 1% TLP + aquatics) also recorded. Pteropsida (monolete) indet. (fern spores; 8-15% TLP + pteridophytes) and *Pteridium aquilinum* (bracken; up to 2% TLP + pteridophytes) are also present.

Table 99: Pollen assemblage from Trench 65, Monolith <1>

Sample	**<1>**	**<1>**
Depth (m OD)	**2.20**	**2.52**
Pinus sylvestris	1	
Quercus	3	1
Betula	3	1
Alnus glutinosa	1	
Corylus avellana-type	5	
Ranunculus acris-type	1	
Chenopodiaceae	1	
Filipendula	1	
Cirsium-type		1
Cichorium intybus-type	1	6
Cyperaceae undiff.	20	9
Poaceae undiff.	23	8
Sparganium emersum-type	2	
Polypodium	1	
Pteridium aquilinum	3	1
Pteropsida (monolete) indet.	46	8
Trees	7	2
Shrubs & Climbers	5	
Dwarf Shrubs & Herbs	27	15
Total Land Pollen Sum	39	17
Pollen Concentration (grains cm^{-3})	23125	13638

3.20.23 The pollen assemblage can be interpreted as indicating a largely open floodplain environment. Some trees were locally present, including *Alnus glutinosa* and *Salix*. Other tree taxa recorded, including *Quercus* and *Corylus avellana*-type, may also have been found upon the floodplain in drier areas, though these are unlikely to have been dense stands of woodland. The dominance of Poaceae suggests that the floodplain was largely open grassland, supported by the presence of *Bupleureum* and *Prunella vulgaris*-type.

3.20.24 Local wetland vegetation is indicated by the presence of Cyperaceae with the aquatic pollen types indicating slow moving or still water. Other taxa probably associated with the wetland vegetation include *Ranunculus acris*-type, *Rumex sanguineus*-type, *Sonchus* (sow-thistle), *Filipendula* (meadowsweet) and *Glyceria*-type. However, the presence of *Bupleureum* (possibly from *B. rotundifolium* (thorow-wax), commonly associated with cornfields) and *Polygonum* in association with a single Cerealia-type grain might indicate some localised arable activity. Areas of disturbed ground are also evident with the presence of *Rumex acetosella* (sheep's sorrel), *Plantago lanceolata* and *Pteridium aquilinum*, the former two probably associated with pastoral activity upon the floodplain itself. Waste/disturbed ground is also suggested by the presence of *Cichorium intybus*-type and *Solidago virgaurea*-type (daises/ goldenrods).

3.20.25 The pollen assemblage obtained from monolith <6> is consistent with the environment expected for the radiocarbon date at 2.40m OD of cal AD 420–590 (SUERC-24531, 1545±30 BP).

3.20.26 In summary, due to issues with pollen preservation and sample concentrations it is not possible to properly assess the sequence from monolith <1>. However, it does appear that the little pollen that was obtained from 2.20m OD is inconsistent with the radiocarbon date obtained at 2.18m OD. More success was obtained from monolith <6> which identified a largely open landscape consistent with radiocarbon date obtained.

Diatoms

3.20.27 Eight sub-samples were prepared for diatom analysis from the Trench 65 sequence. Diatoms are absent from the four sub-samples from sample number <1>, taken from between 2.20 and 2.78m OD, with the exception of a possible (very poorly preserved) rim fragment from an indeterminate centric diatom at 2.31m OD.

3.20.28 With the exception of a valve of *Eunotia diodon*, an acidic, freshwater, attached diatom (that may, for example, be found in pools on peat), diatoms are absent from the top sub-sample from sample number <6> at 2.47m OD. However, diatoms are present in moderate to high concentrations in the other organic alluvial sub-samples from sample <6> at 2.09 to 2.37m OD (**Figure 34**). Diatom preservation varies from good to poor in these samples and species diversity is moderately high to high. The diatom assemblages of these three samples are similar, dominated by freshwater non-planktonic diatoms. The mesohalobous to halophilous planktonic species *Cyclotella meneghiniana* is present at 2.09 and 2.23m OD but in relatively small numbers.

3.20.29 A number of non-planktonic halophilous species are present in all the samples eg. *Rhoicosphaenia curvata, Epithemia turgida* and *Gomphonema olivaceum*. The polyhalobous to mesohalobous species *Cocconeis scutellum* is present at 2.23m OD. However, there are no allochthonous marine planktonic or other estuarine diatoms to indicate direct contact with the tidal river. The dominant freshwater, oligohalobous indifferent, taxa here include *Achnanthes lanceolata, Amphora libyca, Amphora pediculus, Cocconeis placentula, Epithemia adnata, Fragilaria brevistriata, Fragilaria pinnata, Gomphonema angustatum, Gyrosigma acuminatum, Gyrosigma attenuatum* and *Synedra ulna*.

3.20.30 All are attached or epipelic (mud-surface eg. the *Gyrosigma* spp.) diatoms found in shallow water. Diatoms associated with flowing water are present, for example *Meridion circulare* at 2.37m OD and *Melosira varians* at 2.23m OD but these are not the dominant species here. The aerophilous, often epipsammic (grows attached to the surfaces of sand grains) diatom *Ellerbeckia arenaria* comprises almost 5% of the assemblage at 2.37m OD.

Ostracods and Foraminifera

3.20.31 The ostracod content of the four samples is given in Table 100. One Candoniid ostracod valve was retrieved from the sample at 2.30m OD. The samples at 2.15, 2.49 and 2.73m OD contained no ostracods.

3.20.32 No animal or plant remains were recovered from the samples at 2.15 and 2.49m OD, although at 2.15m OD two pieces of flint recovered may have been struck. At 2.30m OD *Bithynia* opercula were common and the sample also contained plant remains including charophyte oogonia, radiate diatoms, sedge, unidentified stems and one small piece of charcoal. At 2.73m OD three bivalve molluscs and a few unidentified seeds were recovered.

3.20.33 The singular ostracod recovered from the sample at 2.30m OD is insufficient to base any environmental interpretations. These Candoniid ostracods are however noted to be usually "non-marine".

Table 100: Microfaunal content of ostracod/ foraminifera samples from Trench 65

Sample number	**<6>**	**<6>**	**<6>**	**<6>**
Depth (m OD)	**2.15**	**2.3**	**2.49**	**2.73**
Ostracoda				
Candona spp.		x		
Other remains				
Bithynia opercula		xxx		
Bivalves				x
Charophyte oogonia		x		
Radiate diatoms		x		
Seeds				xx
Sedge		xx		
Plant stems/ remains		xxx		
Charcoal		x		
Flint	x			

x = 1 to 9 specimens; xx = 10 to 50 specimens; xxx = over 50 specimens

Molluscs

3.20.34 A few mollusc shells were recovered from the sample <7>, context (3), comprising a few shells and opercula of *Bithynia* sp., a few shells of *Pisidium* sp., Planorbids and the marsh snail *Carychium* sp. The presence of *Bithynia* tends to hint towards faster moving water although it is possible that the shell became washed into the deposit. A single shell of *Vallonia* was found in sample <3>, context (1).

3.21 Trench 67 (PDZ4 4.28)

Introduction

3.21.1 Trench 67 was selected as it provided a long probable early to later historic sequence of marshy deposits, including imperfectly sealed land surfaces. The sampled section is presented in (Figure 35). This sequence is located on a relatively high level plateau of gravel, and as the sediments appear to confirm would not have started receiving alluvial sediment input until the post-Romano-British period.

Sediments

3.21.2 Sediment descriptions and interpretations can be found in Table 101.

Table 101: Sediment descriptions for Monoliths <M1> to <M5>, Trench 67

Level (mOD)	Context	Sediment description	Interpretation
4.26 to 3.93		2.5Y5/2 greyish brown silty clay loam, very smooth, stonefree, occasional tiny rootlet. Massive, clear boundary.	Alluvium
3.93 to 3.72		10YR3/ 2 very dark greyish brown silty clay loam, stiffer than above, slight structure (poss fine blocky) – difficult to describe as sample poor at this point.	Likely stabilisation horizon/ buried soil
3.72 to 3.43		10YR3/ 3 brown clay, stiff, medium blocky structure, clear boundary. Well oxidised, looks like alluvial soil B horizon	Overbank alluvium/ accretional soil
3.43 to 2.95		2.5Y4/ 2 dark greyish brown clay loam, 5% distinct iron mottling, abrupt boundary.	Alluvium, possibly somewhat organic
2.95 to 2.81		10YR3/ 2 very dark greyish brown silty clay loam, slight structure (poss fine blocky)	Likely stabilisation horizon/ buried soil
2.81 to 2.10		2.5Y5/ 2 greyish brown clay loam, weak medium blocky structure, shell fragments, rare very small gravel and one large (60mm) at 2.15m OD. Abrupt boundary	Alluvium/ accretional soil
2.10 to 1.97		2.5Y4/ 2 dark greyish brown silty clay loam, rare small gravel. Sample not ideal to base, could be organic alluvium but on balance probably another repeat of the stableish soil/ marshy soil sequence.	Slightly organic alluvium or possible stablilisation horizon

3.21.3 River terrace gravel was observed during excavation to a maximum height of 2.08m OD. The sequence of monolith samples contain sediments from 1.97 to 4.26m OD. The sampled sequence shows an accretional floodplain soil, forming in relatively wet, possibly marshy, conditions which had been imperfectly sealed on repeated occasions by increased rates of sedimentation. Soil formation and accretion had then continued via seasonal overbank flooding until the next increase in sedimentation, and so on. Due to the height OD of this sequence and the nature of sedimentation compared to other sequences on Site, it was thought that this sequence is of approximately Romano-British to Anglo-Saxon date.

Dating

3.21.4 Two radiocarbon dates have been obtained from Monoliths <M3> and <M4> (Table 102), indicating a Romano-British to early Anglo-Saxon date for sediment deposition.

Table 102: Radiocarbon dates from Trench 67

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<M3>	3.20	Sediment (humic acid)	SUERC-26951	1645±30	-28.3	cal AD 260–540	1
<M4>	2.02	Sediment (humic acid)	SUERC-26952	1725±30	-28.3	cal AD 240–400	1

Pollen

3.21.5 Pollen assessment was carried out on sixteen samples from five overlapping monoliths in Trench 67: Monoliths <M1>, <M2>, <M3>, <M4> and <M5>.

3.21.6 The pollen diagram (Figure 36) has been split into three local pollen assemblage zones (LPAZ), prefixed Tr67-; see Table 103 for zone descriptions.

3.21.7 The pollen assemblage is dominated by dwarf shrub/ herb taxa, in particular Poaceae (grasses) and Cyperaceae (sedges). The consistency of these taxa suggests that the local area was largely open grassland with localised wet pasture supporting sedge communities. The consistent presence of Pteropsida (monolete) indet. (ferns) and *Pteridium aquilinum* (bracken) indicates the local presence of ferns and bracken, though these may also be over represented in the assemblage due to deposition of reworked alluvial sediment and transport within the aquatic environment. A similar explanation may account for the consistent presence of *Pinus sylvestris* (pine) pollen.

3.21.8 The pollen assemblage from this trench is strongly influenced by the site formation processes. The oscillation between alluvium deposition and soil formation/ accretion has also resulted in some apparent changes in the pollen assemblage. Taxa such as Brassicaceae (cabbage and mustard family) and *Cichorium intybus*-type (dandelion/ chicory) are found to increase within the alluvium towards the base of the stabilisation horizons. This may be either a response to the presence of disturbed/ waste ground or alternatively over-representation due to differential preservation. Stabilisation is likely to have resulted in a temporary/ prolonged drying of the upper alluvium, with the underlying upper part of the alluvial sequence becoming drier and aerated as a response to a lower water levels and bioturbation. Differential preservation may also account for the increases observed in the pteridophytes mentioned above.

3.21.9 Conversely, taxa such as Apiaceae undiff. (carrot family), *Ranunculus acris*-type (buttercup) Chenopodiaceae (goosefoots and oraches), *Sparganium emersum*-type (bur reed), *Glyceria*-type (sweet-grasses) and *Equisetum* (horsetails) generally become most abundant within the levels associated and immediately above these stabilisation horizons. This may be a response to increased site wetness associated with overbank alluvium deposition, with increased waterlogging allowing the local presence of *Sparganium emersum*-type, *Equisetum* and *Glyceria*-type within area of damp pasture or along the wetland margins. Chenopodiaceae may be present upon areas of recently deposited and exposed alluvium as well as associated with waste/ disturbed ground. The presence of a single grain of *Limonium* (sea lavender) may be thought to suggest a maritime influence near the site, especially in conjunction with the increase of Chenopodiaceae pollen which is also commonly found upon saltmarsh. However the geographical location of the site and interpretation of the changes in Chenopodiceae stated above would suggest that *Limonium* pollen originated from a greater distance and that a local brackish estuarine influence is not present within this sequence.

3.21.10 Tree and shrub/ climber pollen is low throughout indicating a largely open area. Fluctuations in these taxa are again likely to be demonstrating the influence of changing phases of alluvial deposition and stabilisation. Areas of grassland are also indicated by the presence of *Prunella vulgaris*-type (selfheal) and *Silene vulgaris*-type (bladder champion), with taxa possibly associated with disturbed/ waste ground such as *Scrophularia*-type (figwort), *Cichorium intybus*-type, Brassicaceae and *Solidago virgaurea*-type (aster/ goldenrods).

Conclusions

3.21.11 The pollen sequence recorded in Trench 67 shows a marginal floodplain site undergoing a series of phases of overbank alluvium deposition and drier periods allowing soil stabilisation. The vegetation and pollen in turn responds to these changes in the stratigraphic history showing fluctuations between drier periods leading to the establishment of stabilisation horizons, with wetter phases associated with the deposition of over bank alluvium and the local expansion of associated wetland plants.

Table 103: Pollen zone descriptions for Trench 67, Monoliths <M1> to <M5>

Zone	Depth (m OD)	Description
Tr67-3	3.04 to 4.16	Dominated by Poaceae (33-59%) and Cyperaceae (16-44% TLP), with *Cichorium intybus*-type (up to 7%) and *Glyceria*-type (1-5%). *Pinus sylvestris* (1-2%), *Quercus* (up to 5%), *Alnus glutinosa* (up to 3%) and *Corylus avellana*-type (1-2%) are present in low amounts. Dwarf shrub/ herb taxa account for 91-96% TLP, with, Chenopodiaceae (up to 2%), Brassicaceae (up to 2%), and *Solidago virgaurea*-type (1-3%) common throughout the zone. Other taxa present include *Ranunculus acris*-type (up to 2%), *Thalictrum* (up to 1%), *Silene vulgaris*-type (up to 1%), *Polygonum* (up to 2%), *Filipendula* (up to 1%) and Apiaceae undiff. (up to 5%). Aquatic pollen types are represented by *Sparganium emersum*-type (1-6% TLP + aquatics), with occurrences of *Nuphar* (up to 1% TLP + aquatics) and *Typha latifolia* (up to 1% TLP + aquatics) also recorded. Pteropsida (monolete) indet. (2-12% TLP + pteridophytes) are continuously present, with *Equisetum* (up to 7% TLP + pteridophytes), *Polypodium* (up to 1% TLP + pteridophytes) and *Pteridium aquilinum* (up to 5% TLP + pteridophytes) is recorded. Pollen concentrations vary between 123112 - 724737 grains cm^{-3}.
Tr67-2	2.20 to 3.04	Dominated by Poaceae (36-54%), Cyperaceae (16-43%) and *Cichorium intybus*-type (2-10%). *Pinus sylvestris* (up to 4%), *Quercus* (up to 3%), *Alnus glutinosa* (1-5%) and *Corylus avellana*-type (up to 2%) are present in low amounts. Dwarf shrub/ herb taxa account for 92-97% TLP, with *Ranaunculus acris*-type (up to 2%), Brassicaceae (1-6%), Apiaceae undiff. (up to 2%), *Solidago virgaurea*-type (up to 1-6%) and *Glyceria*-type (up to 4%). Other taxa present include *Montia Fontana* (up to 2%), *Persicaria maculosa*-type (up to 1%), *Limonium* (up to 1%) and *Mentha*-type (up to 1%). Aquatic pollen types are represented throughout most of the zone by *Sparganium emersum*-type (up to 6% TLP + aquatics). A continuous presence of Pteropsida (monolete) indet. (4-9% TLP + pteridophytes) and *Pteridium aquilinum* (1-3% TLP + pteridophytes) is recorded, along occurrences of *Polypodium* (up to 1% TLP + pteridophytes). Pollen concentrations range between 25397 and 620672 grains cm^{-3}.
Tr67-1	2.00 to 2.20	Dominated by Poaceae (35-53%) and Cyperaceae (32-43%). *Pinus sylvestris* (1%), *Quercus* (1-4%), *Alnus glutinosa* (1-2%) *Corylus* avellana-type (1-4%) and Sorbus-type (up to%) are present. Dwarf shrub/ herb taxa account for 93-94% TLP, with *Ranaunculus acris*-type (1-2%), Brassicaceae (1-3%), *Filipendula* (up to 2%), Apiaceae undiff. (1-3%), *Cichorium intybus*-type (1-3%), *Solidago virgaurea*-type (up to 1%) and *Glyceria*-type (1-2%). Aquatic pollen types are represented throughout the zone by *Sparganium emersum*-type (3-4% TLP + aquatics), with occurrences of *Nuphar* (up to 1% TLP + aquatics) and *Typha latifolia* (up to 1% TLP + aquatics). A continuous presence of Pteropsida (monolete) indet. (6-8% TLP + pteridophytes) and *Pteridium aquilinum* (2% TLP + pteridophytes) is recorded, along occurrences of *Polypodium* (up to 2% TLP + pteridophytes). Pollen concentrations range between 253014 and 454251 grains cm^{-3}.

Diatoms

3.21.12 Four slides were prepared for diatom analysis from Trench 67. Diatoms were absent from the slides prepared from the top three samples (2.32, 2.64 and 3.12m OD). A very low number of very poorly preserved freshwater, non-planktonic diatoms are present in the bottom sample prepared for diatom analysis (2.00m OD). The diatom assemblage is composed of only three species: eight joined valves of *Meridion circulare*, and valves of *Cocconeis placentula* and *Achnanthes lanceolata*. *Meridion circulare* is a species associated with flowing water. These attached diatom species are derived from shallow-water habitats.

Ostracods and Foraminifera

3.21.13 Four samples taken from monoliths <M1>, <M2>, <M4> and <M5> have been assessed for the presence, preservation and environmental significance of their ostracod content. Given the lack of ostracods and any other identifiable environmental remains within the samples no comment can be made upon the depositional environment.

Table 104: Microfaunal content of ostracod/ foraminifera samples from Trench 67

Sample/monolith number	<M4>	<M5>	<M2>	<M1>
Depth (m OD)	**2.28**	**2.68**	**3.36**	**4.06**
Other Remains				
Molluscs (broken)	xx	x	x	x
Charcoal		x		

x = 1 to 9 specimens; xx = 10 to 50 specimens; xxx = over 50 specimens

3.22 Trench 71 (PDZ5 Morris Fields)

Introduction

3.22.1 Trench 71 is located towards the north of the Site and contains a high-potential peat and organic/ alluvial sequence (Figure 37) of Early Holocene date.

Sediments

3.22.2 Sediment descriptions and interpretations can be found in Table 105. Basal gravels were observed at 0.10m OD (the maximum depth of the trench) but were rapidly obscured by inundation. The lowest deposits sampled by monolith consisted of a humic loamy sand below 0.89m OD; this has been interpreted as the start of peat formation in the upper surface of active channel deposits.

Table 105: Sediment descriptions for Monoliths <1> and <14>, Trench 71

Level (m OD)	Context	Sediment description	Interpretation
3.08 to 2.92	14	10YR3/ 2 very dark greyish brown clay loam, occasional sand speck visible, very small brick/ cbm fragments, granular/ crumb structure,0.5% fine macropores. Clear boundary. A definite soil. (4cm gap at top)	Buried topsoil (relatively modern)
2.92 to 2.41	15	10YR4/ 4 dark yellowish brown clay loam, stonefree, subangular blocky quite well developed structure at top, much less so with depth. Clear to diffuse boundary.	Alluvium (clay loam)
2.41 to 2.09	16	10YR3/ 1 very dark grey clay, stonefree, massive or possibly very weak blocky structure, common fine faint dark yellowish brown mottles (iron staining).	Organic alluvium (clay)
2.09 to 1.70	17 & 18	10YR3/ 1 very dark grey clay loam, with quite common small molluscs (freshwater from initial scan). Towards base (1.77m OD down) some inputs of grey sand (as below) in horizontal laminations. Molluscs continue into sand. Boundary sharp but interdigitated.	Organic alluvium (clay loam)
1.70 to 1.56	19	10YR5/ 1 grey sand (medium), small percentage of humic clay/ silt, more at 1.68-1.65m OD making a slightly darker band. Freshwater molluscs (inc *Bithynia*) continue throughout. Abrupt boundary.	Alluvial sand
		SEQUENCE CONTINUES WITH GAP and OFFSET 2m SOUTH	
1.50 to 1.40	22	10YR2/ 1 black silty clay loam, very humic, stonefree, massive. Occasional waterlogged small root. Non-erosive clear to sharp boundary	Highly organic alluvium (clay loam)
1.40 to 0.89	20	7.5YR2.5/ 1 black peat, quite well humified but with some recognisable plant remains. Woody. Sharp boundary	Peat (woody)
0.89 to 0.82	21	10YR3/ 3 dark brown loamy sand, appears organic rich	Humic loamy sand

3.22.3 Above this a moderately well-preserved peat (somewhat humified in the monolith samples but reddish brown and less oxidised when observed in section) is recorded to 1.40m OD. This formed in a well-vegetated moist environment, and probably represents the fill of an oxbowed or abandoned channel. The upper surface of this peat has a non-erosional boundary into more mineralogenic (but still highly organic) alluvium to 1.50m OD – this appears to show that re-inundation of the peat/ wetland may have been a gradual process and a record of this transition is preserved in the sequence. The peat has been dated to the Early Mesolithic (see below).

3.22.4 There is a break in the sequence to 1.70m OD, from which to 1.56m OD alluvial sand containing freshwater molluscs represents active channel material once more. Above this to 2.41m OD moderately organic fine sediments dominate, initially with interdigitation with sandy lenses – this shows a move to lower energy alluvial conditions, although with occasional flood events – a probable channel edge environment. Radiocarbon dating indicates an Iron Age date for this (SUERC-24526). Above the channel edge deposits to 2.92m OD a move to essentially dry land conditions with seasonal flooding is represented in the form of overbank alluviual deposits which will have formed part of an accretional floodplain soil. A preserved topsoil of relatively modern date (containing brick/ tile fragments) was sealed to 3.08m OD by dumps of made ground above.

Dating

3.22.5 Seven radiocarbon dates have been obtained from Monoliths <1> and <14> (Table 106). There is clearly a problem of internal consistency with a number of these dates when considered in stratigraphic order, most notably the date of cal AD 1440-1640 (SUERC-35328, 385±30 BP) at the top of monolith <14>. Internal inconsistencies when dating these Early Holocene sequences from the Lea Valley are known to have occurred elsewhere, eg. Temple Mills Depot (Bates and Stafford in press) and Enfield Lock (Chambers *et al.* 1996), but the clear stratification of the pollen diagram in each case suggests limited disturbance of the sediment column as a whole.

Table 106: Radiocarbon dates from Trench 71

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<1> (17/ 18)	2.07	Sediment (humic acid)	SUERC-24526	2245±30	-28.6	400–200 cal BC	2
<14> (22)	1.46 to 1.49	Charcoal: cf. *Quercus* sp.	SUERC-35328	385±30	-25.1	cal AD 1440–1640	3
<14> (20)	1.36 to 1.38	Waterlogged plant material: indet. organics x 2, could be roots or twigs.	SUERC-35338	5740±30	-25	4690–4500 cal BC	2
<14> (20)	1.21 to 1.23	Waterlogged plant material: 6 x indet. buds	SUERC-24530	9050±35	-27	8300–8230 cal BC	1
<14> (20)	1.06 to 1.08	Waterlogged plant material: cf. *Populus tremula* bud scale	SUERC-35337	8715±35	-25	7940–7590 cal BC	2
<14> (20)	0.93	Seeds: 30 x *Carex*	SUERC-24868	9365±110	-	9130–8300 cal BC	1
<14> (21)	0.83 to 0.84	Seeds: 2 x cf. *Potamogeton natans*, 2 x *Schoenoplectus lacustris*, 2 x *Carex* sp. flat, *Carex*/*Viola* trig. 13 x *Ranunculus* subg. *Batrachium*	SUERC-35336	10285±35	-22.1	10430–9880 cal BC	1

Plant macrofossils

3.22.6 Eight samples were examined in total covering the Late Upper Palaeolithic/ Mesolithic, the Iron Age (Table 107) and potentially the medieval/ post-medieval periods (Table 108). Most of the samples had reasonable amounts of waterlogged remains and well preserved plant macrofossils within them.

3.22.7 The lowest two samples from context (20) were dated to the early post-glacial/ Early Mesolithic period. The Early Mesolithic date of 8300–8230 cal BC (SUERC-24530, 9050±35 BP) was upon buds within the monolith that correspond to identical specimens seen in the lowest sample <12>. The early post-glacial date of 9130–8300 cal BC (SUERC-24868, 9365±110 BP) was upon seeds of sedge (*Carex* sp.) within the lowest part of the monolith that from their small size, and flatness are probably of *Carex nigra* type. However, while these seeds should correspond to material in the lowest sample from context (20) it might be noted that no such seeds were seen in this or the samples above despite their abundance in this part of the monolith. As such it is speculated that they pre-date the lowest sample examined for plant macrofossils.

3.22.8 The lowest sample was very organic and rich in twigs and wood remains as well as other plant macrofossils. The main remains comprised those of hazel (*Corylus avellana*), with both catkins and nut fragments present, along with stones of dogwood (*Cornus sanguinea*). Also present in high numbers was an unidentified tree bud, which is speculated to be probably either of *Cornus* or *Populus* sp.. Other plants include typical open and wooded fen species, such as gypsywort (*Lycopus europeaus*) and mint (*Mentha* sp.), along with either woundwort or claries (*Stachys/ Salvia* sp.).

3.22.9 Wetland species were also relatively common and represent species growing in the channel and the shallows at the channel edge. These included horned-pondweed (*Zannichellia palustris*), duckweed (*Lemna* sp.), rush (*Juncus* sp.), sedge (*Carex* sp.), spikerush (*Eleocharis palustris*) and branched bur-reed (*Sparganium erectum*). The sample above was less rich with some fragments of charcoal, but mainly species of wetland and relatively few species of shrub or woodland.

Table 107: Waterlogged plant macrofossils; Trench 71; Mesolithic to Iron Age

Sample		**<12>**	**<11>**	**<10>**	**<9>**	**<8>**
Context		**(20)**	**(20)**	**(19)**	**(18)**	**(17)**
Depth top (m OD)		**1.4**	**1.4**	**1.7**	**2.09**	**2.09**
Depth bottom (m OD)		**0.89**	**0.89**	**1.56**	**1.7**	**1.7**
Sediment Type		**peat**	**peat**	**alluvial sand**	**humic clay**	**humic clay**
Period		**EMeso**	**EMeso**	**-**	**-**	**IA**
Sample Size (litres)		**10**	**10**	**10**	**10**	**10**
Flot size (ml)		**5000**	**80**	**300**	**80**	**50**
Chara (gametes)	stonewort	-	-	+++	-	++
Nuphar lutea	yellow water-lily	-	-	cf.2	cf. +	-
Ceratophyllum demersum	rigid hornwort	-	-	-	+	-
Ranunculus subg. *Ranunculus* (arb)	buttercup	-	-	++	+	-
Ranunculus sardous	hairy buttercup	-	-	+	-	-
Ranunculus sceleratus	celery-leaved buttercup	+	-	-	+	+
Ranunculus lingua	greater spearwort	-	-	cf.1	-	-
Ranunculus subg. *Batrachium*	water-crowfoots	++	-	++++	+++	+
Urtica dioica	common nettle	+	-	-	+	++
Corylus avellana (nut frags)	hazelnut	+	-	cf.1	-	-
Corylus avellana (catkins)	hazelnut	+	-	-	-	-
Chenopodium murale	nettle-leaved goosefoot	-	-	-	-	+
Chenopodium album	fat-hen	-	-	-	+	-
Atriplex sp.	orache	-	-	+	-	+
Stellaria palustris (Retz)/ graminea	marsh stitchwort/ lesser stitchwort	-	-	-	-	+
Persicaria hydropiper	water-pepper	-	-	++	+	+
Persicaria mitis	Tasteless water-pepper	-	-	-	-	+
Rumex sp.	dock	-	-	+	++	++
Rumex acetosella group	sheep's sorrel	-	-	-	+	-
Rumex maritimus (whole fruit)	golden dock	-	-	-	+	+
Barbarea vulgaris	winter-cress	-	-	+	-	-
Rorippa cf. *nasturtium-aquaticum*	narrow-fruited watercress	-	-	+++	+	-
Rorippa palustris	marsh yellow-cress	-	-	-	-	+
Rubus sp.	bramble	-	-	+	-	-
Potentilla palustris	marsh cinquefoil	-	-	cf.1	+	-
Potentilla cf. *sterilis*	barren strawberry	-	-	cf.1	-	-
Prunus sp.	sloe or cherry	-	-	+	-	-
Myriophyllum spicatum	spiked water-milfoil	-	-	++	+	-
Cornus sanguinea	dogwood	+	-	-	-	-
Berula *erecta*	lesser water-parsnip	-	-	-	+	-
Oenanthe cf. *fistulosa/ silaifolia*	tubular/ narrow-leaved water-droplet	-	-	+	-	?+
Oenanthe cf. *fluviatilis*	water-dropworts	-	-	+	-	-
Silaum silaus	pepper-saxifrage	-	-	+	-	-
Apium graveolens/ nodiflorum	wild celery/ fool's watercress	-	-	+	+	+

Sample		**<12>**	**<11>**	**<10>**	**<9>**	**<8>**
Context		**(20)**	**(20)**	**(19)**	**(18)**	**(17)**
Depth top (m OD)		**1.4**	**1.4**	**1.7**	**2.09**	**2.09**
Depth bottom (m OD)		**0.89**	**0.89**	**1.56**	**1.7**	**1.7**
Sediment Type		**peat**	**peat**	**alluvial sand**	**humic clay**	**humic clay**
Period		**EMeso**	**EMeso**	**-**	**-**	**IA**
Sample Size (litres)		**10**	**10**	**10**	**10**	**10**
Flot size (ml)		**5000**	**80**	**300**	**80**	**50**
Hyoscyamus niger	henbane	-	-	+	-	-
Solanum nigrum	black nightshade	-	-	+	+	-
Stachys/ Salvia	Woundwort/ Claries	+	-	-	+	+
Lamium cf *album*.	white dead-nettle	-	-	+	cf. ++	-
Lycopus europaeus	gypsywort	+	-	-	+	+
Mentha sp.	mint	+	+	-	++	++
Sambucus nigra	elder	-	-	+	-	-
Carduus/ Cirsium sp.	thistle	-	-	++	+	+
Leontodon/ Tragopogon sp.	hawkbits/ goat's-beard	-	-	+	-	-
Sagittifolia sagittifolia	arrowhead	-	-	+	+	+
Sagittifolia sagittifolia (Inner)	arrowhead	-	-	++	-	+
Baldellia ranunculoides	lesser water plantain	-	-	-	+	+
Alisma plantago-aquatica	water-plantain	-	-	-	-	+
Potamogeton sp.	pondweeds	-	-	++++	++	+
Zannichellia palustris	horned pondweed	+	-	++	+	+
Lemna sp.	duckweeds	+	-	-	+	+
Juncus sp.	rush	-	-	-	-	++
Eleocharis palustris	common spike-rush	+	-	+	-	+
Schoenoplectus lacustris	common club-rush	-	+	++++	++++	+
Carex sp. (flat)	sedge (lenticular)	-	-	-	+*nigra*?	+*nigra*?
Carex sp. (trigonous)	sedge (trigonous)	++	-	++	-	+
Glyceria sp.	sweet-grasses	-	-	-	+	+
Sparganium erectum (fruit/ achene)	branched bur-reed	+	-	-	-	+
Sparganium erectum (embryo)	branched bur-reed	-	-	++	+	-
Seed indet.		+	-	-	-	-
Bud indet.		+++	+	-	+	-
Wood and twigs indet.		+	-	-	-	-
Roots indet.		+++	-	-	-	-
Charcoal	charred wood indet.	-	+	-	-	-
Daphnia sp. (*Ephippium*)	water flea	-	-	-	-	+

+C – denotes material that was preserved by charring. cf. compares with. Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more

3.22.10 Context (17) was dated to the Iron Age, and given that the samples from contexts (19), (18) and (17) were all broadly similar in composition it might be assumed that all relate to this broad period, with context (19) probably being no earlier than later Bronze Age. Context (7) was also broadly similar, although it was suggested that the deposit may have been medieval in date (Sargent and Corcoran 2008, 39). The lowest sample from context (19), as well as contexts (17) and (7), had quite high numbers of gametes of stonewort (*Chara* sp.) indicative of slower flowing, shallow, calcareous water.

3.22.11 Contexts (19) and (18) contained many seeds of water crowfoot (*Ranunculus* subg. *Batrachium*) as well as those of yellow water-lily (*Nuphar lutea*). The vast majority of other species found within these samples are also those of either aquatic or river edge species, for example, water-pepper (*Persicaria hydropiper*), celery-leaved buttercup (*Ranunculus* subg. *Sceleratus*), ridged hornwort (*Ceratophyllum* demersum), branched bur-reed (*Sparganium erectum*), sedge (*Carex* sp.), sweet grasses (*Glyceria* sp.), spikerush *Eleocharis palustris*), rush (*Juncus* sp.), horned pondweed (*Zannichellia palustris*), and arrowhead (*Sagittifolia sagittifolia*).

3.22.12 Seeds of dry land as seen were less well represented than wetland species, comprising mainly those of rough grassland, wasteland and possibly arable soils, in the form of seeds of buttercup (probably *Ranunculus* repens or *acris*), hairy buttercup (*Ranunculus sardous*), dock (*Rumex* sp.), common nettle (*Urtica diocia*), thistle (*Carduus*/ *Cirsium* sp.) and golden dock (*Rumex maritimus*).

3.22.13 Both golden dock and hairy buttercup are perhaps more indicative of bare mud and disturbance caused by flooding, general water action and possibly tidal influence than by animal trampling. However, species of the Chenopodiceae, eg. orache (*Atriplex* sp.), fat-hen (*Chenopodium album*), nettle-leaved goosefoot (*Chenopodium murale*), black nightshade (*Solanum nigra*) and henbane (*Hyocyamus niger*) are associated with nitrogen rich, disturbed soils and might indicate at least some animal activity in the area during the Iron Age.

3.22.14 A few seeds of bramble (*Rubus* sp.), possible sloe or cherry (*Prunus* sp.), do indicate some scrub or possible hedgerow in the vicinity, although such species were very rare.

3.22.15 The uppermost contexts (15) and (14) are of medieval to 18-19th century date, the uppermost containing semi-frequent fragments of coal, as well as a charred grain of free-threshing wheat. Context (15) contained a seed of fig (*Ficus* sp.) also in keeping with its proposed medieval to post-medieval date. Seeds were relatively infrequent in these samples and comprised mainly those of wastelands and overgrown shrub with little to no wetland species present.

3.22.16 The lowest sample corresponds well with the pine hazel forests that are known to have dominated the landscape at this time. It might be noted that such remains of dogwood were commonly seen from broadly contemporary deposits at Denham and Uxbridge to the west (Wessex Archaeology 2005; 2006) and it would appear that the species formed a common component of the wetland, humic riverbanks and floodplain soils at this time. The presence of hazelnuts for this date is slightly more unusual and might at least indicate the existence of such plants growing on stabilised riverbanks in close vicinity to the channel, or possibly the fast inundation or previously dry parts of the channel edge. The predominance of wetland species certainly suggest the existence of swathes of reed marsh along the channel edge, while the absence of drier woodland species from the sample taken at the top of context (20) can be seen as reflective of the general inundation of the area.

3.22.17 The samples from contexts (19), (18), (17) and possibly context (7) representing the Iron Age environment were quite different. With the exception of that from context (18) the samples indicate the existence of probably shallow, slow flowing water, while the presence of ephippium of water flea in context (17) is indicative of standing or still water. The high numbers of seeds of water crowfoot also would indicate a very slow flowing highly vegetated channel although given the results of the mollusc analysis it may be that we are looking at the existence of such areas in inlets along the channel edge, with the high vegetated nature of the channel during this period probably also slowing the water flowing through. There is little evidence for any woody shrub during this period covering the Iron Age and it is probable that the surrounds included disturbed soils along the river edge, possibly with some animal trampling, but also possibly also reflecting some tidal influence.

Table 108: Waterlogged plant macrofossils from medieval and post medieval later deposits at Trench 71

Sample		<7>	<5>	<2>
Context		**(16)**	**(15)**	**(14)**
Depth top (m OD)		**2.41**	**2.92**	**2.92**
Depth bottom (m OD)		**2.09**	**2.41**	**3.08**
Sediment Type		**alluvium**		**Topsoil**
Period		**med?**	**med**	**18-19C**
Sample Size (litres)		**5**	**5**	**10**
Flot size (ml)		**20**	**5**	**20**
Species				
Chara (gametes)	stonewort	+	-	-
Ranunculus sceleratus	celery-leaved buttercup	+	-	-
Ranunculus subg. *Batrachium*	water-crowfoots	+	-	+
Ficus carica	fig	-	+	-
Urtica dioica	common nettle	+	-	+
Atriplex sp.	orache	-	-	+
Rumex sp.	dock	+	-	+
Rumex maritimus (whole fruit)	golden dock	+	-	-
Rorippa palustris	marsh yellow-cress	+	-	-
Rubus sp.	bramble	-	-	+
Potentilla cf. *sterilis*	barren strawberry	-	-	+
Stachys/ Salvia	woundwort/ Claries	+	-	-
Mentha sp.	mint	+	-	-
Carduus/ Cirsium sp.	thistle	+	+	-
Sagittifolia sagittifolia (inner)	arrowhead	+	-	-
Baldellia ranunculoides	lesser water plantain	+	-	-
Alisma plantago-aquatica	water-plantain	cf. +	-	-
Lemna sp.	duckweeds	+	-	-
Schoenoplectus lacustris	common club-rush	+	-	-
Carex sp. (flat)	sedge (lenticular)	+	-	-
Poaceae (small indet.)	small grass seed	-	-	+
Triticum cf. aestivum/ turgidum type	bread/ rivet wheat	-	-	ch+
Charcoal	charred wood indet.	+	-	+
Coal		-	-	+

+C – denotes material that was preserved by charring. cf. compares with. Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more

Pollen

3.22.18 Eight samples were examined initially to assess the pollen preservation and assemblage contained within the sediments from monoliths <1> and <14>. Samples from monolith <14> were found to have good pollen concentrations and preservation and were taken forward to full analysis with a total of 32 closely spaced samples have been taken from this monolith. Monolith <1> was found to have a low species diversity dominated by local taxa (most notably Poaceae (grasses), Cyperaceae (sedges) and *Sparganium emersum*-type (bur reed). The difference between this upper assemblage, coupled with the absence of overlapping monolith samples (between monoliths <14> and <1>) and radiocarbon dates, imply that there is a and a considerable time gap exists between these two sequences. Subsequently it was decided that the pollen samples from monolith <1> will not be subjected to further investigation.

3.22.19 Results of pollen analysis from Monolith <14> are shown in Figure 38, and described in Table 109, which also includes the pollen assessment from monolith <1> not shown in Figure 38 (LPAZ Tr71-5). Five local pollen assemblage zones (LPAZ) have been recognised, using the prefix Tr71- to identify each one

3.22.20 The basal deposits (LPAZ MF-1 and MF-2) bridge the Greenland Stadial 1 (GS-1) – Holocene transition, with two radiocarbon dates from LPAZ Tr71-1 giving calibrated ranges of 10430-9880 cal BC (SUERC-35336, 10285±35 BP) at 0.83-0.84m OD and 9130–8300 cal BC (SUERC-24868, 9365±110 BP) at 0.93m OD. Radiocarbon dates from similar sequences along the Lea Valley generally predate the radiocarbon date obtained from Trench 71, with the exception of Enfield Lock (Chambers *et al.* 1996) which is contemporary. As the radiocarbon date has been obtained from *Carex* sp. seeds, whose pollen is most prevalent in LPAZ Tr71-1, it is concluded that this date is probably correct. The radiocarbon date from a similar pollen assemblage at the neighbouring Omega Works site (Spurr 2006) is considerably younger, though this has been dismissed as probably being erroneous.

3.22.21 The pollen shows an environment dominated by herbs, including Poaceae (grasses), Cyperaceae (sedges) and *Filipendula* (dropwort/ meadowsweet). *Pinus sylvestris* (pine) and *Betula* (birch) are also present in low amounts, with some pollen grains of the latter probably derived from *Betula nana* (dwarf birch). *Juniperus communis* (Juniper), *Salix* (willow), *Helianthemum* (rock-rose), *Saxifraga oppositifolia*-type (purple saxifrage) and *Artemisia*-type (mugwort) are also present and are typical of a Late Pleistocene/ Early Holocene pollen assemblage, as are the high values of *Filipendula* present at the top of LPAZ Tr71-1. Increases in *Filipendula* have been recorded within many contemporary deposits, including a number of sites within the Lea Valley, eg. Stratford Box (Barnett *et al*. 2011), Temple Mills Depot (Bates and Stafford in press), Enfield Lock (Chambers *et al*. 1996) and Trench 118 from this study. The rise in *Filipendula* is often interpreted as indicating a response to rising temperatures after the end of the last glaciation (eg. Barnett *et al*. 2011). However there are two different species of *Filipendula* likely to be present at this time – *Filipendula vulgaris* (dropwort) is likely to be associated with steppe vegetation (Bell 1969; Godwin 1975, 183) whereas *Filipendula ulmaria* (meadowsweet) is to be found in marshy habitats. High values of Poaceae (possibly derived from *Phragmites australis*, common reed), Cyperaceae, *Myriophyllum verticillatum* (whorled milfoil), *Sparganium emersum*-type (bur-reed), *Typha latifolia* (bulrush), *Glyceria*-type (sweet-grasses) and *Arrhenatherum*-type (false oat-grass/ reed sweet-grass) support the interpretation of local marshy habitats. It is likely that the high values of *Ranunculus acris*-type (buttercup) are also associated with this wetland environment. *Filipendula ulmaria* is therefore the most likely species recorded in the pollen assemblage.

3.22.22 *Quercus* (oak) and *Corylus avellana*-type (hazel) pollen are also present in low amounts, yet their origin is unclear as to whether they are derived from re-worked material, long-distance transport or the existence of small localised deciduous woodland stands. A common interpretation for the appearance of pollen of broadleaf trees in sequences from this period is that they are derived from reworked material or long distance transport. Godwin (1975, 279) notes that in a number of Late Pleistocene pollen diagrams there is a low presence of *Quercus* that increases through the Early Holocene which he attributes to long-distance transport, with the slow increase in values representing expansion away from its glacial refuge. From the Lea Valley many of the sequences of contemporary date contain these low values of broadleaf taxa. There have been suggestions that instead of long distance transportation, these low values may instead indicate cryptic northern refugia (Stewart and Lister 2001). For example, at Dozmary Pool, Cornwall (Kelly *et al.* 2010), a sequence dating between 25000–17500 cal BC indicated the presence of conifer tree pollen (*Picea, Pinus, Abies*) and lower but persistent percentages of broadleaf tree pollen during the Last Glacial Maximum which were similarly related to the possibility of refugia. Tallantire (2002) suggested that *Corylus avellana* may have been present as non-flowering trees before the recognised expansion in pollen records, with full pollen production setting in after a stabilisation and amelioration of the climate in the Early Holocene. There is therefore the possibility that the pollen found at the base of sequences from within the Lea Valley may actually be identifying local small stands of deciduous woodland rather than simply being derived purely from long distance pollen transport or reworked material.

3.22.23 It should be noted however that *Corylus avellana*-type also incorporates pollen derived from *Myrica gale* (bog myrtle), as it is often difficult to separate these two species (Edwards 1981) especially if they are poorly preserved. The earliest (albeit tentative) record of *M. gale* in the UK is from the Late Pleistocene (Skene *et al*. 2000, 1090). The modern distributions of *M. gale* indicates an abundance in areas of swamp, often associated with *Phragmites australis*, *Cladium mariscus* (great fen sedge) and *Carex* sp. (Skene *et al*. 2000, 1081). This vegetation community is indicated by the pollen and waterlogged plant macrofossil assemblages, so it is possible that small patches of *M. gale* existed at this time within the Lea Valley, possibly accounting for the early low presence of *C. avellana*-type pollen. This speculation is further supported by the presence of seeds of *M. gale* in peat deposits dated c. 9000-8000 cal BC at Crown Wharf Ironworks, immediately to the west of the Olympic Park (Stephenson 2008; Branch *et al.* 2006).

3.22.24 Peat formation initiates due to a change in the channel hydrology, with the impedance of flow, possibly by damming and the formation of pooled water bodies or oxbows on the floodplain. The accumulation of plant material and formation of peat indicates a transition from open-water flora in the post-glacial period when the River Lea energy was higher, to fen-type vegetation and the transition from sedge and reed communities to the establishment of local *Salix* woodland on the floodplain.

3.22.25 The expansion of *Pinus sylvestris* (Pine) in LPAZ Tr71-2 (obtaining values of up to 70% TLP) occurs between 9130–8300 cal BC. The timing of this expansion is later than a number of sequences from other lowland sites across southern Britain including the neighbouring sites of Temple Mills Depot (c. 9840 cal BC) and Stratford Box (c. 9300 cal. BC). This again may imply that the basal date from this sequence is problematic (as already implied by the GS-1/ Early Holocene pollen assemblage in LPAZ Tr71-1 and date of peat initiation), or alternatively that *P. sylvestris* was not abundant in close proximity to the sample site. High herb and aquatic pollen values would suggest that the local area is very wet so either *P. sylvestris* cannot successfully establish locally, or alternatively the influx of local wetland taxa (Poaceae and *Filipendula*) is reducing the percentage contribution of pollen derived from sources beyond the local wetland, as found in many of the later prehistoric and historic alluvial sequences. Increases of *Pinus sylvestris* to values above 20% TLP occur at Bagshot, Surrey (Groves 2008) and Silvertown, London (Wilkinson *et al*. 2000) at c. 9550 cal BC, at Pannel Bridge, East Sussex (Waller 1993) prior to c. 9550 cal BC and at Gatcombe Withy Bed, Isle of Wight (Scaife 1987) prior to c. 9450 cal BC. A threshold of 20% TLP is commonly applied to *P. sylvestris* to indicate local presence as the tree produces a large amount of pollen that is well dispersed (Bennett 1984). However, the low sustained values of *P. sylvestris* in LPAZ Tr71-1 may indicate small isolated stands rather than the pollen being derived purely from long-distance transport.

3.22.26 With the increase in *Pinus sylvestris* is an associated further increase in *Corylus avellana*-type and *Salix*. The increase in these woodland taxa coincides with a reduction in herb taxa and a change in the local wetland, with a reduction in Cyperaceae, *Ranunculus acris*-type, *Filipendula* and *Typha latifolia*, yet there is an increase in Pteropsida (monolete) indet. (fern spores) and sustained presence of some other taxa associated with the wetland including *Sparganium emersum*-type. This is likely to reflect the gradual infilling of the site by peat accumulation and the establishment of local *Salix* woodland upon the site, with the canopy reducing the amount of light reaching the understorey plants.

3.22.27 LPAZ Tr71-3 contains a large expansion *Corylus avellana-type* and *Ulmus*. The expansion of *Corylus avellana*-type coincides with a reduction in Pteropsida (monolete) indet. and *Pinus sylvestris*, though *Salix* values remain similar to the previous LPAZ. The gradual reduction of *P. sylvestris* values to less than 20% TLP is often interpreted as indicating it is no longer locally present, as deciduous taxa expand upon dryland areas and directly competing with it. The reduction may also be associated with the initial increases in *Alnus glutinosa* which would have been directly competing with *Pinus sylvestris* within wetland areas (Bennett 1984). The increase in *Ulmus,* dated to 8300-8230 cal BC (SUERC-24530, 9050±35 BP) and is contempotary with that recorded at Stratford Box of 8450-8240 cal BC (NZA-27376, 9099±45 BP), but younger than that recorded at Temple Mills Depot of *c.* 9040 cal. BC. However, these correlations clearly suggest that the underlying radiocarbon date at 1.06-1.08m OD of 7940-7590 cal BC (SUERC-35337, 8715±35 BP) is clearly too young.

3.22.28 LPAZ Tr71-4 contains the main expansion of *Quercus* with increases in *Alnus glutinosa* (alder), Cyperaceae, *Sparganium emersum*-type and Pteropsida (monolete) indet. also recorded. There is also the first records of *Tilia cordata* (small-leaved lime) in the sequence. The low and intermittent occurrence of *T. cordata* recorded is likely to be the result of the distance between the sampling site and the dryland edge as its pollen is not produced in high amounts or well-distributed (Waller and Grant 2012). *A. glutinosa* appears to be eractic in its local establishment, reaching initially high values before a reduction then second expansion towards the top of the sequence. Fluctuations in *A. glutinosa* values prior to its successful establishment are common in floodplain sequences from lowland southern Britain, often interpreted as reflecting fluctuating ground water levels. The sequence from Temple Mills Depot contains a similar record of fluctuating *A. glutinosa* values. Changes in the ground water level are supported by increases in Cyperaceae, Poaceae, Pteropsida (monolete) indet. and *S. emersum*-type, along with the occurrence of taxa including *Ranunculus acris*-type and *Typha latifolia*. Radiocarbon dates from the top of this sequence appear unreliable, with a date at 1.36-1.38m OD providing a calibrated range of 4690-4500 cal BC SUERC-35338, 5740±30 BP) and another at 1.46-1.48m OD of cal AD 1440-1640 (SUERC-35328, 385±30 BP). It is unclear what the reason for these erroneous dates are, but possible intrusive material caused by root penetration is possible (material selected for dating in SUERC-35338 appeared to be twig-like, but there is the possibility that these were derived from roots). Similar problems were encountered with dating of the upper part of the similar sequences from Temple Mills Depot (Bates and Stafford in press) and Enfield Lock (Chambers *et al.* 1996). A change in the stratigraphy from wood peat to organic alluvium is recorded at 1.40m OD.

3.22.29 The top of monolith <14> is at 1.50m OD at the top of context (22) while the base of the lowest monolith <1> is at 1.505m OD finishing in the centre of context (19) and located *c.* 2.5m away from monolith <14>. Due to no overlap of the two sets of monoliths (monolith <1> not sampling the underlying context (22)) the transition between the two contexts and probable truncation of the sequence cannot be properly evaluated. A radiocarbon date from 2.07m OD suggests that the upper part of the alluvial sequence dates from 400–200 cal BC (SUERC-24526, 2245±30 BP). The pollen assemblage from LPAZ Tr71-5 is dominated by Poaceae, Cyperaceae and *Sparganium emersum*-type. Woodland taxa are low in abundance, with *Quercus* and *Corylus avellana*-type present. *Alnus glutinosa* is present throughout in low amounts suggesting that it is not locally abundant. The high Poaceae values are likely to have been derived from vegetation within the floodplain such as *Phragmites australis*, with Cyperaceae and *Glyceria*-type also growing along channel margins and cut-offs. The aquatic pollen present is indicative of slow-moving water and marshy conditions with *Typha latifolia*, *S. emersum*-type and *Sagittaria sagittifolia* (arrowhead) present. Local disturbance is indicated by the presence of *Rumex acetosella* (sheep's sorrel), *Plantago lanceolata* (ribwort plantain) and *Pteridium aquilinum* (bracken) which are likely to be indicating some grazing activity upon the open floodplain.

3.22.30 The pollen sequence from Trench 71 clearly shows a Late Pleistocene to Early Holocene sequence at the base. During the Early Mesolithic the changing environment and climate lead to the initial establishement of *Pinus* woodland prior to the widespread establishment of deciduous tree taxa and changes in the local hydrology. Local hydrological changes influenced the local wetland vegetation greatly and are known to control the local establishment of *Alnus glutinosa* and control the abundance of *Salix* on site. Fluctuations in the site hydrology can also be identified through the changes in the aquatic pollen types and different phases of local bur-reed and bullrush dominance, though these are also a reflection of local canopy cover and water flow. Trench 71 contains the most intact Early Holocene record recorded from the site and has clear parallels with other sequences studied along the lower River Lea.

3.22.31 The pollen assemblage from monolith <1> is of a much later date than that from <14>. The upper monolith's pollen is dominated by open-land taxa and is strongly dominated by the local wetland vegetation, indicating an open floodplain environment which is probably grazed.

Table 109: Pollen zone descriptions for Trench 71, Monoliths <1> and <14>

Zone	Depth (m OD)	Description
Tr71-5	1.615 – 2.22	Dominated by Poaceae (31-52%), Cyperaceae (13-39%), *Glyceria*-type (5-8%) and *Sparganium emersum*-type (9-13% TLP + aquatics). *Pinus sylvestris* (1-2%), *Quercus* (4-7%), *Betula* (1-2%), *Alnus glutinosa* (1-4%), *Corylus avellana*-type (3-6%) and *Salix* (1%) are present throughout. Dwarf shrub/herb taxa include *Ranunculus acris*-type (1-2%), Chenopodiaceae (up to 2%), *Rumex acetosella* (up to 2%), *Rumex acetosa* (up to 1%), *Filipendula* (up to 1%), *Plantago lanceolata* (1%), Rubiaceae (up to 1%), *Cichorium intybus*-type (1-2%) and *Solidago virgaurea*-type (up to 2%). Additional aquatic taxa present include *Sagitaria sagittifolia* (up to 1% TLP + aquatics) and *Typha latifolia* (1-5% TLP + aquatics). Pteridophytes include *Pteridium aquilinum* (1-3% TLP + pteridophytes) and Pteropsida (monolete) indet. (7-15% TLP + pteridophytes). Pollen concentrations vary between 137295 to 1258998 grains cm^{-3}.
Tr71-4	1.27 – 1.615	Dominated by Ulmus (3-10%), Quercus (8-21%), *Corylus avellana*-type (36-55%) and Pteropsida (monolete) indet. (1-42% TLP + pteridophytes), with *Alnus glutinosa* (up to 32%) also significant during parts of the zone. *Pinus sylvestris* (5-9%), *Betula* (1%), *Tilia cordata* (up to 2%), *Salix* (1-11%) and *Hedera helix* (1%) are also present. *Ranunculus acris*-type (up to 1%), *Filipendula* (up to 0.5%), Roaceae undiff. (up to 0.5%), Apiaceae undiff. (up to 1%), Poaceae (5-8%) and Cyperaceae (1-14%). *Sparganium emersum* type (4-16% TLP + aquatics) increases towards the end of the zone, with *Polypodium* (up to 0.5% TLP + pteridophytes) and *Pteridium aquilinum* (up to 0.5% TLP + pteridophytes) occasionally present. Pollen concentrations range between 163725 and 11186966 grains cm^{-3}.
Tr71-3	1.165 – 1.27	Dominated by *P. sylvestris* (5-35%),*Ulmus* (1-13%), *Corylus avellana*-type (43-64%) and *Salix* (8-15%). *Quercus* (up to 5%), *Betula* (up to 1%), *Alnus glutinosa* (up to 2%), *Cornus sanguinea* (up to 0.5%) and *Sambucus nigra* (up to 0.5%) are also present, increasing towards the end of the zone. Dwarf shrub/herb taxa are limited, with only *Filipendula* (up to 1%), Cyperaceae (1-6%) and Poaceae (4-5%) present throughout the zone, though other taxa present include *Ranunculus acris*-type (up to 0.5%), Apiaceae undiff. (up to 0.5%), *Linum catharticum* (up to 0.5%), *Solidago virgaurea*-type (up to 0.5%) and *Artemisia*-type (up to 0.5%). *Sparganium emersum* type (up to 2% TLP + aquatics) and Pteropsida (monolete) indet. spores (1-3% TLP + pteridophytes) are also present. Pollen concentrations range between 97566 and 8065022 grains cm^{-3}.
Tr71-2	0.94 – 1.165	Dominated by *Pinus sylvestris* (25-70%), *Corylus avellana*-type (2-13%), *Salix* (6-20%) and Poaceae (4-36%). *Ulmus* (up to 2%), *Quercus* (up to 2%), *Betula* (1-5%), *Sorbus*-type (up to 1%) and *Sambucus nigra* (up to 1%) are present in low amounts. Dwarf shrub/herb taxa present include *Ranunculus acris*-type (up to 1%), *Thalictrum* (up to 1%), *Filipendula* (1-4%), Apiaceae undiff. (up to 2%), *Cirsium*-type (up to 1%), Lactuceae undiff. (up to 1%), *Solidago virgaurea*-type (up to 1%), *Artemisia*-type (up to 1%), Cyperaceae (2-16% TLP), *Glyceria*-type (up to 1%) and *Arrhenatherum*-type (up to 0.5%). *Sparganium emersum*-type (up to 1-3% TLP + aquatics), *Typha latifolia* (up to 4%) and Pteropsida (monolete) indet. spores (8-56% TLP + pteridophytes) are also present. Pollen concentrations increase gradually from 30527 to 146377 grains cm^{-3}.
Tr71-1	0.84 – 0.94	Dominated by Poaceae (22-44%) and Cyperaceae (4-39%). *Pinus sylvestris* (3-10%) and *Betula* (2-6%) are the main tree taxa, with occurrences of *Juniperus* (up to 0.5%), *Ulmus* (up to 0.5%) *Quercus* (up to 1%). *Corylus avellana*-type (1%) and *Salix* (1%) are also present. Dwarf shrub/herb pollen types are diverse, with high occurrences of *Ranunculus acris*-type (1-9%), *Filipendula* (1-30%), with *Thalictrum* (0.5%), *Silene vulgaris*-type (up to 0.5%), *Helianthemum* (1%), *Calluna vulgaris* (up to 0.5%), *Potentilla*-type (up to 0.5%), *Saxifraga granulata*-type (up to 1%), *Saxifraga oppossitifolia*-type (up to 2%), Apiaceae undiff. (1-2%), *Plantago media* (up to 2%), Rubiaceae (1-2%), *Cirsium*-type (up to 2%), *Solidago virgaurea*-type (1-4%), *Artemisia*-type (1-5%), *Glyceria*-type (1-3%) and *Arrhenatherum*-type (2-4%) also notably present. Aquatic pollen is present including *Nuphar* (up to 0.5% TLP + aquatics), *Myriophyllum verticillatum* (up to 9% TLP + aquatics), *Myriophyllum spicatum* (up to 0.5% TLP + aquatics), *Myriophyllum alterniflorum* (up to 0.5% TLP + aquatics), *Pinguicula* (0.5 % TLP + aquatics), *Potamogeton natans*-type (up to 1% TLP + aquatics), *Sparganium emersum*-type (1-27 % TLP + aquatics) and *Typha latifolia* (1-24% TLP + aquatics). *Equisetum* (up to 0.5%TLP + pteridophytes), *Pteridium aquilinum* (up to 1% TLP + pteridophytes) and Pteropsida (monolete) indet. (1-6% TLP + pteridophytes) are present in low amounts. Pollen concentrations are consistent, ranging from 470972 – 2496316 grains cm^{-3}.

Diatoms

3.22.32 Eight samples were prepared from Monoliths <1> and <14> from Trench 71 (Figure 39). Diatoms were present in extremely low numbers and very poorly preserved in the four basal samples from 0.84 to 1.43m OD in Monolith <14>. It is not possible to make percentage diatom counts for these samples. At 0.84m OD two species were identified, the freshwater aerophile *Nitzschia recta* and non-planktonic freshwater diatom *Fragilaria pinnata*. Another *Nitzschia* sp. fragment and indeterminate pennate fragment are also present at 0.84m OD. At 0.95m OD a very poorly preserved frustule of the freshwater benthic diatom *Nitzschia dissipata* is present. At 1.36m OD the non-planktonic diatom *Cocconeis placentula* and a *Gomphonema* sp. frustule are present. At 1.43m OD a dissolved frustule of the non-planktonic freshwater species *Cymbella minuta* is present.

3.22.33 Moderately high concentrations of diatoms are present at 1.75m OD and 2.04m OD. The quality of diatom preservation in these samples varies from good to poor, and species diversity is moderately high in both. It has been possible to make percentage diatom counts for these two levels. The diatom assemblages of these samples are comprised entirely of non-planktonic freshwater diatoms from both attached (eg. epiphytic or epilithic) and benthic (mud) habitats. The diatoms therefore reflect a shallow water environment. Slightly elevated salinity levels are indicated by the presence of a number of mesohalobous and halophilous diatoms, with a higher proportion of mesohalobous or halophilous diatoms at 2.04m OD, including *Anomoeoneis sphaerophora, Fragilaria virescens, Rhoicosphaenia curvata* and *Gomphonema olivaceum*. There is not, however, clear evidence for direct contact with tidal water (a valve of the polyhalobous to mesohalobous diatom *Cocconeis scutellum* at 1.75m OD).

3.22.34 In both samples the dominant components of the assemblages are freshwater (oligohalobous indifferent) non-plankton. In the lower sample at 1.75m OD the dominant freshwater taxa include *Achnanthes minutissima, Amphora pediculus, Cocconeis placentula, Cymbella sinuata, Fragilaria brevistriata, Fragilaria construens, Fragilaria construens* var. *venter and Fragilaria pinnata*. In the upper sample at 2.04m OD the most common freshwater taxa include *Achnanthes lanceolata, Amphora pediculus, Cocconeis placentula, Gomphonema angustatum, Gomphonema parvulum, Synedra ulna, Cocconeis pediculus, Fragilaria leptostauron* and *Fragilaria vaucheriae*. As for 1.75m OD there is a significant proportion of opportunistic taxa such as *Fragilaria pinnata, Fragilaria brevistriata, Fragilaria construens* var. *venter* and probably reflects the shallow water habitat with episodes of drying out. However, there appears to have been little inwash of terrestrial sediments with a low number of aerophilous diatoms, such as *Hantzschia amphioxys*. Rheophilous diatoms, such as *Meridion circulare*, that are associated with greater rates of current flow are also present but in relatively small numbers.

3.22.35 A frustule of the attached freshwater diatom *Achnanthes clevei* and a *Navicula* sp. frustule are present at 2.21m OD. One valve of the freshwater non-planktonic diatom *Achnanthes lanceolata* var. *rostrata* is present at 2.59m OD.

Ostracods and Foraminifera

3.22.36 The ostracod content of the five samples is given in Table 110. Very few ostracods were recovered from the samples. The samples at 1.23 to 1.21m OD, 1.49 to 1.47m OD, 1.91 to 1.89m OD and contained no ostracods. At 1.65 to 1.63m OD a few stray adult valves of *Candona candida* and *Candona neglecta* were recovered. At 2.51 to 2.49m OD one Candoniid was also recovered.

3.22.37 Plant remains including seeds and buds (at 1.23 to 1.21m OD and 1.91 to 1.89m OD), charophyte oogonia (at 1.65 to 1.63m OD and 1.91 to 1.89m OD), radiate diatoms (at 1.49 to 1.47, 1.65 to 1.63 and 1.91 to 1.89m OD) and a small piece of charcoal at 1.49 to 1.47m OD were recovered. Animal remains including amphibian bone (1.65 to 1.63m OD), fish bone (1.91 to 1.89m OD) insect remains (1.63 to 1.63m OD) and freshwater gastropod molluscs (1.65 to 1.63m OD and 1.91 to 1.89m OD) were recovered.

3.22.38 The numbers of ostracods recovered from the samples are too low to make any firm environmental interpretation of the depositional environment. The sample at 1.65 to 1.63m OD produced the greatest numbers of ostracods and also other environmental indicators upon which some information can be gleaned.

Table 110: Microfaunal content of ostracod/ foraminifera samples from Trench 71

Sample number	<14>	<1>	<1>	<1>	<1>
Depth (m OD)	**1.23 to 1.21**	**1.49 to 1.47**	**1.65 to 1.63**	**1.91 to 1.89**	**2.51 to 2.49**
Ostracods					
Candona candida			x		
Candona neglecta			x		
Candona sp.					x
Other remains					
Molluscs				x	
Bithynia opercula			xx	xx	
Bithynia apices			x	x	
Lymnaea				x	
Planorbid			x	x	
Theodoxius fluviatalis			x		
Insect bits			x		
Fish bone				x	
Amphibian bone			x		
Rhizomes			x		xx
Charophyte oogonia			x	xx	
Radiate diatoms		x	x	x	
Sponge spicules			x		
Seeds	x			x	
Plant remains				x	
Buds	xx				
Charcoal		x			

x = 1 to 9 specimens; xx = 10 to 50 specimens; xxx = over 50 specimens

3.22.39 The Candoniid ostracods within the sample the assemblages at 1.65 to 1.63m OD (*Candona candida* and *Candona neglecta*) are known to inhabit a wide range of environments including springs, brooks, wells, ponds and ditches. They are known from the littoral and profundal zones of lakes. Both are also known to be tolerant of slightly brackish waters. *Candona candida* and *Candona neglecta* are not uncommon in the Baltic Sea (Meisch 2000) with a maximum recorded salinity tolerance of 16‰ for *Candona neglecta* and 5.77‰ for *Candona candida* (Hiller 1972). Despite this these taxa are indicative of non-marine "freshwater" environments, confirmed in this case by the absence of any commonly occurring brackish water taxa. *Candona candida* and *Candona neglecta* are both usually found in permanent water-bodies although the juveniles of *Candona candida* and the eggs, juveniles and adults of *Candona neglecta* are desiccation resistant. These taxa are often indicative of colder water and a "*candida* fauna" is often found in post-glacial sediments of small European water-bodies (Boomer 2002). The desiccation resistance of these taxa and parthenogenesis reproductive cycle of *Candona candida* make them suitable for pioneer colonisation of habitats.

3.22.40 The other remains within this sample at 1.65 to 1.63m OD, particularly the molluscs *Bithynia* (including opercula) and *Theodoxius fluviatalis* would confirm a freshwater depositional environment at this level. These molluscs and *Lymnaea* sp. were recovered from the sample at 1.91 to 1.89m OD and although no ostracods were recovered from this sample (possibly due to a reducing depositional environment) it would also seem to be a freshwater environment. It is also possible that that ostracods were not recovered from the samples at 1.23 to 1.21m OD and 1.49 to 1.47m OD due to a reducing environment.

Molluscs

INTRODUCTION

3.22.41 Nine samples were selected for molluscan analysis from the deposits at Trench 71. The results are shown tabulated in Table 111 and plotted as a histogram in Figure 40. The assemblages were dominated by fresh water species throughout the sequence. No brackish water or marine shells were recovered.

Table 111: Mollusc Assemblages from Trench 71

Sample	**<12>**	**<11>**	**<10>**	**<9>**	**<8>**	**<7>**	**<5>**	**<4>**	**<3>**
Context	**(20)**	**(20)**	**(19)**	**(18)**	**(17)**	**(16)**	**(15)**	**(15)**	**(15)**
Depth top (m OD)	**1.15**	**1.4**	**1.7**	**1.8**	**2.09**	**2.41**	**2.54**	**2.73**	**2.92**
Depth bottom (m OD)	**0.89**	**1.15**	**1.56**	**1.7**	**1.8**	**2.09**	**2.41**	**2.54**	**2.73**
Sediment Type	**peat**		**alluvial sand**	**humic clay**		**overbank? alluvium**	**alluvium**		
Period	**Mesolithic**		**Prehistoric**		**Iron Age**	**?IA/ RB**	**medieval**		
Land snails									
Carychium minimum	-	-	3	-	-	-	-	4	1
Carychium tridentatum	-	-	2	-	-	-	-	2	1
Succinea/ Oxyloma spp.	-	1	11	-	8	-	1	13	3
Cochlicopa lubrica	-	-	2	-	-	-	-	-	3
Cochlicopa spp.	-	-	4	-	-	-	-	-	1
Vertigo cf. *antivertigo*	-	-	2	-	-	-	-	-	-
Vertigo pygmaea	-	-	2	-	-	-	-	3	12
Vertigo spp.	-	-	2	1	-	-	-	2	5
Vallonia costata	-	-	12	-	-	-	-	6	15
Vallonia excentrica/ pulchella	-	-	49	1	1	-	1	39	212
Aegopinella nitidula	-	-	1	-	-	-	-	-	-
Limicidae	-	-	12	5	1	3	1	9	12
Trichia hispida	1	1	8	1	-	-	1	6	25
Cepaea sp.	-	-	-	-	9	-	-		1
Burrowing snails									
Cecilioides acicula	-	-	-	1	-	-	-	1	-
Fresh and Brackish Water Snails									
Theodoxus fluviatilis	+	1	39	-	-	-	-	-	-
Valvata cristata	1	3	320	14	116	18	1	30	4
Valvata piscinalis	-	6	913	10	17	17	-	-	1
Bithynia tentaculata	2	1	180	5	69	9	1	8	3
Bithynia spp.	-	1	169	23	113	44	-	11	-
Bithynia opercula	3	-	1714	818	1049	632	-	24	5
Lymnaea truncatula	-	-	23	2	5	3	-	48	23
Lymnaea palustris	-	-	76	-	4	-	-	-	-
Lymnaea peregra	-	1	20	2	1	1	-	6	4
Lymnaea spp.	-	-	41	2	50	6	2	90	46
Planorbis planorbis	-	2	181	4	33	8	-	16	-
Planorbis carinatus	-	-	7	-	-	-	-	-	-
Anisus leucostoma	-	4	117	13	137	27	30	1033	208
Bathyomphalus contortus	-	-	-	-	1	1	-	1	-
Gyraulus albus	-	-	227	1	17	-	-	-	1
Gyraulus crista	-	-	38	2	14	2	-	-	-
Hippeutis complanatus	-	-	2	-	-	-	-	-	-
Planorbarius corneus	-	-	-	-	4	-	-	-	-
Ancylus fluviatilis	-	-	147	2	-	-	-	-	-
Acroloxus lacustris	-	-	44	-	-	-	-	-	-
Pisidium amnicum	1	1	22	2	-	-	-	-	-
Pisidium spp.	-	3	367	2	4	4	-	2	1
?Unionidae frags	-	-	+	-	-	-	-	-	-

Sample	**<12>**	**<11>**	**<10>**	**<9>**	**<8>**	**<7>**	**<5>**	**<4>**	**<3>**
Context	**(20)**	**(20)**	**(19)**	**(18)**	**(17)**	**(16)**	**(15)**	**(15)**	**(15)**
Depth top (m OD)	**1.15**	**1.4**	**1.7**	**1.8**	**2.09**	**2.41**	**2.54**	**2.73**	**2.92**
Depth bottom (m OD)	**0.89**	**1.15**	**1.56**	**1.7**	**1.8**	**2.09**	**2.41**	**2.54**	**2.73**
Sediment Type	**peat**		**alluvial sand**	**humic clay**		**overbank? alluvium**	**alluvium**		
Period	**Mesolithic**		**Prehistoric**		**Iron Age**	**?IA/ RB**	**medieval**		
Taxa	4	10	27	15	17	12	8	16	18
Total	5	25	3043	92	604	144	38	1329	582
% Open country species	0	0	2.1	2.2	0.2	0	2.6	3.8	41.9
% Intermediate species	20	4	0.9	6.5	1.7	2.1	5.3	1.1	7.2
% Shade - loving species	0	0	0.2	0	0	0	0	0.5	0.3
% Unassigned species	0	4	0.4	0	1.3	0	2.6	1	0.5
% Amphibious species	0	16	4.6	16.3	23.5	20.8	79	81	39.7
% Intermediate species	0	4	11.9	5.4	6.1	3.5	0	0.5	0.9
% Ditch species	20	20	18.1	19.6	24.7	18.1	2.6	3.5	0.7
% Moving water species	60	40	48.3	45.7	33	48.6	2.6	1.4	0.7
% Unassigned species	0	12	13.5	4.4	9.6	6.9	5.3	6.9	8.1

Context (20), Samples <11> and <12>, peat

3.22.42 Shell numbers were low but increased through this deposit. The assemblage was dominated by the moving water species in particular *Valvata piscinalis*. These species favour large bodies of slowly flowing water with dense growths of aquatic plants, while, although *Theodoxus fluviatilis* can be found in both slow-flowing and fast-flowing rivers, Boycott suggests that it is characteristic of larger rivers, favouring rapidly moving water, and is indicative of a fully riverine environment (Boycott 1936, 141).

3.22.43 The other species present in significant percentages within the assemblage were *Valvata cristata* and *Anisus leucostoma*. *Valvata cristata* is found in all kinds of well-vegetated aquatic habitats while *Anisus leucostoma* is most typical of swampy pools and ditches, especially those drying up in the summer. These species may be exploiting the river edge habitats.

Context (19), Sample <10>, alluvial sand

3.22.44 Shell numbers were high with good species diversity. The moving water species again dominate this assemblage, in particular *Valvata piscinalis*. The *Pisidium* group contains valves of *Pisidium cf. amnicum*, a species favouring running water. The presence of *Ancylus fluviatilis*, a species which inhabits quick flowing water, as well as *Theodoxus fluviatilis*, together with the ratio of 4.9 opercula to one *Bithynia* apex, is indicative of material from a faster flowing riverine environment.

3.22.45 Shells of *Valvata cristata*, *Planorbis planorbis*, *Planorbis carinatus* and *Acroxulus lacustris* were recorded and indicate material from areas of slower flowing water with rich vegetation such as at the river edge. This habitat may also be exploited by *Gyraulus albus* and *crista* and *Hippeutis complanatus*.

3.22.46 There was also a fragment of probable Unionidae shell, river mussels, within the sample.

Context (18), Sample <9>, organic alluvium

3.22.47 Moderate numbers of shells were recovered from this context with a very high number of *Bithynia* operculum, a ratio of 29 opercula per apices. This may suggest a fast flowing channel with a greater element of allochthonous shells being deposited in slower flowing river edge environment. The assemblage is dominated by *Bithynia tentaculata, Valvata cristata* and *Anisus leucostoma*.

CONTEXT (17), SAMPLE <8>, ORGANIC ALLUVIUM

3.22.48 A high number of shells were recovered from this context. *Bithynia tentaculata, Valvata cristata* and *Anisus Leucostoma* dominate the assemblage. *Theodoxus fluviatilis* and *Ancylus fluviatilis* have disappeared from the assemblages at this point. A slower flowing water environment is indicated with a significant part of the assemblage exploiting the river edge habitats.

CONTEXT (16), SAMPLE <7>, ORGANIC ALLUVIUM

3.22.49 This assemblage is similar to the one recovered from context (17). There was an increase in *Valvata piscinalis* and *Bithynia tentaculata* with a corresponding decline in *Valvata cristata* and *Anisus leucostoma*. There was also a rise in the ratio of *Bithynia* operculum to apices. This assemblage is suggestive of a slight increase in the speed of the flow of water, while the exploitation of river edge habitats continued.

CONTEXT (15), SAMPLES <5>, <4> AND <3>, ALLUVIUM

3.22.50 The assemblages are dominated by the amphibious species *Anisus Leucostoma* and *Lymnaea truncatula,* with other fresh water species forming less than 10% of the assemblages. This is indicative of an open environment either with small areas of standing water or subjected to frequent flooding. *Anisus leucostoma* declines markedly towards the top of the sequence and this is mirrored by a significant increase in *Vallonia pulchella/ excentrica*, which is typical of meadows and damp pastures. The terrestrial species group also increase and this may reflect an open area drying out during the medieval period.

DISCUSSION

3.22.51 The mollusc assemblages obtained from samples <12> to <7> are all indicative of a permanently wet well vegetated channel edge environment with a significant flowing water element. It appears to have been slower flowing water during the Early Mesolithic period, becoming faster flowing during the later prehistoric period. Further slight fluctuations in the water speed within the channel occurred within the Middle Iron Age and possible Iron Age/ Romano-British periods, but it is likely to have been slower flowing than in the Prehistoric period.

3.22.52 There are similarities between these assemblages and those seen at Temple Mills Depot (Bates and Stafford in press) and at St Stephen's East (Wilkinson 2000). In all cases the assemblages were dominated by *Valvata piscinalis* and *Bithynia* spp. and reflect permanently flowing riverine environments. There is an indication of a major change in the local environment in the medieval period. By this time the channel edge appears to be stagnant and the molluscs reflect a local open environment with small areas of standing water or frequent flooding events. During the medieval period the area is likely to have become one of meadows or damp pastures. These assemblages have similarities with those studied from pasture and meadowland on the floodplain of the Upper Thames Basin (Robinson 1988). The snails appear to be more compatible with those in Robinson's assemblages from pasture sites rather than hay meadows. It is probable that the area of Trench 71 was one of lightly grazed pasture, with areas of standing water or seasonal flooding during the medieval period.

Insects

3.22.53 The insect taxa recovered are listed in Table 112. Samples that produced no insects are not included in these lists. The majority of the taxa present are beetles (Coleoptera) though the cases and head capsules of both cased and caseless caddis flies (Tricoptera) were seen in several samples.

Table 112: Insect assemblage from Trench 71, Samples <8> and <11>

Sample number	**<8>**	**<11>**
Context number	**(17)**	**(20)**
Depth (m OD)	**2.09-1.70**	**0.89-1.40**
Coleoptera		
Dytiscidae		
Hydroporus palustris (L.)	-	++
Hygrotus inaequalis (F.)	+	-
Hydraenidae		
Octhebius spp.	+	-
Hydrophilidae		
Cercyon spp.	+	-
Staphylinidae		
Oxytelus spp.	-	+
Stenus spp.	-	+
Scarabaeidae		
Aphodius spp.	-	+
Chrysomelidae		
Donacia spp.	+	-
Phyllotreta spp.	+	-
Curculionidae		
Apion spp.	+	+
Tanysphyrus lemnae (Payk.)	+	-
Notaris acridulus (L.)	+	+
Ceutorhynchus spp.	-	+
Gymnetron spp.	-	+
Degree of preservation	fragmented, eroded	fragmented, eroded
Comparative size of faunas	small	small
Water conditions	slow flowing suggested by Ochthebius and *Hygrotus*	*Hydroporus palustris* suggests slow flowing
Landscape	*Sitona*, and *Apion* may suggest rough ground or grassland. *Donacia* may indicate stands of water side vegetation. *Tanysphyrus lemnae* suggests duck weed. *Notaris* is often found upon *Glyceria maxima* (reed sweet-grass) and other *Glyceria* species (sweet-grasses).	*Sitona*, and *Apion* and Gymnetron may suggest rough ground or grassland. Gymnetron is often found upon *Plantago lanceolata* (plantain). *Aphodius* dung beetle may suggest grazing in area. *Notaris* is often found upon *Glyceria maxima* (reed sweet-grass) and other *Glyceria* species (sweet-grasses).
Overall potential of this location	poor	poor

+ = 1-2 individuals, ++ = 2-5 individuals, +++= 5-10 individuals

3.22.54 The insect faunas recovered were small, fragmented and poorly preserved. The fauna recovered, however, do contain a few species that suggest that the area contained slow flowing water and bankside vegetation, and grazing land. The faunas therefore have a limited role in terms of archaeological interpretation and should only be used to confirm and supplement the results from other proxy environmental data.

3.23 Trench 72 (PDZ5 WET 5.01)

Introduction

3.23.1 Trench 72 was located within the Wetlands area in the central north part of the site, immediately to the west of the modern River Lea, and within the line of the Palaeo-Lea as mapped by this project.

3.23.2 A series of four monoliths were taken through the west-facing section of the trench, along with a suite of 14 bulk samples taken in two blocks alongside the monoliths (Figure 41).

3.23.3 Existing radiocarbon dating evidence (from subsamples of humic sediment taken from the monolith samples) suggested that the sequence dated from Middle Neolithic at the base, 3340-3020 cal BC (SUERC-23167, 4465±30 BP), to Late Iron Age/ early Romano-British, 90 cal BC–cal AD 80 (SUERC-23168, 2000±30 BP).

3.23.4 There were problems with sample numbering from this trench, arising from an apparent error between the Evaluation fieldwork and reporting stages. This was highlighted when identified waterlogged plant material from three of the samples; <14>, <10> and <4>, were radiocarbon dated, and a reversal of the expected sequence was returned (i.e. newer dates from the lower samples, older from the upper ones). Whilst by no means impossible, this result raised concerns. In addition, plant macrofossil results also seemed to be inverted. To resolve the issue, the remaining bulk samples were opened and the sediments described geoarchaeologically and compared with the stratified secure material in the monolith samples.

3.23.5 It was determined that the sample numbering was most probably reversed: whilst listed in the evaluation report (Harris and Melikian 2009, Table 4, Figure 4, 59-60) as numbered in ascending order from top to bottom, by matching the samples with the monolith sediments it was shown that they ran in the opposite direction. This problem most probably arose through a simple misnumbering of a section drawing on site. This has now been resolved, and the sample numbers and locations shown in Figure 41 are now correct.

Sediments

3.23.6 Sediment descriptions and interpretations can be found in Table 113.

3.23.7 The described sequence shows basal gravels at 1.52m OD, which are overlain by yellowish brown sand deposits to 1.70m OD with plant remains and a thin peaty sandy clay lens. These most likely represent active channel deposits with entrained plant material, or possibly rooting, with a period of lower energy conditions depositing an organic mud. They have been dated to the Early to Middle Neolithic (see *Dating*).

3.23.8 Above the active channel deposits moderately organic sandy silt loams to 2.20m OD (decreasing in sand content upwards) represent alluvium laid down in shallow water with vegetation at the edge of an active channel. This was overlaid by a very humic almost peaty fine alluvium with horizontal laminae to 2.31m OD, above which the deposit becomes a very dark grey fibrous peat with possible *Phragmites* fragments, representing a well-vegetated damp channel edge environment. This peat has been dated to the Late Iron Age/ Romano-British period.

Table 113: Sediment descriptions for Monoliths <1> to <4>, Trench 72

Level (m OD)	Context	Sediment description	Interpretation
3.34 to 3.09	102	10YR 4/ 3 brown clay loam, moderately developed medium crumb structure, macropores. Clear boundary.	Base of soil horizon
3.09 to 2.61	102	10YR4/ 3 brown clay to silty clay, moderately developed medium to coarse blocky structure. Clear boundary.	Overbank alluvium
2.61 to 2.46	108?	10YR4/ 1 dark grey silty clay loam, wet and soft, breaks into fine angular blocky peds. Clear boundary	Alluvial 'mud' – rising water choking peat
2.46 to 2.31	103	10YR3/ 1 very dark grey peat, fine, slightly fibrous with horizontal laminae observed. Some recognisable plant remains inc. possible reeds. Clear to sharp boundary.	Peat
2.31 to 2.20	109	10YR4/ 2 dark greyish brown silty clay loam, very humic/ almost peaty, some horizontal laminae observed. Some recognisable plant remains, possibly roots.	Channel edge mud with lots of vegetation/ peat initiation
2.20 to 1.94	104	2.5Y4/ 1 dark grey sandy silt loam. Wet and soft with quite a few waterlogged roots/ rootlets and some possible reed fragments. Occasional very small stones. Clear boundary.	Shallow water alluvium with vegetation
1.94 to 1.81	104	10YR3/ 1 very dark grey sandy silt loam (considerably more sandy than above layer), very humic, common waterlogged roots or plant remains (mainly quite humified). Occ. very small stone. Clear to sharp boundary.	Shallow water alluvium
1.81 to 1.70		10YR4/ 1 grey silty clay loam, quite common waterlogged wood/ plant remains. Sharp boundary.	Organic mud
1.70 to 1.65	105	Yellowish brown loamy sand with quite common waterlogged plant or wood remains. Sharp boundary.	Inwash of sand (active channel deposit)
1.65 to 1.61	105	Very dark greyish brown peat or peaty clay, some sand. Sharp boundary	May be peat or very organic alluvium
1.61 to 1.52	105	Above 1.57m is sand as above (Yellowish brown loamy sand with quite common waterlogged plant or wood remains. Sharp boundary), 1.57-1.52m OD sandy silt loam with plant remains or roots. Boundary sharpish but obscured by large pebble.	Sandy inwash over channel edge mud
1.52 to 1.48	107	Gravels, rounded, 80mm to 10mm with waterlogged plant remains (probably roots)	Fluvial gravels

3.23.9 Rising water levels deposited alluvial mud which choked off the peat from 2.46m OD. At a later stage the area dried out to some extent, and an accretional floodplain soil was formed, with each years flooding events adding more fine silt and clay deposits to the sequence which was then incorporated into the soil. The base of the (relatively modern) soil horizon sealed by the overlaying Made Ground deposits is present from 3.09m OD upwards.

Dating

3.23.10 A total of eight radiocarbon dates have been obtained from the sequence, as shown in Table 114.

3.23.11 The results show that the sequence dates from the Early/ Middle Neolithic at the base, to the late Romano-British period at the top.

3.23.12 As discussed in the introduction above, it was identified upon biological and sedimentological grounds that the original recording of the positions of the bulk samples was inaccurate, and that the sequence was recorded inverted within the evaluation report (Harris and Melikian 2009). This has been resolved - however a number of small reversals have still been identified within the chronologies.

3.23.13 Three of the radiocarbon dates have been obtained from plant macrofossils extracted from bulk samples (SUERC-31368, SUERC-31369; SUERC-31370), whilst in two cases bulk sediment material for dating was obtained from the monoliths themselves (SUERC-23168 and SUERC-23167). Unfortunately no sign of the radiocarbon subsampling positions were left on the monoliths themselves. Although the contexts and positions of the bulk samples have been established, there may still be some uncertainly regarding absolute level of the sampled points, due to discrepancies between the monolith positions as drawn (of up to 0.12m), and their real-world relative positions determined by the matching up of distinct layers within overlapping monoliths themselves.

Table 114: Radiocarbon dates from Trench 72

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<14> (102)	2.59-2.54	Seeds: 2x *Ranunculus*; 4x *Schoenoplectus*, 2x *Carex*, 1x *Persicaria minor*	SUERC-31370	1900±30	-25.9	cal AD 20–220	1
<M3> (103)	2.46 – 2.44	Sediment (humic acid)	SUERC-23168	2000±30	-28.2	90 cal BC–cal AD 80	2
<10> (103)	2.39-2.34	Seeds: 24 x *Schoenoplectus* sp.	SUERC-31369	1755±30	-26.4	cal AD 170–390	1
<M2> (109)	2.20–2.21	Seeds: *Sambucus* sp., *Carex* flat, *Lycopus europaeus*, *Schoenoplectus* sp., 2 x *Carex* trig, *Juncus* sp.	SUERC-35339	1870±30	-25	cal AD 70–230	1
<M2> (104)	2.04-2.05	Charcoal: 1 x indet. roundwood	SUERC-35329	4100±30	-26.7	2870–2500 cal BC	2
<M1>	1.80–1.81	Seeds and waterlogged plant material: 4 x *Rubus* sp., *Sambucus nigra*, *Potamogeton coloratus*, largish Root/twig fragment	SUERC-35343	3395±30	-26.3	1760–1610 cal BC	1
<4> (105)	1.74-1.69	Seeds: 6 x *Sambucus*	SUERC-31368	4795±30	-27.5	3650–3520 cal BC	1
<M1> (105)	1.64 – 1.62	Sediment (humic acid)	SUERC-23167	4465±30	-27.3	3340–3020 cal BC	2

3.23.14 It is therefore quite possible that the apparent reversal between dates at levels 2.39-2.34 and 2.46-2.44m OD is due to discrepancies between methods used to calculate levels, rather than a disturbance in the sequence or introduction of intrusive material. The minor reversal between the two basal dates (SUERC-31368 and SUERC-23167) is almost certainly down to the source material; the younger, lower date is a bulk sediment sample, whilst the upper, older date is from identified seeds. A small proportion of later root material within the lower sample is the likely cause of this dating error. A reversal is also apparent in the centre of the sequence with a radiocarbon date of 1760-1610 cal BC (SUERC-35343, 3395±30 BP) was obtained from identified seeds at 1.80-1.81m OD with an overlying date of 2870-2500 cal BC (SUERC-35329, 4100±30 BP) from charcoal at 2.04-2.05m OD, again implying that an absolute chronology cannot be clearly identified, but implies Late Neolithic to Early/ Middle Bronze Age for this part of the sequence.

3.23.15 Even given the problems listed above, the resultant radiocarbon dates are still of use for interpreting the monolith (and pollen assemblage) as they provide a broad agreement between the monoliths and bulk samples and provide an understanding of the broad chronological timespan that this sequence covers - Early/ Middle Neolithic at the base to late Romano-British at the top.

3.23.16 To summarise, the radiocarbon dates suggest that the sequence covers two main phases of sedimentary deposition and hence vegetation history, that from the Early to possibly the Middle Bronze Age for contexts (106), (105), (104) and the late Iron Age to late Romano-British period for contexts (102), (108), (103) and (109).

Plant macrofossils

3.23.17 A total of 14 bulk samples were taken from the selected sequence in Trench 72. Eight of these were processed and examined for waterlogged material (Table 115).

3.23.18 The lowest sampled deposits contained very little material other than high numbers of twigs, roundwood and general branch material, with some leaf fragments. It should be noted that two large pieces of wood originally thought to be possibly worked were examined from context (104), sample <912>. The material was identified as alder (*Alnus glutinosa*) wood, but it could not be established if either was likely to have been worked (Austin in Harris and Melikian 2009). It is probable that much of this twig and branch material was also of alder. The only seeds present were those of elder (*Sambucus nigra*).

3.23.19 The low amount of waterlogged non-twig macrofossils reflects that the input of twig material far outnumbered anything else, probably as a result of water sorting of the material during deposition. It is however possible that much of this 'twig' material is in fact root, and the deposit was subjected to frequent post-depositional desiccation, which might also account for the lack of seed survival.

3.23.20 A possible charred grain, resembling free-threshing wheat (*Triticum* sp.) was also recovered, although it was too degraded for a positive identification to be made.

3.23.21 The upper samples were broadly similar to each other, although that from the base of this upper sequence, contexts (103/ 109), 2.29 to 2.24m OD had less material and more worm cocoons. Again seeds of elder (*Sambucus nigra*), were recovered, along with a single seed of bramble (*Rubus* sp.). A few seeds of aquatics, bulrush (*Typha* sp.) and water-plantain (*Alisma plantago-aquatica*), gametes of stonewort (*Chara* sp.) were also present along with those of celery-leaved buttercup (*Ranunculus sceleratus*).

3.23.22 The remaining samples, all dating to the Late Iron Age to Romano-British period, also had seeds of elder and occasional bramble (*Rubus* sp.), although these were less common towards the top of the sequence.

3.23.23 Again those of aquatics were generally well represented, horned pondweed (*Zannichellia palustris*), water-crowfoot (*Ranunculus* subg. *Batrachium*). arrowhead (*Sagittifolia sagittifolia*), branched bur-reed (*Sparganium erectum*), occasional stems of common reed (*Phragmites australis*), rigid hornwort (*Ceratophyllum demersum*), water-plantain (*Alisma plantago-aquatica*), pondweed (*Potamogeton* sp.), water-milfoil (*Myriophyllum* sp.), fool's watercress (*Apium nodiflorum*), yellow-water-lily (*Nuphar lutea*), along with gametes of stonewort (*Chara* sp.). Accompanying seeds of aquatics were those of marsh and wetland species such as sedges (*Carex* sp.), common club-rush (*Schoenoplectus lacustris*), mint (*Mentha* sp.), celery-leaved buttercup (*Ranunculus sceleratus*), rushes (*Juncus* sp.), spikerush (*Eleocharis* sp.), small water-pepper (*Persicaria minor*) and gypsywort (*Lycopus europaeus*).

3.23.24 Other than these seeds of elder and bramble, those of generally drier habitats were very poor and included just a few of common nettle (*Urtica dioica*), buttercup (*Ranunculus* sp.), dock (*Rumex* sp.), and woundwort (*Stachys* sp.). The samples also contained occasional worm cocoons.

3.23.25 Of some interest was a single glume base of emmer wheat (*Triticum dicoccum*) recovered from the uppermost sample from context (102), 2.59 to 2.54m OD. This same sample had a couple of charred fragments of sedge rootlets.

Table 115: Waterlogged plant macrofossils from Trench 72

Sample		**<14>**	**<13>**	**<12>**	**<10>**	**<8>**	**<6>**	**<4>**	**<2>**
Context		**(102)**	**(102)**	**(108)**	**(103)**	**(103/109)**	**(104)**	**(105)**	**(106)**
Level top (m OD)		**2.59**	**2.54**	**2.49**	**2.39**	**2.29**	**1.84**	**1.74**	**1.64**
Level bottom (m OD)		**2.54**	**2.49**	**2.44**	**2.34**	**2.24**	**1.79**	**1.69**	**1.59**
Chara (gametes)	stonewort	-	+	++	-	+	-	-	-
Nuphar lutea	yellow water-lily	-	-	-	1	-	-	-	-
Ceratophyllum demersum	rigid hornwort	1	-	-	-	-	-	-	-
Ranunculus subg. *Ranunculus*	buttercup	2	-	-	6	-	-	-	-
Ranunculus sceleratus	celery-leaved buttercup	-	-	-	6	+	-	-	-
Ranunculus subg. *Batrachium*	water-crowfoots	1	5	1	7	-	-	-	-
Urtica dioica	common nettle	-	-	-	6	-	-	-	-
Persicaria minor	small water-pepper	1	-	-	-	-	-	-	-
Rumex sp.	dock	-	1	1	-	-	-	-	-
Rubus sp.	bramble	-	1	-	5	1	-	-	-
Potentilla erecta/ reptans	cinquefoil	-	1	-	-	-	-	-	-
Myriophyllum sp.	water-milfoil	-	1	-	-	-	-	-	-
Oenanthe sp.	water-droplets	-	-	-	cf.1	-	-	-	-
Apium cf. nodiflorum	fool's watercress	-	1	-	2	-	-	-	-
Stachys sp.	woundwort	-	-	-	1	-	-	-	-
Clinopodium acinos	basil thyme	-	-	-	1	-	-	-	-
Lycopus europaeus	gypsywort	-	3	-	-	-	-	-	-
Mentha sp.	mint	-	1	++	46	+	-	-	-
Sambucus nigra	elder	-	1	3	15	11	-	5	20
Carduus/ Cirsium sp.	thistle	1	-	-	-	-	-	-	-
Sagittifolia sagittifolia	arrowhead	1	1	4	2	-	-	-	-
Alisma plantago-aquatica	water-plantain	-	-	+	6	+	-	-	-
Potamogeton sp.	pondweeds	-	-	-	3	-	-	-	-
Zannichellia palustris	horned pondweed	18	10	5	4	-	-	-	-
Juncus sp.	rush	-	-	-	1	-	-	-	-
Cyperaceae type basal culm	sedge rootlets	2ch	-	-	-	-	-	-	-
Eleocharis sp.	spike-rush	-	-	1	-	-	-	-	-
Schoenoplectus lacustris	common club-rush	8	15	3	27	-	-	-	-
Carex sp. (flat)	sedge (lenticular)	-	-	-	1	-	-	-	-
Carex sp. (trigonous)	sedge (trigonous)	6	2	8	26	-	-	-	-
Possible *Triticum aestivum*?	wheat grain?	-	-	-	-	-	-	cf.1	-
Triticum dicoccum (glume base)	emmer glume base	1ch.	-	-	-	-	-	-	-
Phragmites australis (stem)	common reed	-	+	+	-	-	-	-	-
Sparganium erectum (embryo)	branched bur-reed	9	2	2	3	-	-	-	-
Typha sp.	bulrushes	-	-	-	-	+	-	-	-
Leaf laminar abscission	leaf stem node	-	-	-	-		++	-	-
Leaf fragments	leaf fragments	-	-	-	-	+	-	-	-
Roundwood/stems	roundwood ?alder	-	-	-	-	-	++	+++	++
Charcoal		-	-	-	+	-	-	+	+
Worm cocoons		+	-	+	+	++	-	-	-

+C – denotes material that was preserved by charring. cf. compares with. f. - fragment Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more.

3.23.26 In summary, the lowest samples are in keeping with the high representation of alder (*Alnus glutinosa*) in the pollen sequence. This conforms with the high amount of alder seen on the floodplain of the Lea within the Neolithic. The discrepancy on the dates from the base of the sequence might be explained if alder roots are present in the peat that was dated from the base of the sequence. The date would then relate to overlying alder carr that had rooted down into this deposit in the Middle to Late Neolithic. This might explain the younger date occurring in the lowest sample. The older date on the elder seeds can generally though be associated with the original formation of the deposit, under alder carr with a high representation of woodland edge species such as elder. Elder seeds are remarkably resistant to decay and therefore can survive the drying out of the deposit.

3.23.27 There appears to be a truncation or hiatus before the material within the uppermost contexts ((109) to (102)) was laid down in the Romano-British period. The intermediate sample from the base of the upper sequence, 2.24-2.29m OD, (context (103/109)) had less material, and more worm cocoons, indicative of periods of drying either when the deposit was forming and/or shortly after.

3.23.28 There is a persistent scrub element within the samples from context (109) to (102). Otherwise, however, the main vegetation for the Late-Iron Age to Romano-British period appears to be one of wetland aquatics and marshland with less representation of the wet grasslands and disturbed habitats than seen in other samples of this date across the Olympic Park Site.

Pollen

3.23.29 Pollen analysis was carried out on twenty five samples from three overlapping monoliths in Trench 72: Monoliths <M1>, <M2>and <M3>. The pollen diagram (Figure 42) has been split into five local pollen assemblage zones (LPAZ), using the prefix Tr72- to identify each one – see Table 116 for zone descriptions.

3.23.30 The chronology of this sequence has been determined through the use of eight radiocarbon dates (Table 114) and suggests that the sequence covers the Early/ Middle Neolithic at the base to late Romano-British at the top. Although problems with sample numbering have been largely resolved (see *Introduction*), values for the exact level (absolute altitude rather than context) of these samples within the stratified sequence may still contain some minor errors, possibly up to ±0.12m.

3.23.31 LPAZ Tr72-1 is dominated by *Alnus glutinosa* (alder) with Poaceae (grasses) and Cyperaceae (sedges) also indicating a local wetland flora. High amounts of Pteropsida (monolete) indet. (fern spores) are also likely to be associated with the local damp woodland vegetation. There is also a high presence of woodland taxa present, including *Pinus sylvestris* (pine), *Ulmus* (elm), *Quercus* (oak), *Tilia cordata* (small leaved lime) and *Corylus avellana*-type implying their local presence. The values for *Pinus sylvestris* fall close to the 20% TLP threshold that Bennett (1984) implies is indicative of its local presence (due to its high pollen production and dispersal it can be over-represented in pollen diagrams). In contrast, *Tilia cordata* is present at 10% TLP and is known to often be under represented (insect pollinated), so is likely to be a more important component of the local woodland at this time.

3.23.32 There is a notable change in the pollen assemblage at the LPAZ Tr71-1/2 boundary signified by a reduction in *Pinus sylvestris*, with initial reductions in *Tilia cordata* also observed, and an expansion of *Plantago lanceolata* (ribwort plantain), *Glyceria*-type (sweet-grasses), *Hydrocharis morsus ranae* (frogbit), *Sparganium emersum*-type and *Pteridium aquilinum* (bracken). This also coincides with a stratigraphic change from organic muds to shallow water alluvium implying increased site wetness, with *Alnus glutinosa* also increasing in values at this level. It is possible that the local site processes (notably increase in *Alnus glutinosa*) is leading to the suppression of some percentages of some dryland pollen types.

3.23.33 However, there is a clear reduction in *Tilia cordata* values observed through LPAZ Tr72-2 with other woodland taxa including *Quercus* and *Corylus avellana*-type also reducing, as well as *Alnus glutinosa* at the top of the sequence. A radiocarbon date, obtained from charcoal at 2.04-2.05m OD, provide a date for the end of this zone as

2870-2500 cal BC (SUERC-35329, 4100±30 BP). However, given that a younger radiocarbon date of 1760-1610 cal BC (SUERC-35343, 3395±30 BP) was obtained beneath from identified seeds at 1.80-1.81m OD, the absolute chronology of this change cannot be clearly identified, but implies Late Neolithic to Early/ Middle Bronze Age.

3.23.34 Grant *et al.* (2011) have noted that this type of transition commonly occurs in many coastal and floodplain sites in lowland Britain (including changes in the same pollen taxa as recorded here) associated with a decline in *Tilia* values, though differentiating the processes occurring is always complex. Anthropogenic indicators are frequently accompanied by evidence for changing hydrological conditions and apparent increased site openness, and may be attributed to increases in open vegetation communities upon the floodplain itself suitable for grazing. Work by Waller and Grant (2012) in the Lower Thames found similar processes occurring and were able to demonstrate that these transitions were likely to be associated with wetland expansion and the transition from alder-dominated woodland to open fen environments.

3.23.35 Given Trench 72 is situated within the centre of a large channel area of the proto-River Lea, it is likely that changes in the course of the river during this time across this channel area helped lead to the change in the local wetland vegetation and subsequently the representation of these taxa within the pollen assemblage. The same pattern of change is identified in the neighbouring Trench 93 with comparable radiocarbon dates on the sequence.

3.23.36 A truncation of the pollen sequence is present in the sequence between LPAZ Tr74-2 and -3, though direct dating of the base of the later is not available. In keeping with other sequences from the site (see directly dated sequence from adjacent Trench 93), a truncation of the older sequence by younger Romano-British sediments is in keeping with the record of channel migration and increased alluvial deposition at this time. In LPAZ Tr72-3 at 2.06mOD a single pollen sample was found to be dominated by *Cannabis sativa* (hemp; 78% TLP). The pollen grains encountered were clearly identifiable as *Cannabis sativa* and not *Humulus lupulus* (hop) on the basis of their (protruding) pore structure and (larger) grain size (Whittington and Gordon 1987). Hemp was an important economic plant with a variety of purposes including textile and rope production. However, to obtain the useful bast fibres a process known as retting needed to take place first. Stems were often immersed in a stream or pond for a series of days to free their bast fibres from the surrounding tissue. This retting would have led to the shedding of large amounts of pollen within the water body. The high percentage of *C. sativa* pollen recorded is therefore a result of this form of process rather than a reflection of the abundance of *C. sativa* growing locally at the time.

3.23.37 No seeds of *Cannabis sativa* were found in the associated sediments, although this is not uncommon in records from other retting sites in the UK and Europe (eg. Schofield and Waller 2005; Edwards and Whittington 1990; Bradshaw *et al.* 1981). High pollen counts with few/ no seeds may be evidence that predominantly male (pollen producing) plants were used for fibre production rather than the female (seed producing) plants (Flemming and Clarke 1988), although differences in the timing of anthesis and cropping/ retting may explain some of the variations observed (Edwards and Whittington, 1992). In historic times male plants were often preferred for fibre production (cf. Rasmussen 2005).

3.23.38 Although *Cannabis sativa* is not regarded as being an important economic plant until the Anglo-Saxon period in the UK (eg. Godwin 1967a, b), seeds of *Cannabis sativa* have been found in a Roman well at Skeldergate, York (Hall *et al.* 1980) and New Fresh Wharf, London (Willcox 1977), though at the later site the author does note the deposit was disturbed in the Anglo-Saxon period. However, it is possible that seeds were being imported from continental Europe at this time where hemp production is known to have been taken place from at least the Iron Age (Bouby 2002).

3.23.39 The precise date of hemp retting in Trench 72 is uncertain, though with four overlying radiocarbon dates corresponding to the Romano-British period it is clear that the retting here cannot be later than this. A number of radiocarbon dated pollen sequences from the UK also show notable amounts of *Cannabis*-type pollen during the Roman period, most notably those from Thorpe Bulmer, County Durham (up to 19% total tree pollen; Bartley *et al.* 1976), Crose Mere, Shropshire (15% TLP; Beales 1980) and Rimsmoor, Dorset (2% TLP; Waton 1983), with several other sequences showing trace amounts (see Dark 2000). It is therefore most likely that hemp retting was occurring in this area during the early Romano-British period (or possibly earlier) and suggests that crops were being grown in the UK at this time also, rather than simply being imported from continental Europe.

3.23.40 LPAZ TR72-3 shows a very different pollen assemblage to that encountered in LPAZ Tr72-1/2, with open land taxa dominating, implying the presence of open floodplain conditions by the Romano-British period. Taxa such as *Glyceria*-type, Cyperaceae, *Sparganium emersum*-type and *Typha latifolia* indicate the local presence of wet ground, with much of the Poaceae also likely to originate from a similar environment. The persistence of taxa such as *Plantago lanceolata* and *Pteridium aquilinum* may imply persistence of grazing on the floodplain. The lower percentages of tree and shrub taxa in this zone, compared to those from the base of the sequence, is likely to be a reflection of the distance at which these taxa are now growing in the River Lea valley, positioned on the margins of the floodplain, and hence the pollen is less represented in the pollen record now, which is dominated by the localised open ground and wetland taxa. LPAZ Tr72-5 shows the expansion of Cyperaceae and reduction in Poaceae, implying a shift in the main local plants associated with the wetland sample site.

Table 116: Pollen zone descriptions for Trench 72, Monoliths <M1> to <M3>

Zone	Depth (m OD)	Description
Tr72-5	2.46 to 2.66	Dominated by Poaceae (25-34%) and Cyperaceae (37-50%). *Quercus* (3-6%), *Betula* (1-2%), *Alnus glutinosa* (2-3%), *Corylus avellana*-type (3-5%) and *Salix* (1%) are present throughout the zone. Dwarf shrub/herb taxa include *Ranunculus acris*-type (1%), Chenopodicaceae (1%), Brassicaceae (1%), *Filipendula* (0.5%), Apiaceae undiff. (2-6%), *Plantago lanceolata* (1%), Rubiaceae (1%), Lactuceae undiff. (1%), *Solidago virgaurea*-type (up to 1%) and *Glyceria*-type (1%). Aquatics include *Myriophyllum verticillatum* (up to 1% TLP + aquatics), *Sparganium emersum*-type (6-12% TLP + aquatics) and *Typha latifolia* (1-2% TLP + aquatics). *Polypodium* (1% TLP + pteridophytes), *Pteridium aquilinum* (2-4% TLP + pteridophytes) and Pteropsida (monolete) indet. (1-12% TLP + pteridophytes) are present throughout the zone. Pollen concentrations reduce from 11103 to 81554 grains cm^{-3}.
Tr72-4	2.08 to 2.46	Dominated by Poaceae (50-64%) and Cyperaceae (8-22%). *Pinus sylvestris* (2-3%), *Quercus* (3-5%), *Alnus glutinosa* (2-5%), *Corylus avellana*-type (1-6%) and *Salix* (1%) are present in low amounts throughout the zone. Dwarf shrub/herb taxa include *Ranunculus acris*-type (1-4%), Chenopodiaceae (1-2%), *Rumex sanguinea*-type (1%), *Filipendula* (1%), Apiaceae undiff. (up to 1-2%), *Plantago lanceolata* (1-4%), Lactuceae undiff. (1-2%), *Solidago virgaurea*-type (1%) and *Glyceria*-type (1-2%). *Myriophyllum verticillatum* (up to 1% TLP + aquatics), *Sparganium emersum*-type (3-10% TLP + aquatics), *Typha latifolia* (1-6% TLP + aquatics), *Polypodium* (up to 10% TLP + pteridophytes), *Pteridium aquilinum* (up to 1% TLP + pteridophytes) and Pteropsida (monolete) indet. (5-26% TLP + pteridophytes) are also present. Pollen concentrations reduce from 5484 to 66967 grains cm^{-3}.
Tr72-3	2.04 to 2.08	Dominated by *Cannabis sativa* (78%).*Quercus* (0.5%), *Betula* (1%), *Alnus glutinosa* (8%), *Tilia cordata* (0.5%) and *Corylus avellana*-type (1%) are also present. Dwarf shrub/herb taxa include Chenopodiaceae (1%), Apicaeae undiff. (0.5%), *Plantago lanceolata* (0.5%), Cyperaceae (1%) and Poaceae (7%). *Sparganium emersum*-type (3% TLP + aquatics), *Typha latifolia* (0.5% TLP + aquatics), *Polypodium* (2% TLP + pteridophytes), *Pteridium aquilinum* (3% TLP + pteridophytes) and Pteropsida (monolete) indet. (5% TLP + pteridophytes) are also present. Pollen concentration is 52579 grains cm^{-3}.
Tr72-2	1.835 to 2.04	Dominated by *Alnus glutinosa* (31-60%) and Poaceae (11-36%). *Pinus sylvestris* (2%), *Ulmus* (1%), *Quercus* (4-7%), *Tilia cordata* (1-4%), *Corylus avellana*-type (6-11%), *Salix* (1%), *Sorbus*-type (up to 1%) and *Hedera helix* (up to 1%) are also present. Dwarf shrub/herb taxa include *Ranunculus acris*-type (up to 1%), *Thalictrum* (up to 1%), Chenopodiaceae (1-4%), *Cerastium*-type (up to 0.5%), Brassicaceae (up to 1%), *Filipendula* (up to 0.5%), Apicaeae undiff. (1%), *Plantago lanceolata* (1-2%), Lactuceae undiff. (1%), *Solidago virgaurea*-type (up to 1%), Cyperaceae (2-13%) and *Glyceria*-type (up to 0.5%). *Nuphar* (up to 0.5%), *Hydrocharis morsus-ranae* (up to 29% TLP + aquatics), *Sparganium emersum*-type (4-8% TLP + aquatics), *Typha latifolia* (up to 0.5% TLP + aquatics), *Polypodium* (2-7% TLP + pteridophytes), *Pteridium aquilinum* (2-6% TLP + pteridophytes) and Pteropsida (monolete) indet. (12-20% TLP + pteridophytes) are also present. Pollen concentration range between 10287 and 72075 grains cm^{-3}.
Tr72-1	1.56 to 1.835	Dominated by *Alnus glutinosa* (10-46%) with *Quercus* (3-15%), *Tilia cordata* (2-8%), *Corylus avellana*-type (4-17%), Poaceae (13-31%) and Pteropsida (monolete) indet. (9-39% TLP + pteridophytes). *Pinus sylvestris* (2-18%), *Ulmus* (1%), *Betula* (up to 2%), *Salix* (up to 2%) and *Hedera helix* (1%) are also present. Dwarf shrub/herb taxa present include *Ranunculus acris*-type (up to 2%), Chenopodiaceae (up to 3%), Brassicaceae (1%), *Filipendula* (1%), Apiaceae undiff. (up to 1%), *Plantago lanceolata* (up to 1%), *Solidago virgaurea*-type (up to 1%) and Cyperaceae (3-13% TLP), with *Glyceria*-type (up to 1%) at the end of the zone. *Sparganium emersum*-type (1-4% TLP + aquatics), *Polypodium* (up to 9% TLP + pteridophytes) and *Pteridium aquilinum* (up to 2% TLP + pteridophytes) are also present. Pollen concentration range between 3079 and 35843 grains cm^{-3}.

Ostracods and Foraminifera

3.23.41 The contents of the samples are listed in Table 117 and summarised below. No ostracods or other remains of plants or animals were recovered from the 1.59m OD or 1.75m OD samples, though the latter did contain occasional charcoal, clinker and slag.

3.23.42 No ostracods were recovered from the 1.92m OD sample, though occasional broken molluscs, some unidentifiable plant remains and one radiate diatom were recorded. No ostracods were recovered from the 2.06m OD sample, but it did contain occasional charcoal, clinker and slag.

3.23.43 Given the lack of environmental remains within the samples, there is little that can be commented upon regarding the depositional environment. The sediments processed were however clearly waterlain and the presence of slag/ charcoal/ clinker within the samples at 1.75 and 2.06m OD is a likely indication of human activity in the area.

Table 117: Microfaunal and microfloral remains from Trench 72

Sample / monolith number	<M2>	<M2>	<M1>	<M1>
Depth (m OD)	**2.06**	**1.92**	**1.75**	**1.59**
Animal remains				
Broken molluscs		x		
Plant remains				
Charcoal	x		x	
Radiate diatom		x		
Unidentified plant remains		x		
Other				
Clinker	x		x	
?slag	x		x	

x – 1-9 specimens xx – 9-50 specimens xxx – greater than 50 specimens xxxx – greater than 100 specimens

3.24 Trench 75 (PDZ6 6.01)

Introduction

3.24.1 Trench 75 lay c. 40 m south of the site of the medieval Temple Mills, to the east of Temple Mills Stream. Below the modern ground surface at c. 12.5m OD there was up to 9m of made ground and post-1950 landfill deposits. Alluvium dated to between the Late Bronze Age and the medieval period was recorded in the trench, the earliest archaeological feature being the cut of a medieval water channel, possibly a precursor to Tumbling Bay Stream and therefore likely to be associated with the watermills. A line of paired timber piles indicate a probable post-medieval building foundation, and the excavation recovered evidence of buildings and associated industrial activity through the 18th and 19th centuries, some of these buildings, confirmed by map evidence. Structures included a mill with a furnace in one corner and timber-lined water channel for a possible water wheel. The front of a short terrace of six worker's cottages was exposed along the west side of the excavation. A sequence of deposits and revetments exposed a significant part of the history of Tumbling Bay Stream. One of the latest features on the site was a cobbled road surface built around the start of the 20th century, providing access to businesses to the south of the site.

Sediments

3.24.2 Monoliths <26> and <28> were derived from two facing sections through which a medieval channel was seen to cut (Figure 43). Earlier radiocarbon dating from the trench had suggested it was multi-phased but careful consideration of the deposits (the channel cut could be clearly identified in each section transecting it) and renewed dating it was clear that the sediments sequences were much simpler in phasing. Table 118 and Table 119 provide sediment descriptions for the sediments from monoliths <26> and <28> respectively.

Table 118: Sediment descriptions for Monolith <26>, Trench 75

Level (m OD)	Context	Sediment description	Interpretation
2.45 to 2..24	833/ 839	10YR4/ 2 dark grayish brown silty clay loam, some grit and with lenses/laminae of silty sand especially at the base of the unit. Top of the unit is fairly friable with occasional fine-medium gravel, CERAMIC BUILDING MATERIAL, whole gastropod & bivalves and shell fragments. Rare chalk fragments and occasional Mn/charcoal flecks. Boundary is clear and horizontal.	Alluvium
2.24 to 2.15	836	Pale yellowy brown SANDY GRAVEL, poorly consolidated, poorly sorted with medium-coarse sandy matrix. Gravel fine-very coarse (large pebbles) clasts of subangular to well rounded flint with occasional to moderate chalk fragments, shell fragments and occasional wood fragments. Very friable unit. Boundary is clear and horizontal.	Alluvium
2.15 to 1.95	838	10YR3/ 2 very dark grayish brown organic clay with moderate wood fragments and root material. On drying lamination is apparent throughout the layer.	Alluvium

Table 119: Sediment descriptions for Monolith <28>, Trench 75

Level (m OD)	Context	Sediment description	Interpretation
2.49 to 2.29	845	10YR4/ 2 dark grayish brown to 3/ 2 greyish brown clay loam with rare CERAMIC BUILDING MATERIAL and shell fragments. Exhibits sand lenses/lamina throughout indicating changes in flow rate. Occasional Mn speckling throughout, large wood fragment at base of unit. Boundary between units is clear and horizontal.	Alluvium
2.29 to 2.20	827	10YR4/ 2 greyish brown silty clay loam with occasional Mn specking and sand lenses probably the base of the unit above and thus marks a transitional phase. Rare wood fragments. Boundary between units is clear and horizontal.	Alluvium
2.20 to 1.99	830	10YR5/ 4 yellowish brown silt loam (with quite a bit of fine sand) with frequent roots with Fe weathering, occasional large gravel and Mn patches. Laminated throughout with siltier and sandier laminae from 0.5mm up to 30mm thick	Alluvium

Dating

3.24.3 Fourteen Radiocarbon dates were obtained from Trench 75 (Table 120). Several of the earlier radiocarbon dates, obtained from bulk sediment dating, were rejected as they were found to originate from the medieval channel fills which subsequent dating of identified plant macrofossil confirmed, along with the presence of medieval pottery within these same fills.

Table 120: Radiocarbon dates from Trench 75

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<Auger> (939)	1.41	Sediment (acid wash)	Beta-257993	3880±40	-27.3	2480–2200 cal BC	3
<30> (837)	1.6	Sediment (acid wash)	Beta-257994	3840±40	-27.5	2470–2150 cal BC	3
<30> (837)	1.9	Sediment (acid wash)	Beta-257995	3850±40	-27.8	2470–2200 cal BC	3
<30> (822)	2.32	Sediment (acid wash)	Beta-257996	910±40	-27.8	cal AD 1030–1220	2
<26> (838)	1.95	Sediment (acid wash)	Beta-257997	1330±40	-27.1	cal AD 640–780	3
<26> (833/839)	2.45	Sediment (acid wash)	Beta-257998	1400±40	-26.9	cal AD 570–680	3
<28> (830)	2	Sediment (acid wash)	Beta-257999	11080±60	-25.7	11180–10780 cal BC	2
<28> (830)	2.21	Sediment (acid wash)	Beta-258000	2540±40	-27.7	810–530 cal BC	3
<28> (845)	2.49	Sediment (acid wash)	Beta-258001	1710±40	-27.2	cal AD 240–420	3
<2> (281)	3.53	Sediment (acid wash)	Beta-258002	2030±40	-25.5	170 cal BC–cal AD 60	3
<3> (270)	3.04	Sediment (acid wash)	Beta-258003	1240±40	-26.7	cal AD 680–890	3
<36> (845)	-	Plant material: *Prunus domestica* stone	SUERC-36284	420±30	-25.2	cal AD 1420–1620	1
<37> (833)	-	Seeds: 7x *Salix* buds, 5x *Ranunculus* sp, 1x *Solanum,* 2x *Cirsium,* 1x *Oenanthe, Rumex aquatilis* +4 *Rumex* sp.+ 2x *Carex* sp.	SUERC-36285	425±30	-27.3	cal AD 1420–1620	1
<27> (842)	-	Plant material: 4x *Alnus glutinosa* cones/ female catkins	SUERC-36286	3360±35	-27.6	1750–1530 cal BC	1

Plant macrofossils

3.24.4 Six samples covering three phases of sediment accumulation were represented upon this site (see Table 121). The samples from (842) and (837) came from early channel deposits that while initially dated to the Late Neolithic, dates on alder cones indicated a more reliable Early to Middle Bronze Age date for these deposits 1750-1530 cal BC

(SUERC-36286, 3360±35 BP). Three further contexts were examined from the fills of a channel clearly exposed in section. Initial dates on bulk sediments had been regarded as problematic as they indicated a range of Late Iron Age to Saxon dates for the channel. Two dates obtained on plant macrofossils were obtained which proved to be in close agreement and dated the channel fills to the 15th to 17th century cal AD 1420-1620 (SUERC-36284, 420±30 BP; SUERC-36285, 425±30 BP). The final deposit came from a 19th century fill of a barrel 182 (181).

3.24.5 The Early to Middle Bronze Age samples were generally broadly similar to those of a similar date seen from other parts of the site, for example Trench 93 and Trench 118 to the south. The remains included frequent fruits and occasional cones of alder (*Alnus glutinosa*), which along with seeds of elder (*Sambucus nigra*), indicate that wet wooded scrub persisted on site. However, plants of more open conditions, including dock (*Rumex* sp.), thistles (*Carduus/ Cirsium* sp.), common nettle (*Urtica dioica*) and mint (*Mentha* sp.) and those of wetlands at the channel edge, such as branched bur-reed (*Sparganium erectum*), show that such woodland was not necessarily dominant at this location during the Early to Middle Bronze Age. Remains of yellow water-lily (*Nuphar lutea*), stonewort (*Chara* sp.) and pondweed (*Potamogeton* sp.) all indicate a vegetated, slow moving channel.

3.24.6 These Early to Middle Bronze Age deposits were truncated by a 15th to 16th channel. The deposits from this channel included a mixture of locally growing plants and other seeds probably derived from cess material entering the channel. The latter included plum stones (*Prunus domestica*), fig (*Ficus carica*), grape (*Vitis vinifera*), bramble (*Rubus* sp.), probable strawberry (*Fragaria vesca*) and also black mustard (*Brassica nigra*). The latter could be growing wild but equally was used in the medieval and later periods as a means of preserving meat and/ or disguising that which had gone bad. Probably not associated with cess, but possibly with brewing and hence human activity, were finds of probable hop (*Humulus lupulus*) seeds.

3.24.7 In terms of the local environment, willow catkins (*Salix* sp.) were relatively common, although given the later period these might also be of poplar (*Populus* sp.). Along with winter-cress (*Barbarea vulgaris*), these might indicate semi-shaded scrubland or possibly even osiers lining parts of the channel. However, the frequent finds of species more associated with wasteland and rough grassland, eg. buttercup (*Ranunculus* sp.), common nettle (*Urtica dioica*), orache (*Atriplex* sp.), dock (*Rumex* sp.), thistles and dandelion (*Taraxacum* sp.), all point to more open areas associated probably with cattle grazing and a generally managed landscape.

3.24.8 The deposit from the 18th century barrel 182 (181) had very little identifiable waterlogged material other than seeds of elder (*Sambucus nigra*), orache (*Atriplex* sp.) and more unusually sun spurge (*Euphorbia helioscopia*). The latter is a common plant of cultivated ground and wasteland, and while it is often regarded as a native it is rarely found archaeologically and this is the only record of it from the Olympic Park investigations, which quite possibly suggests that rather it is a late medieval/ post-medieval introduction. Together these indicate little about the use or function of the barrel and are probably derived from local hedges and settlement weeds.

Table 121: Waterlogged plant macrofossils from Trench 75

Sample		<1>	<37>	<36>	<40>	<24>	<27>
Context		(181)	(833)	(845)	(838)	(837)	(842)
Period		18th Century	15th-16th Century			Early/Middle Bronze Age	
Sample Size (litres)		9	10	5	10	9	10
Chara (gametes)	stonewort	-	-	-	-	-	+
Nuphar lutea	yellow water-lily	-	-	-	-	+	+
Ceratophyllum demersum	rigid hornwort	-	-	-	+	-	-
Ranunculus acris/ repens	meadow/ creeping buttercup	-	3	6	+	-	-
Ranunculus sceleratus	celery-leaved buttercup	-	1	-	+	-	-
Ranunculus subg. *Batrachium*	water-crowfoots	-	1	-	-	-	-
Humulus lupulus	hop	-	-	cf.2	-	-	-
Ficus carica	fig	-	3	6	-	-	-
Urtica dioica	common nettle	-	16	-	+	-	2
Alnus glutinosa (fruits)	alder fruits	-	-	-	-	++	++
Alnus glutinosa (female catkins/ cones)	female catkins/ cones	-	-	-	-	-	+
Chenopodium rubrum	red goosefoot	-	-	-	5	-	-
Atriplex sp.	orache	++	18	-	+	-	-
Atriplex (probably prostrata/ littoralis)	orache	-	1	-	-	-	-
Stellaria media/ nemorum	common/ wood stitchwort	-	5	-	+	-	-
Silene sp.	campions	-	-	-	-	-	+
Silene gallica	campions	-	1	-	-	-	-
Persicaria maculosa/lapathifolium	redshank/ pale persicaria	-	-	1	+	-	-
Persicaria hydropiper	water-pepper	-	1	-	-	-	-
Persicaria mitis	tasteless water-pepper	-	3	1	+	-	-
Polygonum aviculare	knotgrass	-	1	1	-	-	-
Rumex sp.	dock	-	3	5	-	++	++
Salix catkin bud scale	willow bud scale	-	2	2	+	-	-
Barbarea vulgaris	Winter-cress	-	3	4	+	-	-
Brassica cf. *nigra*	black mustard	-	2	9	-	-	-
Rubus sp.	bramble	-	1	9	+	-	-
Potentilla anserina	silverweed	-	-	1	-	-	-
Potentilla/ Fragaria sp.	cinquefoil/ strawberry	-	20	33	-	-	-
Prunus domestica	wild/ cultivated plum	-	-	1	-	-	-
Prunus spinosa/ Crataegus monogyna (thorns)	hawthorn/ slow thorns	-	1	-	-	-	-
Crataegus monogyna (fruit stones)	hawthorn berries	-	-	1	-	-	-
Euphorbia helioscopia	sun-spurge	++	-	-	-	-	-
Vitis vinifera	grape-vine	-	-	2	-	-	-
Apium graveolens	wild celery	-	2	1	-	-	-
Pastinaca sativa	parsley	-	-	2	-	-	-
Solanum nigrum	black nightshade	-	-	-	+	-	-
Stachys cf. *arvensis*	hedge woundwort	-	-	-	-	-	+
Mentha sp.	mint	-	1	-	+	-	+
Sambucus nigra	elder	+++	-	-	+	-	+
Carduus/ Cirsium sp.	thistle	-	1	-	-	+	-
Leontodon sp.	hawkbit	-	2	-	+	-	-
Sonchus asper type	prickly sow-thistle	-	4	-	-	-	-
Sonchus arvensis/ oleraceus type	sow-thistle	-	1	2	-	+	-
Taraxacum sp.	dandelion	-	-	2	-	-	-
Alisma plantago-aquatica	water-plantain	-	1	-	+	-	-

Sample		<1>	<37>	<36>	<40>	<24>	<27>
Context		(181)	(833)	(845)	(838)	(837)	(842)
Period		18th Century	15th-16th Century			Early/Middle Bronze Age	
Sample Size (litres)		9	10	5	10	9	10
Potamogeton sp.	pondweeds	-	-	+	-	+	-
Schoenoplectus sp.	club rushes	-	7	-	-	-	-
Carex sp. (trigonous)	sedge (trigonous)	-	-	-	+	-	-
Sparganium erectum (fruit/ achene)	branched bur-reed	-	-	1	-	+	-
Sparganium erectum (inner seed/ embryo)	branched bur-reed	-	6	9	-	+	+
Leaf frgs		-	-	-	-	-	+
Bud indet.		-	-	3	+	-	-

Pollen

3.24.9 Four pollen samples were taken from monolith <28>, shown in Figure 26. The pollen assemblage is dominated by Poaceae (40-52%) and Cyperaceae (8-26%). Tree and shrub taxa, albeit at low abundance (maximum 21% TLP), are dominated by *Quercus* (4-10%) with *Betula* (up to 2%), *Alnus glutinosa* (up to 2%), *Corylus avellana*-type (1-5%) and *Salix* (up to 2%). Dwarf shrub and herb taxa include *Humulus lupulus* (up to 0.5%), *Ranunculus acris*-type (up to 4%), Chenopodiaceae (up to 6%), *Polygonum* (up to 1%), *Rumex acetosella* (up to 1%), *Rumex sanguineus*-type (up to 1%), Brassicaceae (up to 1-7%), Apiaceae undiff. (1-4%), *Plantago lanceolata* (up to 2-4%), *Centaurea cyanus* (up to 2%), *Centaurea nigra* (up to 2%), Lactuceae undiff. (2-4%), *Solidago virgaurea*-type (1-3%) and *Cerealia*-type (up to 2%). Aquatic taxa include *Potamogeton natans*-type (1-2% TLP + aquatics) and *Sparganium emersum*-type (1-5% TLP + aquatics). *Polypodium* (up to 2% TLP + pteridophytes), *Pteridium aquilinum* (up to 1-2% TLP + pteridophytes) and Pteropsida (monolete.) indet. (up to 1-4% TLP + pteridophytes) were also present. Pollen concentrations range between 25096 and 85037grains cm^{-3}.

3.24.10 The pollen assemblage from this sequence can be interpreted as indicating a largely open environment, although with some patches of woodland/ trees. Open ground taxa dominate, notably Poaceae and Cyperaceae, possibly implying some local damp grassland, with taxa such as *Glyceria*-type also present. The presence of *Potamogeton natans*-type and *Sparganium emersum*-type may suggest some local standing water. Damp local conditions are also suggested by the presence of *Caltha*-type and *Calystegia*. The presence of *Polygounum*, *Centaurea cyanus* and *Cerealia*-type may indicate local arable activity, while taxa such as *Rumex acetosella*, *Plantago lanceolata* and *Pteridium aquilinum* indicate local disturbance, possibly associated with pastoral activities. Two pollen grains of Cannabaceae were recorded in fill 829 (originally 827). The grains were poorly preserved and although they appeared large in size, the pore protrusion was very slight suggesting that they were from derived from *Humulus lupulus* (hop) rather than *Cannabis sativa* (hemp) (Edwards and Whittington 1990), especially when compared to the *Cannabis sativa* pollen hemp found in Trench 72.

Ostracods and Foraminifera

3.24.11 Seven samples, four from monolith series <28> and three from monolith series <26>, have been looked at and results given in Table 122.

MONOLITH SERIES <28>

3.24.12 Ostracods were generally sparse and recovered from 3 of the 4 samples (at 2.27, 2.34 and 2.46m OD).

3.24.13 At 2.08m OD no ostracods were recovered although plant remains and charcoal were noted within the sample.

3.24.14 At 2.27m OD ostracods were sparse with one identified valve of *Candona neglecta* recorded. Within this sample plant remains were common (including *Salix* sp., *Soncus asper* and *Ranunculus* sp.). Also recorded were very numerous fish bones.

3.24.15 At 2.34m OD ostracods were again sparse with one specimen of *Ilyocypris bradyi* recorded. Plants remains recorded included *Carex* sp., *Urtica* sp., *Prunella vulgaris*, *Juncus* sp., *Chara patrechium* and *Potomageton* sp.. Molluscs were also recorded within the sample (including occasional opercula of *Bithynia* and one specimen of *Valvata* sp.). Within this sample significant amounts of blue glass and cladoceran egg cases were also recovered.

3.24.16 At 2.46m OD, *Candona neglecta*, *Candona* sp. and *Ilyocypris* sp. Other remains included molluscs and some blue glass.

MONOLITH SERIES <26>

3.24.17 At 2.03m OD a singular valve of the ostracod *Cyclocypris ovum* was recovered. Other material recorded within this sample included molluscan remains (including the opercula of *Bithynia*) cladoceran egg cases, a worm coccoon and plant remains, including *Ranunculus* sp., *Toralis avensis*, *Sagittofolia sagittofolia* and *Urtica* sp..

3.24.18 At 2.14m OD no ostracods were recovered, although molluscan remains (opercula of *Bithynia*, Planorbids, *Pisidium* sp. and *Theodoxus fluviatilis*), plants and a small piece of possible fish bone were recovered.

3.24.19 At 2.30m OD a few ostracods were recovered including *Limnocythere inopinata.* Plant remains, cladoceran egg cases and molluscs (including *Bithynia* sp.) were also recovered from this sample.

DISCUSSION

3.24.20 Ostracods within the samples were either absent or very low in abundance and insufficient to make any firm environmental interpretation of the depositional environment from the ostracods alone. It is also noted that no united carapaces or assembalges consisting of the instar and adult growth stages of taxa, were recorded. It is likely therefore that some redeposition of ostracod valves has occurred in these samples.

3.24.21 Within monolith series <28> the samples all contain remains indicative of freshwater environments. The ostracods from the three lower samples, including *Candona neglecta* and *Ilyocypris bradyi,* confirm with the other remains deposition within a fluviatile environment.

3.24.22 Within monolith series <26> similar singular occurrences of freshwater ostracods (*Cyclocypris ovum* and *Limnocythere inopinata*), when viewed in association with the other remains recorded such as the opercula of *Bithynia*, are indicative of deposition within a fluvial environment.

Table 122: Microfaunal content of ostracod/ foraminifera samples from Trench 75

Monolith	<26>	<26>	<26>	<28>	<28>	<28>	<28>
Depth (mOD)	2.03	2.14	2.30	2.08	2.27	2.34	2.46
Ostracoda							
Candona neglecta					o		o
Candona spp.							x
Cyclocypris ovum	o						
Ilyocypris bradyi						o	
Ilyocypris sp.							o
Limnocythere inopinata			o				
Broken/ unid			x		x		
Other remains							
Molluscs		xx	xx				xx
Ancylus fluviatilis							
Bithynia opercula	x	xx	x		xx	x	x
Bithynia apices			o				
Pisidium spp.		x					
Planorbids		x				x	x
Theodoxus fluviatilis		xx					o
Valvata spp.						o	
Cladoceran egg case	xx		x		x	xx	xx
Fish bone		x			xxxx		
Worm coccoon	x						
Plant remains	xxx	xx	xxx	xx	xx	xx	xxx
Charcoal			xx	x		x	xx
Carex						x	
Juncus sp.						x	
Potomageton sp.						o	
Ranunculus sp.	x				o		
Salix bud scale					o		
Sagittofolia sagittofolia	x						
Seeds					x	x	xx
Soncus asper					o		
Toralis sp.	x						
Urtica sp.	x					x	
Fossil foraminifera				o			
Blue glass			xx		o	xx	xx

o = 1 speciment; x = 2 to 9 specimens; xx = 10 to 50 specimens; xxx = over 50 specimens

Molluscs

3.24.23 A series of nine larger samples and four sub-samples from monolith <28> were selected for molluscan analysis from Trench 75. These were derived from deposits of Late Upper Palaeolithic to Late 16th/ Early 17th – Late 17th/ Early 18th century in date. Results are shown in Table 123 and illustrated as histograms in Figure 45.

RESULTS

3.24.24 Almost all of the assemblages were dominated by fresh water species with no brackish water species recovered.

TRENCH 3 – SOUTH FACING SECTION

CONTEXT (830), MONOLITH <28>, 2.04 MOD AND MONOLITH <28>, 2.13M OD, YELLOWISH BROWN SILT LOAM, UPPER PALAEOLITHIC

3.24.25 No snails were recovered from these samples.

CONTEXT (845), MONOLITH <28>, 2.32M OD, DARK GREYISH BROWN TO GREYISH BROWN CLAY LOAM, 15TH-16TH CENTURY AD

3.24.26 The very few shells recovered from this deposit were those of fresh water species.

CONTEXT (845), MONOLITH <28>, 2.43M OD, DARK GREYISH BROWN TO GREYISH BROWN CLAY LOAM, 15TH-16TH CENTURY AD

3.24.27 The moving-water and ditch loving species dominated the small mollusc assemblage recorded from this deposit.

CONTEXT (845), SAMPLE <36>, DARK GREYISH BROWN TO GREYISH BROWN CLAY LOAM, 15TH-16TH CENTURY AD

3.24.28 The large mollusc assemblage from this deposit was dominated by moving water species, which represented 61% of the assemblage. This group mainly comprised *Valvata piscinalis*, which formed 43% of the shells recovered. This species is typical of well oxygenated slow to still waters, while preferring muddy substrates. The presence of *Theodoxus fluviatilis*, albeit in low numbers, is indicative of a faster flowing water element and a fully riverine environment (Boycott 1936, 141). The moderately high ratio of *Bithynia* operculum to apices, 3.7 opercula to every apex, may show the transport of material also from a fairly fast flowing water environment. A small proportion of the molluscs appear to be species which would exploit the marshy river edge and possibly areas of damp grassland in the vicinity. The mollusc assemblage seems to point to a channel with well oxygenated slowly flowing water with areas of marsh and damp grassland in the vicinity.

TRENCH 3 – NORTH FACING SECTION

CONTEXT (842), SAMPLE <27>, COARSE SAND, EARLY/ MIDDLE BRONZE AGE

3.24.29 A high number of shells were recorded from this deposit, with the majority being those of fresh water species. The moving water group, dominated by *Valvata piscinalis* and *Bithynia*, formed 73% of the assemblage. There was a significant presence of *Theodoxus fluviatilis*. This combination of species may indicate a large body of flowing water with dense growths of aquatic plants. The ditch group, mainly represented by *Valvata cristata*, comprised 18% of the assemblage. *Valvata cristata* is found in all kinds of well-vegetated aquatic habitats. The assemblage appears to be indicative of a well oxygenated well vegetated slowing flowing channel environment with a small indication of possible marshy and damp grassland areas on the channel edge.

CONTEXT (838), SAMPLE <40>, VERY DARK GREYISH BROWN ORGANIC CLAY, 15TH-16TH CENTURY

3.24.30 The small assemblage from this deposit predominantly comprised fresh water species. There was also a very high ratio of *Bithynia* opercula to apices.

CONTEXT (836), SAMPLE <39>, CUT 843, PALE YELLOWY BROWN SANDY GRAVEL, 15TH-16TH CENTURY

3.24.31 This deposit produced a moderate size mollusc assemblage. Although the moving water group was still dominant, again mainly represented by *Valvata piscinalis* and *Bithynia*, it had declined slightly to 65% of the assemblage. There was a small rise in the amphibious species group, as shown by *Anisus leucostoma*, 'a species most typical of swampy pools and ditches, especially those subject to seasonal desiccation' (Kerney 1999, 60), and in Limacidae and *Trichia hispida*, intermediate species. The assemblage composition would appear to be indicative of a well oxygenated well vegetated slowing flowing channel edge environment with areas of marsh and damp grassland in the vicinity.

CONTEXT (839), SAMPLE <38>, CUT 843, DARK GREYISH BROWN SILT CLAY LOAM, 15TH-16TH CENTURY

3.24.32 A similar level of moving water species was observed in the moderate assemblage from this deposit, although there was a marked increase in the numbers of *Valvata* *piscinalis* and corresponding decrease in *Bithynia*. There was also a rise in the percentage of the ditch loving species and in the intermediate fresh water species, particularly in *Gyraulus albus*, a species 'found in most kinds of aquatic habitats apart from those subject to seasonal desiccation' (Kerney 1999, 66). There are fewer molluscs present which would need to exploit the channel edge environments. The likely nature of the aquatic environment reflected by this assemblage is one of well oxygenated more slowly flowing water within the channel. There is only a small indication of possible marsh and damp grassland nearby.

CONTEXT (833), SAMPLE <37>, CUT 843, DARK GREYISH BROWN SILT CLAY LOAM, 15TH-16TH CENTURY

3.24.33 The moderate assemblage recovered from this deposit is similar to that observed in context (839). The land snail element has declined to only 3% from a high 12% in context (836). Again the assemblage may be reflective of very slowly flowing well oxygenated water within the channel.

TRENCH 4 – NORTH FACING

CONTEXT (1008), SAMPLE <53>, PEATY SAND, POSSIBLE MEDIEVAL

3.24.34 A mixed environment was reflected by the moderately sized mollusc assemblage recorded from this deposit. The moving water species and the ditch loving group represented 57% and 32% of the assemblage respectively, with *Valvata piscinalis*, *Bithynia* and *Valvata cristata* being the predominant species. These would be reflective of a well oxygenated, well vegetated, slowing flowing aquatic environment. The occurrence of *Ancylus fluviatilis* in significant numbers (8.6% of the assemblage) is noteworthy. It is a moving water species which 'inhabits clean, quicker flowing water, adhering to stones' (Kerney 1999, 72). The ratio of *Bithynia* opercula to apices is very high, at 31 opercula to every apex. The small land snail component present was mainly comprised of shells of *Trichia hispida*. This assemblage may be indicative of a well oxygenated, well vegetated, slow moving channel edge environment with areas of faster flowing cleaner water nearby. The immediate surrounding area appears to be one of long grassland.

TRENCH 4 – WEST FACING

CONTEXT (950), SAMPLE <41>, FILL OF DITCH 615/1091 – POSSIBLE MILL RACE, LATE 16TH/ EARLY 17TH – LATE17TH/ EARLY 18TH CENTURY

3.24.35 A moderate size assemblage was observed from this deposit. It was dominated by the moving water species, in particular *Valvata piscinalis* and *Bithynia*. There were also significant numbers of *Planorbis planorbis*. The assemblage composition may reflect a very slow moving, almost still, well oxygenated, well vegetated aquatic environment in the ditch with areas of long grass on the edge.

CONTEXT (952), SAMPLE <42>, FILL OF DITCH 615/1091 – POSSIBLE MILL RACE, LATE 16TH/ EARLY 17TH – LATE17TH/ EARLY 18TH CENTURY

3.24.36 There were broad similarities between the very large assemblage recorded from this deposit and the much smaller one from context (950). The moving water group increased slightly, with notable rises in *Valvata piscinalis* and *Pisidium*, while the level of *Bithynia* decreased. There is also a marked increase in the numbers of *Gyraulus crista* and *Gyraulus albus*, intermediate species which thrive in all kinds of aquatic environments. The higher ratio of *Bithynia* opercula to apices together with the small rise in numbers of *Theodoxus fluviatilis* indicates a slightly faster rate of water flow. The assemblage appears to be reflective of a ditch with slow moving, well oxygenated and well vegetated water, possibly with a few areas of long grass on the edge.

DISCUSSION

3.24.37 The mollusc assemblages appear to reflect changing fluctuations within the environment of the channels and ditches, in terms of water-flow and levels of vegetation. The molluscan data seems to indicate that the channel was likely to contain moving fresh water with no evidence for any tidal influences.

3.24.38 There is no information from the molluscan analysis on the nature of the Late Upper Palaeolithic environment. During the Early/ Middle Bronze Age there appears to have been a well oxygenated, well vegetated, slowing flowing channel environment with a small indication of possible marshy and damp grassland areas on the channel edge. By the 15th-16th Century AD it seems that there is evidence of fluctuating levels of vegetation and speed of water flow, though generally the environment is one of well oxygenated, slowly flowing, water within the channel, with areas of marsh and damp grassland in the vicinity, though

3.24.39 The Late 16th/ Early 17th to Late 17th/ Early 18th ditch is likely to have been permanently wet with well oxygenated, well vegetated, very slowly to slowly moving water. There may have been patches of long grass along the ditch edge.

Table 123: Mollusc Assemblages from Trench 75

Sample	<28.4>	<28.3>	<27>	<28.2>	<28.1>	<36>	<40>	<39>	<38>	<37>	<53>	<41>	<42>
Context	(830)	(830)	(842)	(845)	(845)	(845)	(838)	(836)	(839)	(833)	(1008)	(950)	(952)
Feature								843	843	843		615/1091	615/1091
Feature Type	Layer	Layer	Layer	Layer	Layer	Layer	Layer	Channel			Layer	Ditch/ Mill Race	
Sample size	125 ml	120 ml	10 l	140 ml	125 ml	5 l	10 l	5 l	10 l	10 l	10 l	10 l	5 l
Depth (m OD)	2.04	2.13		2.32	2.43								
Phase	Late Upper Palaeolithic		E/ MBA	15-16th Century							?med	L16th/E17th - L17th/E18th	
Land snails													
Carychium cf. *minimum*	-	-	1	-	-	1	-	-	-	-	-	-	1
Carychium tridentatum	-	-	1	-	-	1	-	-	-	-	-	-	-
Carychium spp.	-	-	2	-	-	2	-	1	1	-	-	-	2
Succinea/ Oxyloma spp.	-	-	6	-	1	3	-	-	2	5	-	-	3
Cochlicopa spp.	-	-	1	-	-	4	-	-	1	-	2	1	1
Vertigo spp.	-	-	-	-	-	-	-	1	-	-	-	-	-
Pupilla muscorum	-	-	-	-	-	-	-	-	-	-	-	-	1
Vallonia costata	-	-	1	-	-	6	-	-	1	-	-	2	23
Vallonia pulchella/bexcentrica	-	-	2	-	-	36	-	1	1	1	2	4	17
Vallonia spp.	-	-	-	-	-	-	-	-	-	-	-	-	4
Acanthinula aculeata	-	-	1	-	-	-	-	-	-	-	-	-	-
Punctum pygmaeum	-	-	-	-	-	-	-	-	-	1	-	-	-
Discus rotundatus	-	-	+	-	-	1	-	-	-	-	-	-	-
Vitrea spp.	-	-	-	-	-	3	-	-	-	1	-	-	2
Nesovitrea hammonis	-	-	-	-	-	-	-	-	-	-	-	-	1
Aegopinella pura	-	-	-	-	-	-	-	-	-	-	-	-	1
Aegopinella nitidula	-	-	-	-	-	2	-	-	-	1	-	-	-
Oxychilus cellarius	-	-	-	-	-	-	-	-	-	-	-	-	-
Limacidae	-	-	7	-	-	18	1	4	6	-	-	4	10
Helicella itala	-	-	-	-	-	1	-	-	-	-	1	3	6
Trichia hispida	-	-	-	-	1	20	-	4	2	-	6	12	13
Cepaea/ Arianta sp.	-	-	1	-	-	-	-	1	-	-	-	-	-
Fresh and Brackish Water Snails													
Theodoxus fluviatilis	-	-	61	-	-	44	+	2	5	1	5	6	52
Valvata cristata	-	-	162	-	2	78	1	8	34	25	55	23	168
Valvata piscinalis	-	-	318	-	4	656	2	30	137	117	40	68	486
Bithynia tentaculata	-	-	110	-	2	19	1	4	6	9	-	17	10
Bithynia leachii	-	-	-	-	-	-	-	-	-	-	-	2	-
Bithynia spp.	-	-	206	-	2	127	4	22	33	25	35	24	145
Bithynia opercula	-	-	1084	5	9	646	93	88	121	79	1101	93	955
Bithynia/ Lymnaea spp.	-	-	39	-	-	36	-	-	-	18	-	20	56
Aplexa hypnorum	-	-	-	-	-	1	-	-	-	-	-	-	-
Physa spp.	-	-	-	-	-	-	-	-	-	-	-	1	-
Lymnaea truncatula	-	-	2	-	1	16	-	1	-	1	-	1	4
Lymnaea palustris	-	-	-	-	-	-	-	-	1	-	-	-	2
Lymnaea peregra	-	-	1	-	-	14	-	1	4	8	-	3	-

Sample	<28.4>	<28.3>	<27>	<28.2>	<28.1>	<36>	<40>	<39>	<38>	<37>	<53>	<41>	<42>
Context	(830)	(830)	(842)	(845)	(845)	(845)	(838)	(836)	(839)	(833)	(1008)	(950)	(952)
Feature								843	843	843		615/1091	615/1091
Feature Type	Layer	Layer	Layer	Layer	Layer	Layer	Layer	Channel			Layer	Ditch/ Mill Race	
Sample size	125 ml	120 ml	10 l	140 ml	125 ml	5 l	10 l	5 l	10 l	10 l	10 l	10 l	5 l
Depth (m OD)	2.04	2.13		2.32	2.43								
Phase	Late Upper Palaeolithic		E/ MBA	15-16th Century							?med	L16th/E17th - L17th/E18th	
Lymnaea spp.	-	-	2	-	-	17	-	-	4	4	3	3	16
Planorbis planorbis	-	-	19	3	7	107	1	5	17	22	1	30	137
Planorbis carinatus	-	-	-	-	-	26	-	-	3	-	-	2	-
Anisus leucostoma	-	-	-	-	-	11	-	4	4	-	-	3	9
Bathyomphalus contortus	-	-	5	-	-	1	-	-	1	-	-	-	-
Gyraulus albus	-	-	3	-	1	44	-	2	18	12	-	5	60
Gyraulus crista	-	-	53	-	-	46	-	-	1	4	8	2	46
Hippeutis complanatus	-	-	-	-	-	-	-	-	-	1	-	4	-
Planorbids	-	-	15	-	-	123	-	-	10	4	-	10	82
Ancylus fluviatilis	-	-	9	-	-	3	-	2	-	-	17	-	9
Acroloxus lacustris	-	-	1	-	-	1	-	-	-	-	7	-	1
Pisidium cf. *amnicum*	-	-	2	-	-	2	1	-	-	1	-	1	3
Pisidium spp.	-	-	102	1	-	62	1	3	16	20	15	11	225
Taxa	0	0	22	2	9	28	6	18	20	17	14	21	25
Total			1034	4	23	1535	12	97	308	283	197	259	1597
% Open country species			0.29	0	0	2.8	0	2.06	0.65	0.35	1.52	3.49	3.19
% Intermediate species			0.87	0	4.35	2.74	8.33	9.28	2.92	0.35	4.06	6.59	1.57
% Shade - loving species			0.48	0	0	0.65	0	1.03	0.32	0.71	0	0.39	0.38
% Unassigned species			0.58	0	4.35	0.2	0	0	0.65	1.77	0	0	0.19
% Amphibious species			0.19	0	4.35	1.82	0	5.15	1.3	1.41	0	1.55	0.81
% Intermediate species			6	0	4.35	6.84	0	4.12	8.12	8.83	4.06	3.88	6.76
% Ditch species			17.6	75	39.13	13.81	16.67	13.4	17.53	16.61	31.98	21.32	19.16
% Moving water species			62.38	0	26.09	57.85	66.67	61.86	58.77	60.42	49.24	53.49	47.65
% Unassigned species			11.51	25	17.39	13.22	8.33	3.09	9.74	9.89	9.14	9.69	20.23

Insects

3.24.40 The fluvial deposits examined from Trench 75 (Table 124), both from the Early/ Middle Bronze Age and later 15th-16th Century deposits, appear to have been associated with fast flowing water and sandy bedded channels, as suggested by the large numbers of water beetles recovered that are associated with such environments especially the ‘diving water beetle’ *Stictotarsus duodecimpustulatus* (Nilsson and Holmen 1995). Similar conditions are favoured by many of the elmid ‘riffle beetles’ recorded such *as Helichus substriatus, Elmis aenea, Eslolus parallelepipedus, Oulimnius* spp*., Macronychus quadrituberculatus, Limnius volckmari* and *Riolus subviolaceus* (Holland 1972).

3.24.41 The Early/ Middle Bronze Age channel also appears to have contained areas of waterside vegetation such as stands of common club-rush (*Schoenoplectus lactustris*), sedges (*Carex* spp.) and reed sweet-grass (*Glyceria maxima*), the food plants of *Donacia impressa, Donacia simplex* and *Notaris acridulus* respectively. There also seem to have been plants of the water surface present, such as white and yellow water-lilies (*Nymphaea alba* and *Nuphar lutea*) and duck weed (*Lemna* spp.), the food plants of *Donacia crassipes* and *Tanysphyrus lemnae* respectively.

3.24.42 The presence of the ‘reed beetle’ *Plateumaris sericea*, which is normally associated with sedges (*Carex* spp.), suggests that the later 15th-16th Century channel may have, in part, contained stands of waterside vegetation. They also seemed to have contained areas of slow flowing water as well, suggested by the recovery of ‘diving water beetles’ such as *Hygrotus inaequalis* and *H. decoratus,* the hydreanid O*chthebius minimus* and the hydrophilids *Cercyon ustulatus* and *Laccobius* spp.. All species which are associated with slow waters (Nilsson and Holmen 1995; Hansen 1987).

3.24.43 The presence of woodland in the landscape during the Early/ Middle Bronze Age is indicated by a limited number of taxa associated with deadwood such as the ‘woodworm’ *Anobium punctatum* and the eucnemid *Melasis buprestoides* and the ‘bark beetle’ *Dryocoetes villosus* which is associated with oak (*Quercus* spp.). However, several of the other woodland species recovered from these samples are more typical of waterside woodland and fen. For example *Agelastica alni* is associated with alder (*Alnus* spp.) and *Chilocorus renipustulatus* and *Rhamphus pulicarius* often with willow (*Salix* spp.).

3.24.44 The terrestrial insects recovered from both the Early/ Middle Bronze Age and later 15th-16th Century deposits also contain considerable numbers of individuals which are typical of open grassland, pasture or, perhaps, open arable ground (17-25% of the terrestrial taxa recovered). Taxa typical of grassland consist of a range of ‘leaf beetles’ and weevils that feed on plants common in this type of landscape, such as clover (*Trifolium*), medicks (*Medicago* spp.), vetches (*Vicia* spp.) and ribwort plantain (*Plantago lanceolata*). The ‘garden chaffer’ *Phyllopertha horticola* is normally associated with old mature grassland where its larvae feed on the roots of grass (Jessop 1986) and the small weevil *Ceutorhynchus contratus* with mignonettes and poppies (Resedacae and Papaveraceae). Finally, the recovery of a number of *Aphodius* dung beetles probably suggests that grazing animals were also present in this landscape during both these periods. Several of the ground beetles recovered, particularly from the 15th-16th Century deposits such as *Loricera pilicornis, Clivina fossor, Harpalus* spp., *Platynus dorsalis* and *Amara* spp., are usually associated with open grassland or disturbed ground (Lindroth 1974).

Table 124: Insect assemblage from Trench 75

Sample number		**<27>**	**<24>**	**<40>**	**<36>**	**<38>**	**<37>**	**<42>**	**Phytophage plant hosts (nomenclature follows that of Stace 1997)**
Context number		**(842)**	**(837)**	**(838)**	**(845)**	**(839)**	**(833)**	**(952)**	
Feature number		**Coarse sand**	**peat clay**	**alluvium**	**sandy clay**	**sandy clay**	**alluvium**	**615**	
Feature type		**Layer**	**Layer**	**Layer**	**Layer**	**Sandy clay Layer**	**layer**	**robber trench**	
Date		**Early/ Middle Bronze Age**		**15th-16th Century**				**16th-18th Century**	
Volume (l.)		**5**	**5**	**3**	**3.5**	**3.5**	**2**	**2.5**	
COLEOPTERA									
Carabidae									
Loricera pilicornis (F.)		-	-	1	-	1	-	-	
Clivina fossor (L.)		-	1	-	1	-	1	-	
Dyschirius globosus (Hbst.)		1	3	-	-	-	-	-	
Bembidion lampros (Hbst.)		-	-	1	-	-	-	-	
Bembidion obtusum Serv.		-	-	1	-	-	-	-	
B. guttula (F.)		-	-	1	1	-	-	-	
Bembidion spp.		2	2	-	2	3	-	1	
Harpalus cf. *rufipes* (Geer)		1	-	-	-	-	-	-	
Harpalus spp.		-	1	-	-	-	-	-	
Pterostichus strenuus (Panz.)		-	-	1	1	-	-	-	
Pterostichus nigrita (Payk.)	ws	-	-	-	-	-	1	-	
Pterostichus spp.		1	1	-	-	1	-	-	
Platynus obscurus (Herbst.)		-	-	-	1	-	-	-	
Amara spp.		-	-	1	-	-	2	-	
Dromius spp.	l	-	-	1	-	-	-	-	
Halididae									
Haliplus spp.	a	-	-	1	-	1	1	-	
Dytiscidae									
Hygrotus inaequalis (F.)	a	-	-	-	-	1	1	-	
Hygrotus decoratus (Gyll.)	a	-	-	-	1	-	-	-	
Hydroporus spp.	a	-	-	-	-	-	1	-	
Stictotarsus duodecimpustulatus (F.)	aff	-	1	-	1	-	-	-	
Gyrinidae									
Gyrinus spp.	a	-	2	-	-	1	-	-	
Hydraenidae									
Hydraena riparia (Kug.)	aff	1	1	1	-	-	1	-	
Hydraena spp.	a	2	5	1	1	1	-	-	
Ochthebius minimus (F.)	a	-	1	-	-	-	-	-	
Ochthebius spp.	a	-	8	-	2	1	1	-	
Limnebius spp.	a	-	1	1	-		-	-	
Helophorus spp.	a	-	15	4	2	2	3	-	
Hydrophilidae									
Cercyon ustulatus (Preyssl.)	a	-	1	-	-	-	-	-	
Cercyon unipunctatus	df	-	-	-	1	-	-	-	

Sample number		<27>	<24>	<40>	<36>	<38>	<37>	<42>	Phytophage plant hosts (nomenclature follows that of Stace 1997)
Context number		(842)	(837)	(838)	(845)	(839)	(833)	(952)	
Feature number		Coarse sand	peat clay	alluvium	sandy clay	sandy clay	alluvium	615	
Feature type		Layer	Layer	Layer	Layer	Sandy clay Layer	layer	robber trench	
Date		Early/ Middle Bronze Age		15th-16th Century				16th-18th Century	
Volume (l.)		5	5	3	3.5	3.5	2	2.5	
(L.)									
Cercyon atricapillus (Marsh.)	df	-	-	-	-	1	-	-	
Cercyon analis (Payk.)		-	-	-	1	1	2	-	
Cercyon spp. (aquatic)		-	2	-	-	-	-	1	
Megasternum boletophagum (Marsh.)		1	1	2	1	-	-	1	
Cryptopleurum minutum (F.)	df	-	-	-	2	-	1	1	
Hydrobius fuscipes (L.)	a	-	-	-	1	-	-	-	
Laccobius spp.	a	-	1	-	-	1	1	-	
Histeridae									
Onthophilus striatus (Forst.)	df	-	1	-	-	-	-	-	
Orthoperidae									
Corylophus cassidoides (Marsh.)	ws	-	-	-	1	-	-	-	
Orthoperus spp.	ws	-	2	-	-	-	-	-	
Ptiliidae									
Ptilidae gen. & spp. indet.		-	1	-	-	-	-	-	
Acrotrichis spp.		-	-	1	-	-	-	-	
Staphylinidae									
Lesteva longelytrata (Goeze)	ws	-	-	-	1	-	-	-	
Lesteva spp.	ws	-	1	1	-	1	-	-	
Trogophloeus bilineatus (Steph.)	ws	-	-	-	2	-	1	-	
Trogophloeus spp.		-	-	1	1	1	-	-	
Oxytelus rugosus (F.)	df	1	1	1	1	2	1	1	
Oxytelus sculpturatus (Grav.)	df	-	1	1	-	-	-	-	
Platystethus arenarius (Fourc.)	df	-	-	1	-	-	-	-	
Platystethus cornutus (Grav.)	ws	1	-	-	-	-	-	-	
Platystethus nitens (Sahlb.)	ws	-	2	1	-	-	1	-	
Stenus spp.		-	-	-	2	-	1	-	
Paederus spp.		-	-	1	-	-	-	-	
Astenus spp.		-	-	-	1	-	-	-	
Stilicus spp.		-	2	-	-	-	-	-	
Lathrobium spp.		-	-	-	2	-	1	-	
Xantholinus spp.		-	-	1	-	1	-	1	
Philonthus spp.		-	4	-	-	-	-	-	
Philonthus spp.		-	-	1	1	-	3	-	
Tachyporus spp.		-	1	-	1	-	-	-	
Tachinus rufipes (Geer.)		-	-	1	-	-	-	-	
Tachinus spp.		-	-	-	1	-	-	-	
Aleocharinidae gen. &		-	-	3	2	5	3	-	

Sample number		**<27>**	**<24>**	**<40>**	**<36>**	**<38>**	**<37>**	**<42>**	**Phytophage plant hosts (nomenclature follows that of Stace 1997)**
Context number		**(842)**	**(837)**	**(838)**	**(845)**	**(839)**	**(833)**	**(952)**	
Feature number		**Coarse sand**	**peat clay**	**alluvium**	**sandy clay**	**sandy clay**	**alluvium**	**615**	
Feature type		**Layer**	**Layer**	**Layer**	**Layer**	**Sandy clay Layer**	**layer**	**robber trench**	
Date		**Early/ Middle Bronze Age**		**15th-16th Century**				**16th-18th Century**	
Volume (l.)		**5**	**5**	**3**	**3.5**	**3.5**	**2**	**2.5**	
spp. indet.									
Pselaphidae									
Bryaxis spp.	-	-	-	-	-		1	-	
Cantharidae									
Cantharis sp.	oa	-	-	-	-	1	-	-	
Eucnemidae									
Melasis buprestoides (L.)	l	-	1	-	-	-	-	-	
Helodidae									
Helodidae gen. & spp. indet**.**	a	-	-	-	-	-	1	-	
Dryopidae									
Helichus substriatus (Müll.)	aff	1	1	-	-	-	-	-	
Dryops spp.	a	-	-	1	-	-	-	-	
Esolus parallelepipedus (Müll.)	aff	-	1	-	-	-	-	-	
Oulimnius spp.	aff	2	2	3	5	4	5	2	
Limnius volckmari (Panz.)	aff	-	1	-	-	-	-	-	
Riolus subviolaceus (Müll.)	aff	1	1	-	1	-	2	-	
Riolus spp.	aff	-	-	-	-	1	-	-	
Macronychus quadrituberculatus (Müll)	aff	-	2	-	1	-	-	-	
Nitidulidae									
Meligethes spp.		-	1	-	2	1	2	-	
Cucujidae									
Monotoma spp.	s	-	-	-	1	1	-	-	
Cryptophagidae									
Cryptophagus spp.	s	-	-	-	2	1	-	-	
Atomaria spp.	s	-	2	-	-	-	1	-	
Phalacridae									
Phalacrus caricis Sturm	ws	-	1	-	-	-	-	-	
Phalacrus spp.	ws	1	-	-	-	-	-	-	
Lathridiidae									
Enicmus minutus (Group)	s	-	-	-	-	1	-	-	
Corticaria/ corticarina spp.		-	1	1	4	-	1	-	
Colydiidae									
Aglenus brunneus (Gyll.)	s	-	-	-	-	-	1	-	

Sample number		<27>	<24>	<40>	<36>	<38>	<37>	<42>	Phytophage plant hosts (nomenclature follows that of Stace 1997)
Context number		(842)	(837)	(838)	(845)	(839)	(833)	(952)	
Feature number		Coarse sand	peat clay	alluvium	sandy clay	sandy clay	alluvium	615	
Feature type		Layer	Layer	Layer	Layer	Sandy clay Layer	layer	robber trench	
Date		Early/ Middle Bronze Age		15th-16th Century				16th-18th Century	
Volume (l.)		5	5	3	3.5	3.5	2	2.5	
Coccinellidae									
Chilocorus renipustulatus (Scriba)	l	-	-	1	-	-	-	-	On a range of trees but often *Salix* spp. (willow)
Lyctidae									
Lyctus linearis (Goeze)	l	-	-	-	1	-	-	-	
Anobiidae									
Anobium punctatum (Geer)	l	1	2	-	-	-	1	-	
Ptinidae									
Ptinidae gen. & spp. indet		-	-	-	-	1	-	-	
Scarabaeidae									
Aphodius fossor (L.)	df	-	1	-	1	-	-	-	
Aphodius sphacelatus (Panz.) or *A. prodromus* (Brahm)	df	-	2	1	1	-	2	-	
Aphodius fimetarius (L.)	df	-	-	-	2	-	-	-	
Aphodius granarius (L.)	df	-	-	-	-	1	-	-	
Aphodius spp.	df	-	-	-	-	2	-	-	
Phyllopertha horticola (L.)	p	-	1	-	-	-	-	-	
Chyrsomelidae									
Donacia crassipes (F.)	ws	-	1	-	-	-	-	-	*Nymphaea alba* and *Nuphar lutea* (white and yellow water-lily)
Donacia impressa (Payk.)	ws	-	1	-	-	-	-	-	*Schoenoplectus lactustris* (common club rush)
Donacia simplex (F.)	ws	-	2	-	-	-	-	-	Range of water reeds and rushes
Plateumaris sericea (L.)	ws	-	-	-	1	-	-	-	Usually on *Carex* spp. (sedges)
Donacia/ Plateumaris spp.	ws	1	-	-	-	1	-	-	
Phyllodecta spp.	ws	-	-	-	1	1	1	-	
Prasocuris phellandrii (L.)	ws	-	1	-	1	1	-	-	On aquatic Apiaceae (Umbellifers)
Agelastica alni (L.)	l	-	1	-	-	-	-	-	On *Alnus* spp. (alder)
Phyllotreta spp.		-	-	1	4	-	2	-	
Haltica spp.	l	-	1	-	-	-	-	-	
Chaetocnema concinna (Marsh.)	p	1	2	1	-	-	-	-	

Sample number		<27>	<24>	<40>	<36>	<38>	<37>	<42>	Phytophage plant hosts (nomenclature follows that of Stace 1997)
Context number		(842)	(837)	(838)	(845)	(839)	(833)	(952)	
Feature number		Coarse sand	peat clay	alluvium	sandy clay	sandy clay	alluvium	615	
Feature type		Layer	Layer	Layer	Layer	Sandy clay Layer	layer	robber trench	
Date		Early/ Middle Bronze Age		15th-16th Century				16th-18th Century	
Volume (l.)		5	5	3	3.5	3.5	2	2.5	
Chaetocnema spp.		-	-	3	-	-	-	-	
Scolytidae									
Leperisinus varius (F.)	l	-	-	-	1	-	-	-	Mainly on *Fraxinus* (ash)
Dryocoetes villosus (F.)	l	-	1	-	-	-	-	-	
Curculionidae									
Apion spp.	p	2	6	-	6	2	2	-	
Barypeithes spp.		-	-	2	-	-	-	-	
Sitona suturalis (Steph.)	p	-	-	-	-	-	-	2	*Lathyrus pratensis* (Meadow vetchling) and *Vicia* spp. (Vetches spp.)
Sitona sulcifrons (Thunb.)	p	-	-	-	1	-	-	-	On *Medicago* (medicks), *Trifolium* (clover) and *Vicia* (vetches)
Sitona flavescens (Marsh.)	p	-	-	2	1	-	1	-	*Trifolium* species (Clover)
Sitona spp.	p	-	1	1	1	1	-	3	
Bagous spp.	ws	2	1	-	-	-	2	-	
Notaris acridulus (L.)	ws	-	1	-	-	1	-	-	Often on *Glyceria maxima* (reed sweet-grass) and other *Glyceria* species (sweet-grasses)
Alophus triguttatus (F.)	p	-	-	-	-	1	-	-	
Ceutorhynchus contractus (Marsh.)	p	-	1	4	1	-	1	-	Usually associated with RESEDACEAE and PAPAVER-ACEAE (migonettes and poppies)
Ceutorhynchus erysimi (F.)	p	-	-	-	-	2	-	-	On *Capsella bursa-pastoris* (shepherd's purse)
Ceuthorhynchidius troglodytes (F.)	p	-	-	-	-	-	-	1	*Plantago lanceolata* (ribwort plantain)
Mecinus pyraster (Hbst.)	p	-	-	1	-	-	-	-	*Plantago lanceolata* (ribwort plantain)
Gymnetron labile (Hbst.)	p	-	1	-	-	-	-	-	*Plantago lanceolata* (ribwort plantain)
Gymnetron spp.	p	1	-	-	1	-	-	-	*Plantago lanceolata* (ribwort plantain)
Rhynchaenus sp.	l	-	-	-	-	-	2	-	
Rhamphus pulicarius	l					3	1	-	*Sallix* spp.

Sample number		**<27>**	**<24>**	**<40>**	**<36>**	**<38>**	**<37>**	**<42>**	**Phytophage plant hosts (nomenclature follows that of Stace 1997)**
Context number		**(842)**	**(837)**	**(838)**	**(845)**	**(839)**	**(833)**	**(952)**	
Feature number		**Coarse sand**	**peat clay**	**alluvium**	**sandy clay**	**sandy clay**	**alluvium**	**615**	
Feature type		**Layer**	**Layer**	**Layer**	**Layer**	**Sandy clay Layer**	**layer**	**robber trench**	
Date		**Early/ Middle Bronze Age**		**15th-16th Century**				**16th-18th Century**	
Volume (l.)		**5**	**5**	**3**	**3.5**	**3.5**	**2**	**2.5**	
(Hbst.)									(willow)
DIPTERA									
SUBORDER NEMATOCERA									
Family, gen. & spp. indet.		-	-	10	50+	60	50	15	
SUBORDER CYCLORRHAPHA									
Family, gen. & spp. indet.		-	20	3	10	5	5	6	
Total number of individuals		24	105	54	78	52	56	14	
Total number of taxa		19	57	39	50	36	37	10	
% aquatic (a)		-	32.4	14.8	9.0	15.4	16.1	-	
% aquatic fast flowing (aff)		-	10.5	9.3	14.1	9.6	14.3	-	
% waterside (ws)		-	12.4	3.7	9.0	9.6	10.7	-	
% dung/ foul (df)		-	12.8	10.3	15.1	17.6	12.1	-	
% woodland/ dead wood (l)		-	12.8	5.1	3.8	8.8	12.1	-	
% pasture (p)		-	25.5	23.1	20.8	17.6	12.1	-	
% synanthropic (s)		-	4.3	0.0	5.7	8.8	6.1	-	

Key to ecological groupings used
a= aquatic water beetles
aff= aquatic taxa normally associated with faster flowing waters
ws = waterside taxa often associated with emergent vegetation
df = taxa often associated with dung
p= taxa associated with grassland and open areas
l= taxa associated with trees
s= taxa normally associated with human settlement

3.25 Trench 93 (PDZ6 WET 6.08)

Introduction

3.25.1 Trench 93 was located within the Wetlands area in the central northern part of the Site immediately to the east of the modern River Lee, and within the projected limits of the Palaeo-Lea channel as mapped by the deposit modelling.

3.25.2 Radiocarbon dating indicated that the sequence sampled dates to the Early Bronze Age, Late Iron Age/ early Romano-British and the early to middle Romano-British periods.

3.25.3 Problems with sample numbering, similar to those in Trench 72, were highlighted by the discrepancy between dates obtained from the monoliths themselves – i.e. from securely stratified material – and those from identified macrofossils within the bulk sample series. The monolith dates ran as expected (oldest at base to most recent at top), whilst the bulk sample dates ran in the opposite direction.

3.25.4 After sedimentary comparison between the bulk material and the monolith descriptions, together with examination of the pollen and plant macrofossil data, it was determined that most likely a misnumbering of the bulk sample column in the evaluation report had occurred (Harris and Melikian 2009, Table 5, Figure 6, 66-70); rather than running from sample <1> at the top to sample <11> at the base of the sequence, the opposite was found to be the case. This problem most probably arose through a simple misnumbering of a section drawing on site. This has now been resolved and the sample numbers and locations shown in Figure 46 are correct.

Sediments

3.25.5 Sediment descriptions and interpretations can be found in Table 125.

3.25.6 The lower sequence is dominated by active channel deposits of sand with common mollusc fragments; these active channel sands were interrupted several times by detrital lenses of material (including water rounded wood), deposited at high-water marks during times of reduced flow. These were probably consolidated by limited plant growth before being reburied by further active channel deposits.

3.25.7 At this point the channel either migrates slightly away or, perhaps more likely, becomes cut-off from the main flow. The sequence from 1.57m OD upwards is markedly different, first being composed of relatively inorganic very fine sediment deposited in some reasonable depth of very slow moving or still water (at least enough to prevent significant plant growth of rushes *etc*), and then from 1.81m OD becoming gradually more organic until becoming quite peaty (from the dating it is apparent that this change represents an erosive contact, with a transition from Early Bronze Age to Romano-British sediments). From 2.27m OD up mineralogenic fine sediments with indications of soil formation were recorded, which are typical of a floodplain soil accreting due to additions from overbank flooding.

3.25.8 The best interpretation for this sequence would be of a relatively fast-flowing active channel with fluctuating (perhaps seasonally fluctuating) water levels, which is then cut off from the main flow by channel avulsion, creating an oxbow lake/ abandoned channel. Standing water of some depth was present, and with the greatly decreased flow (although with probably some occasional input from the main channel) the oxbow quickly silted up. As the water grew shallower with increased sediment depth, vigorous plant growth became established, further hastening the process of sedimentation and inputting partially preserved plant material to form a waterlogged peaty layer and essentially becoming a wet terrestrial environment rather than an aquatic one. Later sedimentation was in the form of fine material deposited during overbank flooding events.

Table 125: Sediment descriptions for Monoliths <1> to <4>, Trench 93

Level (m OD)	Context	Sediment description	Interpretation
2.54 to 2.27	802 803	2.5Y4/ 2 dark greyish brown clay, stonefree, occasional (land) snail, 0.5-1% fine macropores, crumbles into quite sharp angular peds of coarse crumb to fine blocky size *c.* 7mm. Faint diffuse iron mottling, with distinct iron stained band at 2.33-2.29m OD (a post depositional redox product, not a separate context). Clear boundary	Overbank alluvium/ accretional floodplain soil
2.27 to 1.81	803 807	10YR3/ 1 very dark grey clay to clay loam, with less organic upper 60-70mm paler 4/1 dark grey (clear boundary). Highly organic (not far off from being a peat), stonefree, with moderately developed coarse to very coarse platy structure (this may be an artefact of lamination and core shrinkage). Occasional recognisable plant remains, snails present (including operculae of *Bithynia*). Diffuse boundary; a continuation from the less organic sediment below.	Well vegetated channel edge environment NB
1.81 to 1.57	808	10YR4/ 1 dark grey silty clay, stonefree, occasional poorly-preserved root (waterlogged). Abrupt boundary. Low energy alluvial deposit (mud), in a reasonable depth of water, not well vegetated, probably inside bend of channel or perhaps a cut-off channel which is silting up.	Low-energy aquatic environment
1.57 to 1.40	808 814	10YR2/ 1 black silty clay, peaty, wood fragments up to 40mm (including water-abraded/ rounded chunks), occasional small calcareous lumps, some opercula of *Bithynia*.	Detrital layer (strandline) probably consolidated by plant growth.
1.40 to 0.83	806 (1.37 to 0.93) 813 (0.92 to 0.82)	2.5Y5/ 3 light olive brown sand, with common shell fragments. Occasional calcareous lumps (redeposited tufaceous material), especially to top and in detrital layers. Common bits of wood 5-70mm throughout. Within this context are very dark greying brown slightly peaty, woody detrital lenses at 1.26-1.22 and 1.15-1.11m OD. Lowest detrital layer at 0.93-0.84 is more peaty, and water snails noted (*Pisidium amnicum*). NB this layer was drawn up as a peat deposit and given separate context number 813, but active channel sand deposits continue beneath at the base of the sample. Also the presence of *Pisidium amnicum* firmly within the lens, a snail which likes fast moving water, supposts the detrital interpretation. Abrupt boundaries between all lenses and sand.	Active channel deposits with detrital/ strandline layers.

Dating

3.25.9 A total of six radiocarbon dates have been obtained from Monoliths <M2> and <M4>, and bulk samples <3> and <11>, as shown in Table 126.

3.25.10 Two dates on alder cones and seeds provided dates of 1900-1740 cal BC (SUERC-31371, 3495±30 BP) and 1920-1740 cal BC (SUERC-23173, 3970±30 BP) from the middle and base of the sequence respectively. A further date on bulk peats from the base (813), slightly below the Early Bronze Age date, provided a Late Neolithic date, 2580-2350 cal BC (SUERC-23173, 3970±30 BP).

3.25.11 A date on water-lily (*Nuphar lutea*) seeds from the upper sequence provided a Late Iron Age to early Romano-British date of 30 cal BC - cal AD 130 (SUERC-31372, 1945±30 BP) and one on bulk sediments provided a contemporary early to middle Romano-British date. A third date was obtained from seeds in monolith <M2> at 1.85m OD and provided a Late Iron Age/ early Romano-British date of 50 cal BC to cal AD 80. The three dates indicate that the upper sediments can be constrained to the Late Iron Age/ early Romano-British period.

Table 126: Radiocarbon dates from Trench 93

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<11> (803/807)	2.24 to 2.19	Seeds: 2 x *Nuphar lutea*	SUERC-31372	1945±30	-25.5	30 cal BC–cal AD 130	1
<M2> (807)	2.15 to 2.13	Sediment (acid wash)	SUERC-23172	1890±30	-28.1	cal AD 50–220	1
<M2> (807)	1.85	Seeds: *Cirsium/ Carduus*, 2 x *Rumex* sp., *Schoenoplectus*, *Ranunculus* sp., *Alisma plantago-aquatica*, *Betula* sp., *Rorippa nasturtium aquaticum*, *Carex cf. nigra*, 3 x frags cf. Cyperaceae/ *Rumex* sp.	SUERC-35344	1990±30	-25	50 cal BC–cal AD 80	1
<3> (807)	1.84 to 1.79	Plant material: 2 x *Alnus glutinosa* cones	SUERC-31371	3495±30	-28.7	1900–1740 cal BC	2
<M4> (813)	0.92 to 0.87	Plant material: 12 x *Alnus glutinosa* seeds + 6 x catkins	SUERC-31376	3510±30	-27.2	1920–1740 cal BC	1
<M4> (813)	0.89 to 0.87	Sediment (acid wash)	SUERC-23173	3970±30	-28.4	2580–2350 cal BC	2

Plant macrofossils

3.25.12 The results are shown in Table 127. A total of eleven samples were examined from the selected sequence at the southern end of the west-facing trench section (Figure 46). Six of these were sub-samples of 1 litre taken from bulk samples. The remaining five samples came from 200 to 350ml sub-samples taken from the monolith in order to extend the sequence to the base and to obtain additional material suitable for radiocarbon dating.

3.25.13 The lowest samples, from contexts (813) and (806), dating from the Late Neolithic to Early Bronze Age, all had remains of alder (*Alnus glutinosa*) within them, mainly fragments of male catkins, but also some female catkins or “cones” and several fruits at 1.12-1.14m OD in context (806) and also in the basal sample from (813), along with possible root nodules and leaf fragments. There were few other remains in these samples, other than several seeds of branched bur-reed (*Sparganium erectum*) and elder (*Sambucus nigra*), a few of bramble (*Rubus* sp.) and sedges (*Carex* sp.), occasional fragments of moss, a gamete of stonewort (*Chara* sp.), and a single seeds of fat-hen (*Chenopodium album*).

3.25.14 In terms of evidence for alder only a single possible alder fruit was recorded within the intermediate sample from context (814), but seeds of elder (*Sambucus nigra*), bramble (*Rubus* sp.) and a single stone of sloe (*Prunus spinosa*), all indicative of woodland edge or woody scrub continuing to be present. Other than these elements those of more marsh and wetland species became more common. As also found in the samples above were seeds of buttercup (*Ranunculus* sp.), river water-droplet (*Oenanthe fluviatilis*), a few seeds of branched bur-reed (*Sparganium erectum*) and seeds of aquatics, water-crowfoot (*Ranunculus* subg. *Batrachium*), common club-rush (*Schoenoplectus lacustris*), sedges (*Carex* sp.), as well as those of disturbed grasslands, thistles (*Carduus/ Cirsium* sp.).

3.25.15 Slightly more unique to this sample from context (814) were seeds of pondweed (*Potamogeton* sp.), although these were recovered from the samples in (807) above.

3.25.16 The lowest bulk sample <1> (807) was fairly similar in composition to some extent to the underlying monolith sub-sample from (814), but had few seeds within it. It also contained no evidence for alder as seen in the underlying monolith samples. It did, however, contain a few seeds of bramble (*Rubus* sp.) and elder (*Sambucus nigra*).

3.25.17 In general, however, it was seeds of wetlands, marsh and grassland species, as seen in the samples above that predominated. These included seeds of mint (*Mentha* sp.), common club-rush (*Schoenoplectus* sp.), rushes (*Juncus* sp.) and sedges (*Carex* sp.), as well as seeds of numerous aquatics including water-plantain (*Alisma plantago-aquatica*), arrowhead (*Sagittifolia sagittifolia*), branched bur-reed (*Sparganium erectum*), pondweed (*Potamogeton* sp.), stonewort (*Chara* sp.) and water-crowfoot (*Ranunculus* subg. *Batrachium*). A few seeds of plants of disturbance and wasteland, such as thistles (*Carduus/ Cirsium* sp.), were also present.

3.25.18 Species not represented elsewhere included a few seed fragments of hemp-agrimony (*Eupatorium cannabinum*), which also grows in wet grassland and wasteland next to rivers and streams.

3.25.19 The two samples towards the base of context (807) at 1.94-1.79m OD and 2.09-2.14m OD were quite different from the underlying sample <1>, but similar to material in the monolith samples, particularly in that both contained evidence for alder (*Alnus glutinosa*), especially that from 1.84-1.79m OD which had some 150 plus fruits, along with numerous cones, fragments of male catkins, bud scales, possible root nodules and quite high amounts of twig and branch wood. Other species probably associated with this fen-woodland in this same sample were those of hazel (*Corylus avellana*), bramble (*Rubus* sp.), elder (*Sambucus nigra*) and greater stitchwort (*Stellaria holostea*).

3.25.20 The seeds of gypsywort (*Lycopus europaeus*) in the samples are in keeping with the lower samples from alder carr within the Site, while seeds of river water-droplet (*Oenanthe fluviatilis*) have been less common in such alder dominated assemblages and generally more frequent in Romano-British and Anglo-Saxon contexts. Seeds of branched bur-reed (*Sparganium erectum*) were also abundant in these two samples although these were generally present albeit in smaller quantities throughout the sequence.

3.25.21 The uppermost three samples from (807) and (803/ 807), at 1.99 to 2.24m OD, were generally similar to each other with the same range of marsh, open fen and general wetland species, along with seeds of gypsywort (*Lycopus europaeus*). Seeds of narrow-fruited watercress (*Rorippa nasturtium-aquaticum*), were present in all three samples, but absent in the remainder of the assemblage. Seeds of other species present in these samples were those of water-pepper (*Persicaria hydropiper*), associated with shallow water in ponds and ditches, along with those of sweet-grass (*Glyceria* sp.) and rushes (*Juncus* sp.) associated with marsh and wet grasslands in general.

3.25.22 Seeds of yellow water-lily (*Nuphar lutea*), from the uppermost sample <11>, context (803/807), were dated to the Late Iron Age to early Romano-British period, 30 cal BC - cal AD 130 (SUERC-31372, 1945±30 BP). Along with seeds of water-lily were those of other aquatics including water-crowfoot (*Ranunculus* subg. *Batrachium*), narrow-fruited watercress (*Rorippa nasturtium-aquaticum*), arrowhead (*Sagittifolia sagittifolia*), water-plantain (*Alisma plantago-aquatica*) and particularly branched bur-reed (*Sparganium erectum*).

3.25.23 Seeds of marsh, pond/ stream edge and wetland species, such as small water-pepper (*Persicaria minor*), mint (*Mentha* sp.), river water-droplet (*Oenanthe fluviatilis*), forget-me-nots (*Myosotis* sp.), common spikerush (*Eleocharis palustris*), common club-rush (*Schoenoplectus lacustris*), sedges (*Carex* sp.), and possible seeds of purple moor-grass (*Molinia caerulea*) were also relatively common in this sample. It is also probable that the seeds of woundwort (*Stachys* sp.) are of marsh woundwort (*Stachys palustris*).

3.25.24 Associated more with disturbed grassland habitats were seeds of buttercup (*Ranunculus* sp.), dock (*Rumex* sp.), clustered dock (*Rumex conglomeratus*), self-heal (*Prunella vulgaris*), along with single seeds of common nettle (*Urtica dioica*), thistles (*Carduus/ Cirsium* sp.) and orache (*Atriplex* sp.).

3.25.25 Unlike the earlier samples there was little indication of alder in this sample other than a single fragment of an alder catkin.

3.25.26 In conclusion, the lower (monolith) sub-samples covering those from 0.87 to 1.94m OD represent the local environment from the Late Neolithic to the Early Bronze Age (though also cover the hiatus indicated by the radiocarbon dating), and show a clear predominance of localised alder carr, with little indication of open areas in the bulk sample.

3.25.27 There appears to be a slight gap towards the top of this earlier part of the sequence, between 1.42-1.74m OD where there is a predominance of wetland and aquatic species within the samples, particularly from 1.42 to 1.74m OD and less evidence for alder. With some general floating and submerge aquatics, but also evidence for some wet grassland and marsh elements on the floodplain. Presumably this represents a localised expansion of the channel with the temporary removal of alder; the sediment reports indicate a low-energy environment with probable deeper water (see *Sediments*). By 1.79 to 1.84m OD alder seems to have re-established in the local area.

3.25.28 The amount of alder seems to diminish from 1.89 to 1.94m OD, and it is probable that a truncation occurs at sometime around this point, with the samples from 1.99 to 2.24m OD clearly representative of a different environment, and probably all dating to the Late Iron Age to early Romano-British period. However, it might be noted that there was no clear boundary to be seen in the monolith from this point which was lower in the sequence and generally coincided with the hiatus indicated by the radiocarbon dates. However, this may be a reflection of problems with the sequence sampling and recorded (see *Introduction*).

3.25.29 The environment represented in the uppermost samples dated to the Late Iron Age to Romano-British period indicate an environment in which marshland and wet-grassland, including probably rough pasture, is present on the floodplain. The very high numbers of seeds of water-cress indicate a very open, environment, with low-growing vegetation and they are usually to be associated with moving water.

Table 127: Waterlogged plant macrofossils from Trench 93

Sample		**<11>**	**<9>**	**<7>**	**<5>**	**<3>**	**<1>**	**<mono>**	**<mono>**	**<mono>**	**<mono>**	**<mono>**
Context		**(803/807)**	**(807)**	**(807)**	**(807)**	**(807)**	**(808)**	**(814)**	**(806)**	**(806)**	**(806)**	**(813)**
Depth top (mOD)		**2.24**	**2.14**	**2.04**	**1.94**	**1.84**	**1.74**	**1.44**	**1.18**	**1.14**	**1.05**	**0.92**
Depth bottom (mOD)		**2.19**	**2.09**	**1.99**	**1.89**	**1.79**	**1.69**	**1.42**	**1.16**	**1.12**	**1.02**	**0.87**
Sample Size (litres)		**1**	**1**	**1**	**1**	**1**	**1**	**0.35**	**1**	**0.2**	**0.3**	**0.3**
Sediment type						**Low energy aquatic**		**Active channel & strandline deposits**				
Chara (gametes)	stonewort	-	1	-	-	-	+	-	-	-	1	-
Bryophyta (leaf stem)	mosses	-	-	-	+	++	-	-	1	2	-	2
Nymphaeaceae	Water-lilies	cf.1	-	-	-	-	-	-	-	-	-	-
Nuphar lutea	yellow water-lily	8	1	-	-	1	-	-	-	-	-	-
Ranunculus subg. *Ranunculus* (arb)	buttercup	3	3	6	-	5	1	2	-	-	-	-
Ranunculus sceleratus	celery-leaved buttercup	-	-	3	-	cf.1	?	-	-	-	-	-
Ranunculus subg. *Batrachium*	water-crowfoots	7	-	-	-	-	3	1	-	-	-	-
Urtica dioica	common nettle	1	-	-	-	7	2	-	-	-	-	2
Alnus glutinosa (fruits)	alder fruits	-	-	-	5	150+	-	cf.1	-	7	-	27
Alnus glutinosa (female catkins/cones)	female catkins/cones	-	-	-	-	27	-	-	1	20	4	2
Alnus glutinosa (female catkins)	female “cone” scale	-	-	-	-	1	-	-	-	-	-	-
Alnus glutinosa (male catkins)	alder male catkins	1f.	-	-	4f.	11f	-	-	1f.	7+5f.	3+5f.	27f.
Alnus glutinosa (bud scales)	alder bud scales	-	-	-	-	10	-	-	-	-	-	-
Alnus glutinosa (root nodules?)	alder root nodules/ galls	-	-	-	-	24	-	-	-	-	-	9
Alnus glutinosa (leaf fragments)	alder leaf fragments	-	-	-	-	-	-	-	-	-	-	7
Corylus avellana	hazelnut	-	-	-	-	1f	-	-	-	-	-	-
Chenopodium album	fat-hen	-	-	-	-	-	-	-	-	-	1	-
Atriplex sp.	orache	1	-	-	-	-	-	-	-	-	-	-
Stellaria cf. *holostea*	greater stitchwort	-	-	-	-	1	-	-	-	-	-	-
Persicaria hydropiper	water-pepper	-	36	-	-	-	-	-	-	-	-	-
Persicaria minor	small water-pepper	22	-	+	-	-	-	-	-	-	-	-
Rumex sp.	dock	21	11	14	-	-	-	-	-	-	-	-
Rumex acetosella group	sheep’s sorrel	-	3	3	-	-	-	-	-	-	-	-
Rumex conglomeratus	clustered dock	-	14	-	-	-	-	-	-	-	-	-
Rumex conglomeratus (fruit)	clustered dock	10	6	-	-	-	-	-	-	-	-	-
Rorippa cf. *nasturtium-aquaticum*	narrow-fruited watercress	30+	+++	3	-	-	-	-	-	-	-	-
Rubus sp.	bramble	-	-	-	-	2	1	5	-	2	-	-
Potentilla sp.	cinquefoil/ tormentil	-	-	-	-	-	-	2	-	-	-	-
Potentilla anserina	silverweed	-	1	-	-	-	1	-	-	-	-	-

Sample		**<11>**	**<9>**	**<7>**	**<5>**	**<3>**	**<1>**	**<mono>**	**<mono>**	**<mono>**	**<mono>**	**<mono>**
Context		**(803/807)**	**(807)**	**(807)**	**(807)**	**(807)**	**(808)**	**(814)**	**(806)**	**(806)**	**(806)**	**(813)**
Depth top (mOD)		**2.24**	**2.14**	**2.04**	**1.94**	**1.84**	**1.74**	**1.44**	**1.18**	**1.14**	**1.05**	**0.92**
Depth bottom (mOD)		**2.19**	**2.09**	**1.99**	**1.89**	**1.79**	**1.69**	**1.42**	**1.16**	**1.12**	**1.02**	**0.87**
Sample Size (litres)		**1**	**1**	**1**	**1**	**1**	**1**	**0.35**	**1**	**0.2**	**0.3**	**0.3**
Sediment type						**Low energy aquatic**		**Active channel & strandline deposits**				
Prunus spinosa	sloe	-	-	-	-	-	-	1	-	-	-	-
Oenanthe fluviatilis	river water-droplet	1	1	1	2	25	-	5	-	-	-	-
Myosotis sp.	foget-me-nots	4	-	-	-	-	-	-	-	-	-	-
Stachys sylvatica	woundwort	22	5	-	-	-	-	-	-	-	-	-
Lamium sp.	dead-nettle	-	-	2	-	-	1	-	-	-	-	-
Prunella vulgaris	self-heal	1	-	-	-	-	-	-	-	-	-	-
Clinopodium acinos	basil thyme	3	-	-	-	-	-	-	-	-	-	-
Lycopus europaeus	gypsywort	-	1	1	1	2	-	-	-	-	-	-
Mentha sp.	mint	20+	-	-	4	3	20+	-	-	-	-	-
Galium aparine type	cleavers	-	1	-	-	-	-	-	-	-	-	-
Sambucus nigra	elder	-	-	-	1	5	1	4	-	2	4	1
Carduus/ Cirsium sp.	thistle	2	-	4	-	-	2	3	-	-	-	-
Eupatorium cannabinum.	hemp-agrimony	-	-	-	-	-	+f.	-	-	-	-	-
Sagittifolia sagittifolia (whole fruit)	arrowhead	-	-	-	-	-	1	-	-	-	-	-
Sagittifolia sagittifolia (embryo)	arrowhead	1	-	-	-	-	3	-	-	-	-	-
Alisma plantago-aquatica	water-plantain	1	2	+	-	-	20+	-	-	-	-	-
Potamogeton sp.	pondweeds	-	1	-	-	-	5	11	-	-	-	-
Juncus sp.	rush	-	++	-	-	-	+	-	-	-	-	-
Eleocharis sp.	spike-rush	3	-	-	-	-	-	-	-	-	-	-
Schoenoplectus lacustris	common club-rush	33	17	5	-	-	8	6	-	-	-	-
Carex sp. (flat)	sedge (lenticular)	2	-	-	-	-	-	-	-	1	-	-
Carex sp. (trigonous)	sedge (trigonous)	9	-	-	-	3	1	4	-	1	-	-
Glyceria sp.	sweet-grasses	-	12	-	-	-	-	-	-	-	-	-
Molinia caerulea	purple moor grass	cf. 6	-	-	-	-	-	-	-	-	-	-
Sparganium erectum (whole fruit)	branched bur-reed	-	-	-	-	1	1	2	-	3	-	-
Sparganium erectum (embryo)	branched bur-reed	6	1	-	28	100+	2	1	-	1	-	20
Typha sp.	bulrushes	-	-	-	-	-	++	-	-	-	-	-
Seed indet.		-	-	-	-	-	-	1	-	-	-	-
Root base indet.			-	-	-			1				
Twigs/ roundwood/ stems		-	-	+	+	++	-	+	++	+++	++	+

Sample		**<11>**	**<9>**	**<7>**	**<5>**	**<3>**	**<1>**	**<mono>**	**<mono>**	**<mono>**	**<mono>**	**<mono>**
Context		**(803/807)**	**(807)**	**(807)**	**(807)**	**(807)**	**(808)**	**(814)**	**(806)**	**(806)**	**(806)**	**(813)**
Depth top (mOD)		**2.24**	**2.14**	**2.04**	**1.94**	**1.84**	**1.74**	**1.44**	**1.18**	**1.14**	**1.05**	**0.92**
Depth bottom (mOD)		**2.19**	**2.09**	**1.99**	**1.89**	**1.79**	**1.69**	**1.42**	**1.16**	**1.12**	**1.02**	**0.87**
Sample Size (litres)		**1**	**1**	**1**	**1**	**1**	**1**	**0.35**	**1**	**0.2**	**0.3**	**0.3**
Sediment type						**Low energy aquatic**		**Active channel & strandline deposits**				
Leaf fragments		-	2	-	-	-	-	-	-	-	-	-
Charcoal		-	-	-	-	-	-	+	-	-	-	-
Worm cocoons		-	+	+++	-	+	-	-	-	-	-	-
Lophopus crystallinus	freshwater Brytozoa	-	-	-	-	+	1	-	-	-	-	-
(K) Plumatella-type	freshwater Brytozoa	+	-	-	-	-	+	-	-	-	-	-
Trichoptera, pupal case	Caddis Fly pupal case	-	2	3	-	-	-	-	-	1	1	-
fish vertebra		-	1	-	-	-	-	-	-	1	-	-

[+]C – denotes material that was preserved by charring. cf. compares with. f. - fragment Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more.

Pollen

3.25.30 Pollen assessment was carried out on nineteen samples from three overlapping monoliths in Trench 93: Monoliths <M1>, <M2>, <M3> and <M4>. The pollen diagram (Figure 47) has been split into three local pollen assemblage zones (LPAZ), using the prefix Tr93- to identify each one – see Table 128 for zone descriptions.

3.25.31 The chronology of the sequence ranges from the Late Neolithic at the base to Late Iron Age to middle Romano-British at the top, with a hiatus in the centre of the sequence.This is very similar to the nearby sequence from Trench 72.

3.25.32 LPAZ Tr93-1 shows the local presence of woodland taxa, notably *Quercus* (oak), *Tilia cordata* (small-leaved lime) and *Corylus avellana*-type (hazel), with *Hedera helix* (ivy) and *Salix* (willow) also present. Wetland habitats are indicated by a high abundance of *Alnus glutinosa* (alder), with *Sparganium emersum*-type (bur-reeds) and low but fluctuating Cyperaceae (sedge) also present throughout the zone. Low values of Poaceae are probably related to the density of the *Alnus* canopy on-site reducing the amount of flowering (and species composition) of the understorey herb layer.

3.25.33 LPAZ Tr93-2 coincides with a change in the sediments from channel edge deposits to a low energy depositional environment. The reduction in *Alnus glutinosa* and increase in Cyperaceae and Poaceae (grasses), along with *Sparganium emersum*-type and *Typha latifolia* (bulrush) are likely a refelction of the increased vegetative nature of the former channel. Some reductions in woodland taxa are observed though this may be a result of changes in local pollen loading (change from *Alnus* to Poaceae and Cyperaceae dominated pollen rain) and changes in the local wetland area (eg. channel migration). The general reduction in *Alnus* remains within the plant macrofossil assemblage towards the top of the sequence also reflects its reduction in the local wetland vegetation. Increases in *Pteridium aquilinum* (bracken) and *Plantago lanceolata* (ribwort plantain) may indicate an increase in local grazing activity within the more open floodplain vegetation. A notably inclusion in the sequence is *Cerealia*-type pollen at 1.34m OD, coinciding with the presence of *Convolvulus arvensis* (field bindweed), which may indicate some local cultivation or pollen derived from inwashed sediments.

3.25.34 Radiocarbon dates from LPAZ Tr93-3 generally imply it to be of Late Iron Age/ early Romano-British in date. The radiocarbon date from bulk <3> at 1.79-1.84m OD of 1900-1740 cal BC (SUERC-31371, 3495±30 BP) implies the older underlying sediments typical of LPAZ Tr93-1/2 extend into the base of Tr93-3. However, given the problems with the sampling of the sequence (inversion of the bulk sample numbering) similar to that from Trench 72, there may be some problems over the precision of the altitude for the bulk sample from which this radiocarbon date was obtained (ie, could be from deeper in the sequence).

3.25.35 Tr93-1 shows a largely open environment dominated by Poaceae (grasses) and Cyperaceae, with *Sparganium emersum*-type, *Typha latifolia* and *Glyceria*-type (sweet-grass) continuing to form part of the local wetland vegetation. Low amounts of woodland taxa, including *Quercus* and *Corylus avellana*-type, support this largely open environment interpretation, along with low amounts of *Alnus glutinosa* suggesting a limited amount of local wet woodland.

3.25.36 The pollen sequence from Trench 93 shows strong similarities to that from Trench 72 with a general reduction in local alder woodland and the subsequent expansion in open wetland vegetation communities. Apparent reductions in woodland are likely to be associated with the complex relationship between local pollen production, changing vegetation composition and some wetland expansion. Increases in grazing appear to be identified and are a consequence of the transition from alder woodland to open grassland on the floodplain itself. Some possible local cultivation is hinted towards, though this small amount of pollen could be derived from in washed sediment from elsewhere in the floodplain catchment area.

Table 128: Pollen zone descriptions for Trench 93, Monoliths <M1>, <M2>, <M3> and <M4>

Zone	Depth (m OD)	Description
Tr93-3	1.7375 – 2.32	Dominated by Poaceae (13-55%) and Cyperaceae (14-65%). *Pinus sylvestris* (up to 11%), *Quercus* (up to 4%), *Betula* (up to 1%), *Alnus glutinosa* (2-4%), *Tilia cordata* (up to 3%) *Corylus avellana*-type (1-10%), *Salix* (up to 1%) and *Sorbus*-type (up to 1%) are also present. Dwarf shrub/herb taxa include *Ranunculus acris*-type (up to 3%), *Urtica dioica* (up to 2%), *Rumex acetosella* (up to 2%), Brassicaceae (peak at 36%), *Filipendula* (up to 1%), Fabaceae undiff. (peak at 7%), Apiaceae undiff. (up to 4%), *Convolvulus arvensis* (up to 1%), *Plantago lanceolata* (up to 6%), Rubiaceae (up to 2%), Lactuceae undiff. (1-10%) and *Glyceria*-type (up to 1%). *Sparganium emersum*-type (1-15% TLP + aquatics), *Typha latifolia* (up to 5% TLP + aquatics), *Polypodium* (up to 3% TLP+ pteridophytes), *Pteridium aquilinum* (1-3% TLP+ pteridophytes) and Pteropsida (monolete) indet. (5-13% TLP+ pteridophytes) are present throughout much of the zone. Pollen concentration range between 24186 - 188573 grains cm^{-3}.
Tr93-2	1.18 – 1.7375	Dominated by Poaceae (23-46%) and *Alnus glutinosa* (7-40%).*Pinus sylvestris* (up to 6%), *Quercus* (up to 4%), *Betula* (up to 2%), *Tilia cordata* (up to 2%), *Fraxinus excelsior* (up to %) and *Corylus avellana*-type (2-9%) are present throughout much of the zone, along with occurrences of *Hedera helix* (up to 2%) and *Sambucus nigra* (up to 5%). Dwarf shrub/herb taxa present include *Caltha palustris*-type (up to 1%), *Ranunculus acris*-type (up to 3%), *Urtica dioica* (up to 1%), Chenopodiaceae (1-5%), Brassicaceae (up to 3%), *Filipendula* (up to 2%), Apiaceae undiff. (up to 1%), *Solanum dulcamara* (up to 0.5%), *Convolvulus arvensis* (up to 3%), *Plantago lanceolata* (up to 5%), Lactuceae undiff. (up to 3%), *Solidago virgaurea*-type (1-2%), Cyperaceae (3-38%), *Glyceria*-type (1%) and *Cerealia*-type (up to 0.5%). Aquatic pollen types present include *Nymphaea alba* (up to 0.5% TLP + aquatics), *Potamogeaton natans*-type (up to 0.5% TLP + aquatics), *Sparganium emersum*-type (up to 11% TLP + aquatics) and *Typha latifolia* (up to 2% TLP + aquatics). Pteridophytes include *Polypodium* (1-2% TLP + pteridophytes), *Pteridium aquilinum* (up to 7% TLP + pteridophytes) and Pteropsida (monolete) indet. (7-28% TLP + pteridophytes). Pollen concentration decreases from 30011 to 170353 grains cm^{-3}.
Tr93-1	0.87 – 1.18	Dominated by *Alnus glutinosa* (28-72%). *Quercus* (up to 9%), *Corylus avellana*-type (5-9%), *Betula* (1%), *Tilia cordata* (1-4%), *Salix* (up to 0.5%) and *Hedera helix* (1%) are also present. Dwarf shrub/herb taxa include *Ranunculus acris*-type (up to 1%), *Urtica dioica* (up to 0.5%), *Filipendula* (1%), Apiaceae undiff. (up to 2%), *Plantago lanceolata* (1%), Lactuceae undiff. (up to 1%), *Solidago virgaurea*-type (peak at 53%), Cyperaceae (peaks at 34%) and Poaceae (4-5%). *Sparganium emersum*-type (up to 5% TLP + aquatics), *Typha latifolia* (up to 1%), *Polypodium* (1% TLP + pteridophytes), *Pteridium aquilinum* (up to 0.5% TLP + pteridophytes) and Pteropsida (monolete) indet. (3-5% TLP + pteridophytes) are present. Pollen concentration increases from 8824 to 182667 grains cm^{-3}.

Ostracods and foraminifera

Introduction

3.25.37 Four samples taken from monoliths from Trench 93 have been assessed and analysed for the presence, preservation and environmental significance of their ostracod content. In addition to these four samples, three of the bulk samples taken for the analysis of waterlogged plants and molluscs ((803) <1>, (807) <3> and (807) <5>) contained ostracods and are also discussed here.

3.25.38 The contents of the samples are listed in Table 129 and summarised below.

Monolith samples

3.25.39 The 0.99 to 0.97m OD sample produced one ostracod, a species of the genus *Fabaeformiscandona*. It was a singular right valve of an adult specimen recovered from the >1mm fraction. Molluscs were frequent within this sample including gastropods (*Bithyinia* sp., *Limnaea* sp. and *Theodoxus fluviatilis*) and bivalves (*Piscidium* sp.). Animal bone, possibly amphibian vertebra and long bones were also recorded. Plant remains were common with occasional reed seeds (*Juncus* sp.) noted.

3.25.40 The 1.30 to 1.28m OD sample contained two valves of the ostracod *Candona neglecta*. Molluscs were also frequent in this sample including gastropods (*Bithyinia* sp. and *Theodoxius fluviatilis*) and bivalves (*Piscidium* sp.). Insect egg cases were also noted to be frequent within the sample. Plants including charophyte oogonia, reed seeds (*Juncus* sp.) and charcoal were also recovered.

3.25.41 No ostracods were recovered from the 1.54 to 1.52m OD sample. Insect parts and egg cases were recorded along with a fish tooth (possible roach type) and opercula of *Bithynia* sp. Plant remains were noted including charcoal.

3.25.42 No ostracods were recovered from the 1.94 to 1.92m OD sample. Opercula of *Bithynia* were common as were plant remains including reed seeds (*Juncus* sp.). One radiate diatom was also noted within the sample.

3.25.43 Ostracods from the waterlogged plant/ mollusc samples are summarised below and in Table 129:

- *(803) <1>: One broken ostracod valve Candona candida was noted within this sample.*
- *(807) <3>: One ostracod valve Candona candida was noted within this sample.*
- *(807) <5>: Ostracods were more frequent within this sample including Candona candida (whole carapaces and predominantly adult forms) and Candona neglecta (whole carapaces and predominantly adult forms).*

BULK SAMPLES

3.25.44 The bulk waterlogged plant and mollusc samples are of far greater size than the ostracod samples (1 litre as opposed to 50 millilitres) and were been processed using a larger sieve (300μm as opposed to 63μm), so it is important to note that the results are not directly comparable to those from the monolith samples.

3.25.45 Bulk samples <1> and <3> contained only a few stray valves of *Candona candida*.

3.25.46 Bulk sample <5>, at 1.89-1.94m OD, contained a greater number of ostracods, predominantly adult forms of *Candona candida* and *Candona neglecta*, with the larger mesh size accounting for the loss of some of the juvenile stages. The whole carapaces recovered are of interest and are an indication that the specimens have not undergone significant post depositional transport.

3.25.47 *Candona neglecta* as noted above is generally indicative of freshwater environments including lakes, streams, pond and brooks connected to springs. *Candona candida* and *Candona neglecta* are both usually found in permanent waterbodies although the juveniles of *Candona candida* and the eggs, juveniles and adults of *Candona neglecta* are desication resistant. Both are also known to be tolerant of slightly brackish waters, although given the absence of other indicators these conditions are not implied here. These taxa are often indicative of colder water and a "candida fauna" is often found in post-glacial sediments of small European waterbodies (Boomer 2002). The dessication resistance of these taxa and parthenogenetic reproductice cycle of *Candona candida* make them suitable for pioneer colonisation of habitats.

DISCUSSION

3.25.48 Although only one ostracod was recovered at the base of the sequence from the sample at 0.99-0.97m OD, the *Fabaeformiscandonid* ostracod group to which it belongs are generally restricted to freshwater habitats. The large size of the specimen indicates that it is potentially an epigean (surface dwelling) taxon (Meisch

2000). As it is a singular occurrence of an unattached valve, the ostracod has most likely been reworked. The molluscan remains also indicate freshwater environment of probably flowing water due to the presence of the bivalve molluscs *Pisidium* and a noted higher proportion of opercula to apices ratio of *Bithynia*.

Table 129: Microfaunal and microfloral remains of ostracods/foraminifera samples from Trench 93

Sample	**Monolith <4>**	**Monolith <4>**	**Monolith <3>**	**Monolith <2>**	**<1>**	**<3>**	**<5>**
Context	**(806)**	**(806)**	**(808)**	**(807)**	**(803)**	**(807)**	**(807)**
Depth (mOD)	**0.99-0.97**	**1.30-1.28**	**1.54-1.52**	**1.94-1.92**	**1.74-1.69**	**1.84-1.79**	**2.04-1.99**
Ostracoda							
Candona candida					x	x	xx
Candona neglecta		x					xx
Fabaeformiscandona sp.	x						
Animal remains							
Bone	x						
Egg cases		xx	xx				
Fish tooth			x				
Insect parts			xx				
Molluscs							
Broken molluscs	x	xx					
Bithynia	xxx	xx					
Bithynia operculum	xxx	xx	x	xx			
Limnaea	xxx						
Piscidium sp.	xxx	xx					
Theodoxius fluviatalis	xx	xx					
Unidentified molluscs	xxx	xxx					
Plant remains							
Charcoal		x	xx				
Charophyte oogonia		x					
Juncus sp.	x	x		xx			
Radiate diatoms				x			
Unidentified plant remains	xxx	xxx	xx	x			

Abundance: x – 1-9 specimens; xx – 9-50 specimens; xxx – greater than 50 specimens; xxxx – greater than 100 specimens

3.25.49 At 1.30-1.28m OD *Candona neglecta* although in small numbers is again indicative of freshwater environments with extant examples found preferring relatively cold waters (although it can tolerate temporary temperature increases beyond 20°C) including streams, pond and brooks connected to springs. It has also occasionally been reported from lakes. As with the sample at 0.99-0.97m OD the molluscan remains also indicate a flowing freshwater environment. Plant material including charophyte oogonia and seeds of *Juncus* seeds were also recorded from this sample and together the environmental remains within this sample would indicate a vegetated stream/ brook. Interestingly charcoal was also recorded from his sample.

3.25.50 At 1.54-1.52m OD there were notably no ostracods and less molluscan remains. This may be due to a reducing environment. A few opercula of *Bithynia* were recorded which indicate a flowing freshwater body. Insect remains, a fish tooth and plant remains including frequent (small <500µm) charcoal were also recorded

3.25.51 At 1.94-1.92m OD a similar lack of ostracod and molluscs was noted although with opercula of *Bithynia* more frequent. Frequent seeds of the rush Juncus sp. were recovered, indicating the continuation of a flowing freshwaterbody fringed by reeds.

Molluscs

INTRODUCTION

3.25.52 A series of 12 samples were selected for molluscan analysis from the deposits at Trench 93. The waterlogged samples examined for mollusc remains varied in size from 0.25–6 litres, as six of these samples were sub-sampled from monoliths <3> and <4>. The results are shown tabulated in Table 130 and plotted as a histogram in Figure 48.

3.25.53 The assemblages were dominated by fresh water species throughout the sequence. No brackish water or marine shells were recovered.

CONTEXT (813), MONOLITH SAMPLE 0.87-0.92M OD, VERY DARK GREYING BROWN PEATY, WOODY DETRITAL LENS

3.25.54 Shell numbers were good and the assemblage was dominated by the moving water species, in particular *Valvata piscinalis, Bithynia tentaculata* and *Pisidium* spp. These species favour large bodies of slowly flowing water with dense growths of aquatic plants. The presence of *Theodoxus fluviatilis* is noteworthy as, although this species can be found in both slow-flowing and fast-flowing rivers, Boycott (1936, 141) suggests that it is characteristic of larger rivers, favouring rapidly moving water, and is indicative of a fully riverine environment. There was also a low level presence of *Ancylus fluviatilis*, a species which inhabits quick flowing water. However the almost even ratio of *Bithynia* opercula to apices suggests that this active channel is more likely to be fairly slow flowing at this stage. The other species present in significant percentages within the assemblage was *Valvata cristata* which is found in all kinds of well-vegetated aquatic habitats.

3.25.55 The other species present in significant percentages within the assemblage was *Valvata cristata* which is found in all kinds of well-vegetated aquatic habitats.

3.25.56 There is no real indication of the exploitation of channel edge environments within the composition of the mollusc assemblage.

CONTEXT (806), MONOLITH SAMPLES 1.02-1.05, 1.12-1.14 AND 1.16-1.18M OD, LIGHT OLIVE BROWN SAND WITH DETRITAL LENSES

3.25.57 The samples all produced very high numbers of shells. These assemblages were again dominated by the moving water species, in particular *Valvata piscinalis, Bithynia tentaculata* and *Pisidium* spp., with *Theodoxus fluviatilis* and *Ancylus fluviatilis* also being recovered. Again the ratio of *Bithynia* opercula to apices is generally low.

3.25.58 *Valvata cristata* and *Bathyomphalus contortus, Gyraulus albus* and *Gyraulus crista* were also present in significant numbers. These can all be found in the well vegetated moving water environment suggested by the rest of the assemblage.

3.25.59 There are slight fluctuations within the composition of the mollusc assemblages from this deposit, which coincide with a detrital lens within this context. This is reflected by a decrease in the percentages of *Pisidium* spp., *Bathyomphalus contortus, Gyraulus albus* and *Gyraulus crista* and a rise in *Valvata cristata* in monolith sample 1.12-1.14m OD.

3.25.60 The mollusc assemblages appear to be indicative of a slow-flowing well vegetated channel environment. In addition to this the low numbers of land snails hint that there were some marshier areas, possibly of long grass, in the vicinity together with some limited evidence for trees nearby.

CONTEXT (814), MONOLITH SAMPLE 1.42-1.44M OD, BLACK SILTY CLAY WITH PEATY DETRITAL MATERIAL

3.25.61 Shell numbers were very low within this deposit. The indications of the local aquatic environment inferred from the limited molluscan evidence is one of a flowing water channel. The higher ratio of *Bithynia* opercula to apices may point to increased movement within the channel during this period but the assemblage is small.

CONTEXT (808?), MONOLITH SAMPLE 1.60-1.68M OD, DARK GREY SILTY CLAY

3.25.62 The only molluscan evidence recovered from this deposit was a small fragment of *Lymnaea*.

CONTEXT (807), BULK SAMPLES <1>, <3>, <5>, <7> AND <9>, VERY DARK GREY CLAY TO CLAY LOAM,

3.25.63 There are marked changes between the mollusc assemblages within this deposit.

3.25.64 Shell numbers were good at the base of this deposit in sample <1> and the assemblage was dominated by the fresh-water species. There are marked differences between this assemblage and those from the upper part of deposit (807).

3.25.65 The moving water species form the largest component of the assemblage at 35%, but the dominant species was *Valvata cristata* representing 27% of the shells. The next highest group was the amphibious species, comprised of *Lymnaea truncatula, Anisus leucostoma* and *Aplexa* sp. There is also a marked increase in the marsh loving species *Vallonia pulchella/ excentrica* and in the other land snails, in particular Limacidae. It is also noteworthy that *Theodoxus fluviatilis* and *Ancylus fluviatilis* are no longer present.

3.25.66 This assemblage appears to be reflective of a well-vegetated more channel edge environment. It is more likely that it is indicative of slow-flowing water rather than stagnant or still water, particularly as there is a relatively high ratio of *Bithynia* opercula. There is also an indication of the presence of areas of flooding or standing water on the channel edge together with patches of marshy grassland in the vicinity.

3.25.67 High numbers of shells were recovered from the middle portion of this deposit, samples <3> and <5>. The assemblages mainly comprise freshwater species, in particular the moving water species. These are dominated again by *Valvata piscinalis, Bithynia tentaculata* and *Pisidium* spp., with *Theodoxus fluviatilis* and *Ancylus fluviatilis* also being recovered once more. There are fluctuations between the two samples, with *Valvata piscinalis* increasing and *Pisidium* spp. declining. Also present in significant numbers were shells of *Valvata cristata*, *Bathyomphalus contortus, Gyraulus albus* and *Gyraulus crista.* The small numbers of land snails recovered are indicative of the presence of some areas of marsh and long grass in the vicinity.

3.25.68 These assemblages may be reflective of an increase in the speed of water flow from that observed in sample <1>, but a decrease with an increase of vegetation within the channel sample <5>.

3.25.69 Shell numbers were very low in the upper part of this deposit, samples <7> and <9>. These small assemblages were dominated by Limacidae. Very high numbers of *Bithynia* opercula were recovered, particularly from sample <7>, indicating the very allochthonous nature of this material.

3.25.70 There is likely to have been a degree of movement within this channel environment.

CONTEXT (803/807), BULK SAMPLE <11>, DARK GREY CLAY TO CLAY LOAM.

3.25.71 Shell numbers were still low in this sample and the assemblage was dominated by Limacidae with very high numbers of *Bithynia* opercula, similar to the assemblage at the top of context (807).

Table 130: Mollusc Assemblages from Trench 93

Sample	monolith						<1>	<3>	<5>	<7>	<9>	<11
Context	**(813)**	**(806)**	**(806)**	**(806)**	**(814?)**	**(808?)**	**(807)**	**(807)**	**(807)**	**(807)**	**(807)**	**(803/807)**
Depth top (m OD)	**0.92**	**1.05**	**1.14**	**1.18**	**1.44**	**1.68**	**1.74**	**1.84**	**1.94**	**2.04**	**2.14**	**2.24**
Depth bottom (mOD)	**0.87**	**1.02**	**1.12**	**1.16**	**1.42**	**1.6**	**1.69**	**1.79**	**1.89**	**1.99**	**2.09**	**2.19**
Sample size (l)	**0.3**	**0.3**	**0.3**	**0.3**	**0.35**	**0.25**	**6**	**5**	**5**	**1**	**1**	**1**
Sediment type	**Peaty Detrital layer**	**Sand**	**Peaty Detrital lens**	**Sand**	**Silty clay with peaty detrital material**	**Silty clay**	**Clay to Clay loam**					
Phase	**Early Bronze Age**										**Early RB**	
Land snails												
Carychium cf. *minimum*	-	4	1	2	-	-	1	1	6	-	-	-
Carychium tridentatum	-	2	-	2	-	-	-	-	3	-	-	-
Carychium spp.	-	1	1	-	-	-	-	-	6	-	-	-
Succinea/ Oxyloma spp.	2	11	4	7	-	-	-	-	6	-	-	1
Cochlicopa spp	-	1	2	2	-	-	-	-	4	-	-	-
Vertigo pygmaea	-	-	-	-	-	-	2	-	-	-	-	-
Vertigo spp.	-	-	-	1	-	-	-	-	-	-	-	-
Vallonia costata	-	-	-	-	-	-	1	-	-	-	-	-
Vallonia excentrica/ pulchella	-	2	-	1	-	-	14	1	1	-	-	-
Discus rotundatus	-	4	1	1	-	-	-	-	1	-	-	-
Vitrea sp.	-	-	2	-	-	-	-	-	3	-	-	-
Aegopinella pura	-	-	-	-	-	-	1	-	-	-	-	-
Aegopinella nitidula	2	2	3	3	-	-	-	-	2	-	-	-
Oxychilus cellarius	-	1	-	-	-	-	-	-	-	-	-	-
Limacidae	1	1	-	-	-	-	10	-	-	10	3	19
Trichia hispida	-	2	-	2	-	-	2	-	-	-	-	1
Helicigona lapicida	-	1	2	-	-	-	-	-	-	-	-	-
Cepaea spp.	-	-	-	-	-	-	-	-	3	-	-	-
Fresh and Brackish Water Snails												
Theodoxus fluviatilis	4	36	14	31	+	-	-	13	27	-	-	-
Valvata cristata	15	117	82	78	3	-	53	31	63	-	-	-
Valvata piscinalis	26	253	127	168	2	-	29	43	186	-	-	1
Bithynia tentaculata	2	10	8	6	-	-	-	6	-	-	-	-
Bithynia spp.	17	116	67	96	+	-	14	42	118	-	-	-
Bithynia opercula	24	277	140	337	25	-	579	112	227	835	545	517
Aplexa sp.	-	-	-	1	-	-	-	1	1	-	-	-
Lymnaea truncatula	1	6	2	2	-	-	9	-	-	-	-	-

Sample	**monolith**						**<1>**	**<3>**	**<5>**	**<7>**	**<9>**	**<11**
Context	**(813)**	**(806)**	**(806)**	**(806)**	**(814?)**	**(808?)**	**(807)**	**(807)**	**(807)**	**(807)**	**(807)**	**(803/807)**
Depth top (m OD)	**0.92**	**1.05**	**1.14**	**1.18**	**1.44**	**1.68**	**1.74**	**1.84**	**1.94**	**2.04**	**2.14**	**2.24**
Depth bottom (mOD)	**0.87**	**1.02**	**1.12**	**1.16**	**1.42**	**1.6**	**1.69**	**1.79**	**1.89**	**1.99**	**2.09**	**2.19**
Sample size (l)	**0.3**	**0.3**	**0.3**	**0.3**	**0.35**	**0.25**	**6**	**5**	**5**	**1**	**1**	**1**
Sediment type	**Peaty Detrital layer**	**Sand**	**Peaty Detrital lens**	**Sand**	**Silty clay with peaty detrital material**	**Silty clay**	**Clay to Clay loam**					
Phase	**Early Bronze Age**										**Early RB**	
Lymnaea glabra	-	-	-	-	-	-	-	2	-	-	-	-
Lymnaea peregra	1	9	1	-	-	-	-	3	-	-	-	-
Lymnaea spp.	7	41	12	18	-	+	23	21	30	-	-	1
Planorbis planorbis	2	17	6	5	1	-	-	5	33	-	-	-
Anisus leucostoma	1	2	-	-	-	-	7	-	-	-	-	-
Bathyomphalus contortus	2	28	8	20	-	-	-	4	5	-	-	-
Gyraulus albus	6	33	6	16	-	-	-	7	31	-	-	-
Gyraulus crista	1	34	11	20	1	-	4	19	38	-	-	-
Ancylus fluviatilis	4	12	6	7	1	-	-	14	27	-	-	-
Acroloxus lacustris	3	8	2	3	-	-	1	17	14	-	-	-
Pisidium amnicum	1	1	1	1	-	-	1	2	1	-	-	-
Pisidium spp.	21	121	36	62	4	-	26	101	111	1	-	1
Taxa	17	25	20	22	6	0	15	16	22	2	1	6
Total	118	876	405	555	12	0	198	333	720	11	3	24
Shannon Index	2.304	2.278	2.07	2.15	1.633	0	2.122	2.203	2.323	0.305	0	0.847
Brillouin Index	2.097	2.224	1.985	2.09	1.194	0	2.002	2.115	2.262	0.218	0	0.644
Shannon - Brillouin Index	0.207	0.054	0.086	0.07	0.439	0	0.121	0.089	0.06	0.087	0	0.204
Delta 2	0.8654	0.85	0.814	0.83	0.7778	0	0.848	0.845	0.8624	0.165	0	0.3646
Delta 4	6.8622	5.71	4.436	5.06	5.6	0	5.756	5.56	6.3338	0.222	0	0.614
% Open country species	0	0.23	0	0.36	0	0	8.59	0.3	0.14	0	0	0
% Intermediate species	0.85	0.46	0.49	0.72	0	0	6.06	0	0.97	90.91	100	83.3
% Shade - loving species	1.69	1.71	2.47	1.44	0	0	1.01	0.3	2.92	0	0	0
% Unassigned species	1.69	1.26	0.99	1.26	0	0	0	0	0.83	0	0	4.17
% Amphibious species	1.69	0.91	0.49	0.54	0	0	8.08	0.3	0.14	0	0	0
% Intermediate species	8.47	11.87	6.42	10.1	8.33	0	2.02	9.91	10.28	0	0	0
% Ditch species	16.95	16.21	22.22	15.5	33.33	0	27.27	15.92	15.28	0	0	0
% Moving water species	45.76	48.86	55.06	55.7	25	0	22.22	36.04	49.86	0	0	4.17
% Unassigned species	23.73	18.49	11.85	14.4	33.33	0	24.75	37.24	19.58	9.09	0	8.33

<u>DISCUSSION</u>

3.25.72 The mollusc assemblages obtained from these deposits are all indicative of a permanently wet moving water channel environment. Generally the channel appears likely to have been well vegetated and slow-flowing during the beginning of the Early Bronze Age, with vegetation levels and water speed fluctuating up through the deposits, reflecting the changing nature of the channel. At times the channel appears to be less active and there is an increase in the amount of localised flooding or standing water together with areas of marshy grassland in the vicinity of the channel edge.

3.25.73 There are similarities between these assemblages and those seen at Temple Mills Depot (Bates and Stafford in press) and at St Stephen's East (Wilkinson 2000) as well as some of those assemblages observed at Trench 71. Generally where molluscs were recovered in numbers, the assemblages were dominated by *Valvata piscinalis, Bithynia* spp., *Pisidium* spp. and *Valvata cristata* and reflect permanently flowing riverine environments.

3.25.74 This sequence can be compared with other analysed sequences of the same periods in the area and this will establish whether these environments are very localised and should enable a picture of the wider landscape to be ascertained

3.26 Trench 94 (PDZ6 WET 6.09)

Introduction

3.26.1 Trench 94 was located within the Wetlands area in the central north part of the site immediately to the east of the modern River Lea, and within the projected limits of the Palaeo-Lea channel as mapped in the deposit modelling.

Sediments

3.26.2 Sediment descriptions and interpretations can be found in Table 131, with section drawings shown in Figure 49.

Table 131: Sediment descriptions for Monoliths <1> to <6>, Trench 94

Level (m OD)	Context (with levels from site dwg))	Sediment description	Interpretation
3.16 to 1.96	901 (3.12 to 3.04) 902 (3.04 to 2.10) 903 (2.10 to 1.47)	10YR4/ 3 brown clay, stonefree, quite well developed coarse crumb to fine blocky structure, common medium to coarse clear to faint iron mottling. Clear boundary	Accretional floodplain soil, likely marshy meadow or similar
1.96 to 1.54	903 (2.10 to 1.47)	10YR3/ 2 very dark greyish brown clay loam, fine faint clear mottling of slightly redder iron staining. Occasional very fine tendril-like mineral inclusions filling fine rootlet holes/ macropores; non calcareous and presumably iron-mineral (faint yellowish brown) – product of gleying/ redox, particularly at 1.76-1.69 OD. Also occasional very small nodular concretions, again a product of gleying. Weak angular blocky structure observed. Abrupt amd convoluted boundary.	Alluvium, probably channel edge, with signs of incipient soil formation and repeated phases of wetting and drying. Essentially interface between channel edge mud and marshy meadow phases.
1.54 to 1.44	903 (2.10 to 1.47)	10YR3/ 1 very dark grey silty clay loam, fine roots and rootlets (w/ l) soft, sticky and stonefree. Clear boundary.	Choking off of peat formation by rising water and alluviation.
1.44 to 1.06	904 (1.47 to 1.16)	7.5YR3/ 1 very dark greyish brown (slightly reddish) peat, quite dense and solid with visible specks of quartz sand. Appears slightly humified but recognisable plant remains are in evidence, horizontal layering is faint but observable. The boundary is abrupt but undulates quite sharply, from 1.06m OD on north side of 0.1m wide mono to 1.13m OD on south side. Possible macro-scale bioturbation (i.e.large mammal scale?)	Peat; well vegetated shallow water/ wet terrestrial environment, probable reedbeds.
1.06 to 0.84	906 (1.16 to 0.61)	10YR5/ 2 greyish brown clay loam, coarse diffuse distinct mottles of 7.5YR4/ 4 brown iron staining, some mineralised rootlets, fine to medium angular blocky structure. Slightly calcareous (slight to medium reaction with HCl). Clear boundary.	Channel edge mud with wetting/ drying
0.84 to 0.47	906 (1.16 to 0.61) 910 (below 0.61)	10YR4/ 1 dark grey clay loam, horizontal layering and visible laminae of siltier and sandier fine laminae, becoming increasingly sandy down profile. Calcareous to highly calcareous (vigourous HCl), occasional recognisable plant remains, including definite roots but some probable twigwood horizontally.	?edge of active channel.

3.26.3 The lower sequence is composed of horizontally layered calcareous fine sediments with laminae of silt and sand, with sand content decreasing up profile (0.47-0.84m OD). These give way to a mottled clay loam; a probable channel edge mud with evidence of wetting and drying (to 1.06m OD). Above this, a peat to 1.44m OD represents a probable reedbed, which is choked off by fine alluvium representing rising water levels to 1.54m OD. Above this is more probable channel edge alluvium to 1.96m OD, with signs of incipient soil formation and repeated phases of wetting and drying (essentially interface between channel edge mud and marshy meadow phases). From 1.96-3.16m OD an accretional floodplain soil is present, probably representing a marshy meadow or similar.

Dating

3.26.4 A total of three radiocarbon dates have been obtained, as shown in Table 132. Due to the dearth of waterlogged material from most of the sequence, the dates are concentrated on the peat unit (904).

Table 132: Radiocarbon dates from Trench 94

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<2> (904)	1.38 to 1.36	Sediment	SUERC-31378	6935±30	-28.2	5890 - 5730 cal BC	2
<18> (904)	1.18 to 1.13	*Ranunculus* sp. x9; *Schoenoplectus* x5; *Lycopus* x7; *Carex* x4.	SUERC-31379	9945±35	-26.4	9660 - 9290 cal BC	1
<2> (904)	1.13 to 1.11	*Ranunculus* arb x6; *R.* subg. *Batrachium* x23; *Lycopus europaeus* x3; *Carex* x4.	SUERC-31377	9735±35	-27.0	9290 - 9150 cal BC	1

3.26.5 All of the returned dates fall within the early post-glacial to Mesolithic period. Those from the lower deposits from 1.18-1.13m OD and from 1.13-1.11m OD produced Early Mesolithic dates of 9660-9290 cal BC (SUERC-31379, 9945±35 BP) and 9290-9150 cal BC (SUERC-31377, 9735±35 BP) respectively. These two dates were on seeds of buttercup (*Ranunculus* sp.), sedges (*Carex* sp.), club-rush (*Schoenoplectus* sp.) and gypsywort (*Lycopus europaeus*).

3.26.6 There was no plant material from the uppermost sample suitable for dating, and a date on bulk sediment from 1.38 to 1.33m OD yielded a Late Mesolithic date of 5890-5730 cal BC (SUERC 31378, 6935±30 BP).

3.26.7 Despite the lack of physical variation within the context dated (all three dates were from the same peat unit), the Late Mesolithic date from the upper peat (obtained from bulk sediment rather than plant macros) is supported by both the plant macrofossil and pollen evidence.

Plant macrofossils

3.26.8 Eight samples were examined from the deposits in this trench for waterlogged material (Table 133). Five of the samples were 1 litre subsamples from bulks, the remaining three were taken for radiocarbon from 300ml subsamples from monoliths.

3.26.9 Most of the samples several produced little to no waterlogged material, and only the bulk and monolith samples from 1.11 to 1.18m OD had any significant quantities of plant material.

3.26.10 The samples from between 1.11 and 1.18m OD had seeds of buttercup (*Ranunculus* sp.), gypsywort (*Lycopus europaeus*), along with those of sedges (*Carex* sp.), club-rush (*Schoenoplectus* sp.) and water-crowfoot (*Ranunculus* subg. *Batrachium*). Single seeds of woundwort (*Stachys* sp.), mint (*Mentha* sp.), thistles (*Carduus/ Cirsium* sp.) and water-plantain (*Alisma plantago-aquatica*) were also recorded. The samples also contained numerous small fragments of charcoal, along with a charred seed of sedge (*Carex* sp.) and a probable fragment of sedge stem.

3.26.11 The seeds are generally indicative of a wet marsh/ grassland environment. There is no evidence for trees in the immediate vicinity in the sample and similarly there generally little evidence for either birch or pine from the pollen evidence for this part of the sequence (see *Pollen*).

3.26.12 The presence of charred material, albeit in limited quantities, in particular of stems and seeds of Cyperaceae, at this date is of some interest. Potentially Early Mesolithic sequences to the south-west at Uxbridge (Wessex Archaeology 2006; Lewis and Rackham 2011) also yielded similar charred remains and would seem to point to either the natural or deliberate burning of such vegetation being a common occurrence during this period.

3.26.13 The remainder of the sequence appears to have dried out, and no remains of waterlogged material are present. The presence of worm cocoons in the samples at 1.33 to 1.48m OD are also consistent with this drying out.

Table 133: Waterlogged plant macrofossils from Trench 94

Sample		<10>	<12>	<14>	<mono>	<16>	<18>	<mono>	<mono>
Context		**(903)**	**(904)**	**(904)**	**(904)**	**(904)**	**(906)**	**(906)**	**(906)**
Depth top (m OD)		**1.58**	**1.48**	**1.38**	**1.38**	**1.28**	**1.18**	**1.13**	**0.5**
Depth bottom (m OD)		**1.53**	**1.43**	**1.33**	**1.36**	**1.23**	**1.13**	**1.11**	**0.8**
Sample Volume (litres)		**1**	**1**	**1**	**0.3**	**1**	**1**	**0.3**	**0.3**
Date				**5890-5730 BC**			**9660-9290 BC**	**9290-9150 BC**	
Ranunculus subg. *Ranunculus* (arb)	buttercup	-	-	-	-	-	12	6	-
Ranunculus subg. *Batrachium*	water-crowfoots	-	-	-	-	-	16	23	-
Stachys sylvatica	woundwort	-	-	-	-	-	1	-	-
Lycopus europaeus	gypsywort	-	-	-	-	-	11	3	-
Mentha sp.	mint	-	-	-	-	-	1	-	-
Callitriche sp.	water-starwort	1	-	-	-	-	-	-	-
Carduus/ Cirsium sp.	thistle	-	-	-	-	-	1	-	-
Alisma plantago-aquatica	water-plantain	-	-	-	-	-	1	+	-
Schoenoplectus lacustris	common club-rush	-	-	-	-	-	11	-	-
Carex sp. (flat)	sedge (lenticular)	-	-	-	-	-	1	-	-
Carex sp. (trigonous)	sedge (trigonous)	-	-	-	-	-	7	4	-
Charred Cyperaceae type basal culm		-	-	-	-	-	1C	-	-
Carex trig (charred)		-	-	-	-	-	1C	-	-
Charcoal		-	-	-	-	-	++	-	-
Worm coccoons		-	+	+	-	-	-	-	-

$^{+}$C – denotes material that was preserved by charring. cf. compares with. Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more.

Pollen

3.26.14 Pollen assessment was carried out on eleven samples from five overlapping monoliths in Trench 94: Monoliths <M1>, <M2>, <M3> and <M4>. Results of pollen assessment are shown in Figure 50, and described in Table 134. Three local pollen assemblage zones (lpaz) have been recognised, using the prefix Tr93- to identify each one.

3.26.15 The radiocarbon dates at the top of LPAZ Tr94-2 of 9290-9150 cal BC (SUERC-31377, 9735±35 BP) and 9660-9290 cal BC (SUERC-31379, 9945±35 BP) confirm that LPAZ Tr94-1 and -2 contain a Late Pleistocene/ Early Holocene pollen sequence and therefore contemporary with sequences from Trenches 71 and 118.

3.26.16 LPAZ Tr94-1 shows a pollen assemblage dominated by Poaceae (grasses) and Cyperaceae (sedges) with *Corylus avellana*-type (hazel), *Pinus sylvestris* (pine) and *Betula* (birch) important components. Also present throughout the zone are *Quercus* (oak) and *Alnus glutinosa* (alder). The presence of these deciduous woodland taxa is unexpected and may be the result from the intrusion of later pollen, as found in Trench 71. The high amounts of *C. avellana*-type (up to 20% TLP) is notable. If the pollen assemblage does contain this large amount of intrusive sediment, then its reliability is questionable. However, the high percentages (in comparison to those from other Lea Valley sites) might also imply that some deciduous taxa were locally present at this early time, or may be derived from *Myrica gale* (bog myrtle) whose plant remains have been found in a similar dated sequence nearby at Crown Wharf Ironworks (Stephenson 2008; Branch *et al.* 2006). The elevated *Betula* values and persistence of *Salix* (willow) also correlate with the sequences of Trenches 71 and 118. However, there is a general absence of taxa that would be correlated with cold conditions (eg. *Helianthemum* (rock rose), *Saxifraga oppositifolia*-type (purple saxifrage) and *Artemisia*-type (mugwort)) which were found in other contemporary sequences.

3.26.17 There is a reduction in *Betula* in LPAZ Tr94-2 with a notable increase in *Sparganium emersum*-type (bur-reeds), *Typha latifolia* (bulrush) and peak in *Filipendula* (meadowsweet). These increases correlate with LPAZ Tr71-1 and Tr118 M122-1. The increase in *Alnus glutinosa* and persistent presence of *Corylus avellana*-type may again be due to intrusive reworked pollen, though the arrival and expansion of *Alnus* during the Holocene has been subject to much debate in Britain (eg. Chambers and Price 1985; Bush and Hall 1987; Bennett and Birks 1990; Tallantire 1992). Some studies have suggested that *Alnus* (most probably *Alnus incana*) may even have been present during the late glacial (Wilkinson *et al.* 2000) which is supported by the presence of *Alnus* sp. seeds in the basal deposits from Temple Mills Depot, to the north of this trench (Bates and Stafford in press), and at Pannel Bridge, Sussex from deposits dated to 9130–8320 cal BC (SRR 2891, 9380±100 BP; Waller 1993). The persistence of *Pinus sylvestris* throughout the LPAZ probably indicates that it was locally present.

3.26.18 The change in the pollen assemblage across the LPAZ Tr94-2/ 3 boundary probably indicates that the sequence is truncated. This is also implied by the radiocarbon date at 1.38-1.36m OD of 5890-5730 cal BC (SUERC-31378, 6935±30 BP), c. 3400 cal yrs younger than the radiocarbon dates 0.20m deeper in the sequence. This upper pollen assemblage shows a sequence dominated by *Quercus*, *Corylus avellana*-type and *Alnus glutinosa* with *Ulmus* (elm) and the occurrence of *Tilia cordata* (small leaved lime) at the very top of the sequence. The local wetland vegetation is still reflected by the presence of Cyperaceae, Poaceae and *Sparganium emersum*-type, with *Salix* and *Alnus glutinosa* also associated with this. The consistent presence of *Pinus sylvestris* probably also implies it was locally present.

3.26.19 The pollen sequence from Trench 94 covers the Late Pleistocene/ Early Holocene. The basal deposits show the active channel is situated within an open landscape. Similar to other early sequences from the Lea Valley, a high component of deciduous taxa is found in the basal deposits and it is questionable whether this represents intrusive material or contemporary vegetation. The upper pollen assemblage dates from the Late Mesolithic and shows mixed deciduous woodland established locally.

Table 134: Pollen zone descriptions for Trench 94, Monoliths <1>, <2>, <3> and <4>

Zone	Depth (m OD)	Description
Tr94-3	1.52 to 1.25	Dominated by *Quercus* (8-21%), *Alnus glutinosa* (5-52%) and *Corylus avellana*-type (18-39%), with *Pinus sylvestris* (6-15%) and *Ulmus* (2-5%). *Tilia cordata* (up to 1%), *Fraxinus excelsior* (up to 1%) and *Salix* (1-4%) are also present. Dwarf shrub/herb taxa include *Ranunculus acris*-type (up to 1%), Apiaceae undiff. (up to 1%), Cyperaceae (2-9%) and Poaceae (6-9%). *Sparganium emersum*-type (2-3% TLP + aquatics) and Pteropsida (monolete) indet. (3-17% TLP + pteridophytes) increase towards the end of the zone. Pollen concentrations vary between 272565 and 1009731 grains cm^{-3}.
Tr94-2	1.25 to 0.69	Dominated by Poaceae (22-42%) and Cyperaceae (28-48%), with *Pinus sylvestris* (8-13%) and *Corylus avellana*-type (2-10%). *Quercus* (up to 1%), *Betula* (up to 2%), *Alnus glutinosa* (2%) and *Salix* (up to 1%) are also present. Dwarf shrub/herb taxa includes *Ranunculus acris*-type (up to 2%), Caryophyllaceae undiff. (up to 2%), Brassicaceae (up to 4%), *Filipendula* (up to 10%), *Rubus*-type (up to 1%), Fabaceae undiff. (up to 1%), Apiaceae undiff. (up to 2%), *Stachys*-type (up to 2%), Lactuceae undiff. (up to 1%) and *Artemisia*-type (up to 1%). *Sparganium emersum*-type (1-4% TLP + aquatics), *Typha latifolia* (up to 8% TLP + aquatics), *Pteridium aquilinum* (up to 2% TLP + pteridophytes) and Pteropsida (monolete) indet. (2-7% TLP + pteridophytes) are also present. Pollen concentrations range between 12971 and 158308 grains cm^{-3}.
Tr94-1	0.69 to 0.49	Dominated by Poaceae (21-27%) and Cyperaceae (31-46%), with *Pinus sylvestris* (6-18%) and *Corylus avellana*-type (6-15%). *Quercus* (up to 2%), *Betula* (1-5%), *Alnus glutinosa* (1-2%) and *Salix* (1-2%) are also present. Dwarf shrub/herb taxa include *Ranunculus acris*-type (1-2%), Brassicaceae (up to 2%), *Filipendula* (1-2%), *Rubus*-type (up to 0.5%), Apiaceae undiff. (1-3%), Lactuceae undiff. (up to 1%) and *Solidago virgaurea*-type (up to 1%). *Sparganium emersum*-type (up to 2% TLP + aquatics), *Pteridium aquilinum* (up to 2% TLP + pteridophytes) and Pteropsida (monolete) indet. (7-8% TLP + pteridophytes) are also present. Pollen concentrations range between 13801 and 33175 grains cm^{-3}.

Ostracods and foraminifera

3.26.20 The contents of the samples are listed in Table 135 and summarised below.

3.26.21 The 0.54m OD sample produced no ostracods. Fossil Rotaliid foraminifera were recovered including *Globorotalia truncatulinoides*. Plant remains were also frequent within the sample. The 0.93m OD sample contained one ostracod valve of the genus *Eucypris* sp. Occasional fossil Rotaliid foraminifera were recovered. Plant remains were frequent within the sample. No ostracods were recovered from the 1.52 and 1.84m OD samples, though plant remains were frequent within both.

3.26.22 In conclusion, only one ostracod was recovered from the samples, at 0.93m OD. The specimen is a juvenile right valve of the genus *Euypris* sp. As the specimen is juvenile it is not possible to revise the taxonomy to any greater level and therefore make any comment about its environmental preferences.

3.26.23 The fossil foraminifera present are thought to be reworked predominantly from underlying marine Cretaceous and Tertiary rocks. *Globorotalia truncatulinoides* recorded in the sample at 0.94m OD is however a more recent planktonic form usually associated with Pleistocene and Holocene deep marine sediments.

3.26.24 All of the samples contained plant remains. It is possible that a reducing depositional and post-depositional environment has caused the dissolution of ostracod valves within these sediments. It is noted that very few calcareous remains occurred within these samples.

Table 135: Microfaunal and microfloral remains from Trench 94

Depth (m OD)	0.54	0.93	1.52	1.84
Ostracoda				
Eucypris sp.		x		
Plant remains				
Unidentified plant remains	xxx	xxx	xxx	xxx
Other				
fossil foraminifera	xx	x		

Abundance:x – 1-9 specimens; xx – 9-50 specimens; xxx – greater than 50 specimens; xxxx – greater than 100 specimens

3.27 Trench 109 (PDZ8 5.36(c))

Introduction

3.27.1 This trench is located towards the southern end of the Site, at the interface of a raised gravel area and channel shown in the deposit modelling. It was selected for further work due to its organic deposits and potential for elucidating channel conditions and chronology in this area, as well as providing palaeoenvironmental proxy data (Figure 51).

Sediments

3.27.2 Sediment descriptions and interpretations can be found in Table 136.

Table 136: Sediment descriptions for Monolith <1>, Trench 109

Level (m OD)	Context	Sediment description	Interpretation
1.35 to 1.15	37	2.5YR4/ 2 dark greyish brown silty clay loam, stonefree, slight platy structure, moderately calcareous (moderate reaction with 10% HCl). Occ. shell fragments. Slighly humic. Sharp boundary	Alluvium, shallow water
1.15 to 0.55	38	10YR3/ 2 very dark greyish brown, extremely humic silty clay loam. Peaty but not peat, no recognisable plant remains except common vertical rootlets. Band of above context included near top of this one at1.13-1.11m OD; sharp boundaried but non-planar. Likely bioturbation from large animal. Non-calcareous (no reaction with HCl) NB Microscopic crystalline inclusions observed (sparkle effect in seds) – on exam at x100 – x400 is quite common hexagonal colourless crystals, unreactive with HCl – very likely silica.	Very humic fine sediment, non calcareous, likely channel edge deposit

3.27.3 Solid basal gravels were not recorded in Trench 109, which in a deeper sondage reached 0.38m OD; however gravely clays were observed at this depth. Above the gravely clays a soft grey clay with rooting (57) was noted. These layers were interpreted as Pleistocene, although the evidence for this is unclear.

3.27.4 Above the soft clay, and included in the sampled monolith <1> from 0.55 to 1.15m OD, was an extremely humic silty clay loam (37). This was recorded on Site as a peat, but very few recognisable plant remains were observable (although small colourless hexagonal prismatic silica crystals were observed during sediment description). The sediment was non-calcareous and very probably represents a channel-edge environment.

3.27.5 Overlying the humic layer from 1.15 to 1.35m OD+ a moderately calcareous silty clay loam representing shallow water conditions was sampled. Above this level the sondage finished and no relationship could be established with overlying deposits in the trench, which included overbank alluvial deposits.

Dating

3.27.6 Two radiocarbon dates have been obtained from Monolith <1> (Table 137).

Plant macrofossils

3.27.7 Two bulk samples, each of 5 litres, were examined from contexts (37) and (38), alongside two smaller samples processed from these same approximate levels within the monolith for radiocarbon dating (Table 138).

3.27.8 Waterlogged material submitted from the two smaller samples indicated a Middle to Late Iron Age date for the lower deposits within context (38) and a Romano-British date for the top of context (38). The overlying context (37) was undated but assumingly dates to the later Romano-British to Early Saxon period.

Table 137: Radiocarbon dates from Trench 109

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<1> (38)	1.02 to 1.00	Seeds: 5 x *Eleocharis palustris*, *Carex,* 3 x *Ranunculus* subg. *Batrachium*, *Rubus* sp., *Mentha*	SUERC-31386	1885±30	-25.0	cal AD 60-220	1
<1> (38)	0.60 to 0.58	Seeds: 5x *Eleocharis* sp, 3x *Ranunculus* sp. 3x *Mentha*, 4x *Carex* sp.	SUERC-31387	2125±30	-25.0	350-50 cal BC	1

3.27.9 The most abundant seeds within the lower Middle to Late Iron Age samples were those of buttercup (*Ranunculus* sp.), probably mainly either creeping buttercup (*Ranunculus repens*) or meadow buttercup (*Ranunculus acris*) and rushes (*Juncus* sp.) which are indicative of wet, marshy grassland. Other relatively common remains associated with such marshy, wetland environments included seeds of bogbean (*Menyanthes trifoliata*), mint (*Mentha* sp.), sedges (*Carex* sp.), common spikerush (*Eleocharis palustris*) and club-rush (*Schoenoplectus* sp.). While those of knotgrass (*Polygonum aviculare*), dock (*Rumex* sp.), thistles (*Carduus/ Cirsium* sp.), silverweed (*Potentilla argentea*) and common nettle (*Urtica dioica*) all are associated with the drier, more disturbed, parts of such grassland environments.

3.27.10 Less frequent but also associated with wet grasslands, pastures and pastures, were seeds of lesser spearwort (*Ranunculus flammula*), celery-leaved buttercup (*Ranunculus sceleratus*) and common meadow-rue (*Thalictrum flavum*). Seeds of aquatic species were also relatively well represented and included those of water-plantain (*Alisma plantago-aquatica*), pondweed (*Potamogeton* sp.), branched bur-reed (*Sparganium erectum*) and duckweed (*Lemna* sp.).

3.27.11 The dated Romano-British sample from the monolith was broadly similar to the aforementioned samples, but had mainly seeds of aquatics and wetland species, including water-crowfoot (*Ranunculus* subg. *Batrachium*), rushes (*Juncus* sp.), sedges (*Carex* sp.), water-plantain (*Alisma plantago-aquatica*), mint (*Mentha* sp.) and common spikerush (*Eleocharis palustris*). The only non-wetland species was of bramble (*Rubus* sp.), represented by a single seed.

3.27.12 The later samples dating after the early to middle Romano-British, potentially to the Saxon period or later, were dominated by seeds of aquatics, mainly water-plantain (*Alisma plantago-aquatica*), fool's watercress (*Apium nodiflorum*) and pondweed (*Potamogeton* sp.). A few seeds of wetland species, such as bogbean (*Menyanthes trifoliata*), water-pepper (*Persicaria hydropiper*), bristle club-rush (*Isolepis setacea*), club-rush (*Schoenoplectus* sp.) and common reed (*Phragmites australis*), were also present.

3.27.13 Terrestrial environments were represented by seeds of orache (*Atriplex* sp.) elder (*Sambucus nigra*), black horehound (*Ballota nigra*), wild teasel (*Dipsacus* cf. *fullonum*) and catkins of probable willow (*Salix* sp.), though the later can often be found in a wetland environment as well. These are all more indicative of hedges, wastelands and wayside shrub.

3.27.14 The earlier samples dated to the Iron Age indicate mainly rough grassland with wetland and marshland elements assumingly increasing closer to the channel. The later samples in the dominance of aquatics reflect the increasingly influence of the channel edge environment.

3.27.15 While alder was noted in the pollen sequence between 0.57 and 0.72m OD associated with the Early to Middle Iron Age no remains of alder were present in either sample and generally the immediate environment seems to be relatively open during this and subsequent periods.

Table 138: Plant waterlogged macrofossils dates from Trench 109

Sample		<3>	<M1>	<2>	<M1>
Context		**(37)**	**(38)**	**(38)**	**(38)**
Depth top (m OD)		**1.35**	**1.00**	**1.15**	**0.60**
Depth bottom (m OD)		**1.15**	**1.02**	**0.55**	**0.58**
Sediment Type		**Alluvial clay**		**Clayey peat**	
Period			**Romano-British**		**Middle-Late Iron Age**
Sample Size (litres)		**5**	**0.3**	**5**	**0.3**
Ranunculus subg. *Ranunculus* (arb)	buttercup	-	-	++	+
Ranunculus cf. *auricomus*	goldilocks buttercup	-	-	1	3
Ranunculus sceleratus	celery-leaved buttercup	-	-	1	-
Ranunculus flammula	lesser spearwort	-	-	cf.1	-
Ranunculus subg. *Batrachium*	water-crowfoots	-	4	2	-
Thalictrum flavum	common meadow-rue	-	-	1	-
Urtica dioica	common nettle	-	-	+	-
Atriplex sp.	orache	1	-	-	-
Persicaria hydropiper	water-pepper	+	-	-	-
Polygonum aviculare	knotgrass	-	-	+	-
Rumex sp.	dock	-	-	+	-
Rumex crispus (whole fruits)	curled-leaved dock	+	-	-	-
Viola sp.	violet	-	-	1	-
Salix catkin bud scale	willow bud scale	cf.+	-	-	-
Rubus sp.	bramble	-	1	+	-
Potentilla anserina	silverweed	-	-	+	-
Potentilla erecta/ reptans	tormentil/ creeping cinquefoil	-	-	2	-
Apium nodiflorum	fool's water-cress	++	-	-	-
Menyanthes trifoliata	bogbean	+	-	2	-
Ballota nigra	black horehound	1	-	-	-
Mentha sp.	mint	-	1	+	-
Callitriche sp.	water-starwort		-	-	+
Sambucus nigra	elder	2	-	-	-
Dipsacus cf. *fullonum*	wild teasel	cf.1	-	-	-
Carduus/ Cirsium sp.	thistle	-	-	2	-
Alisma plantago-aquatica	water-plantain	+++	+	+	+
Potamogeton sp.	pondweeds	+++	-	+	-
Lemna sp.	duckweeds	-	-	1	-
Juncus sp.	rush	-	+	+++	-
Eleocharis sp.	spike-rush	-	5	+	-
Schoenoplectus sp.	club rushes	1	-	+	-
Isolepis setacea	bristle club-rush	1	-	-	-
Carex sp. (flat)	sedge (lenticular)	-	4	+	-
Carex sp. (trigonous)	sedge (trigonous)	-	1	+	-
Phragmites australis Seed	common reed	1	-	-	-
Sparganium erectum (fruit/ achene)	branched bur-reed	-	-	+	-
Large roots		-	-	3	-
Vitreous coal/charcoal conglomerate		-	-	1	-

[+]C – denotes material that was preserved by charring. cf. compares with. Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more

Pollen

3.27.16 Pollen assessment was carried out on seven samples from monolith <1> in Trench 109. The pollen diagram (Figure 52) has been split into two local pollen assemblage zones (LPAZ), Tr109-1 and -2 – see Table 139 for zone descriptions.

3.27.17 LPAZ Tr109-1 shows the local presence of *Alnus glutinosa* (alder), Cyperaceae (sedges), Poaceae (grasses) and *Sparganium emersum*-type (bur reeds) locally abundant, forming part of the wetland community. Taxa associated with this wetland vegetation include *Ranunculus acris*-type (buttercup), *Caltha palustris*-type (marsh marigold), *Filipendula* (meadowsweet), *Glyceria*-type (sweet-grass), *Arrhenatherum*-type (false oat-grass and reed sweet-grass) and *Equisetum* (horsetails). Woodland taxa present in low amounts include *Quercus* (oak) and *Corylus avellana*-type (hazel), though the low values suggest that these are not locally dominant and instead present either as small patches close to the floodplain or located further from the sample site. Patches of woodland are also implied throughout the sequence by the presence of taxa such as *Stellaria holostea* (greater stichwort), *Vicia sylvatica*-type (wood vetch) and *Acer campestre* (maple). The radiocarbon date associated with the base of the sequence gave a calibrated date of 350-50 cal BC (SUERC-31387, 2125±30 BP) indicating that the sequence is of Middle to Late Iron Age date.

3.27.18 Poaceae is dominant and although some will be associated with the local wetland vegetation, it is likely to also be recording its presence within a wider open floodplain environment. These open areas would have been suitable for grazing, with the presence of grassland also indicated by taxa such as *Silene vulgaris*-type (bladder campion). The presence of *Rumex acetosella* (sheep’s sorrel), *Plantago media* (hoary plantain), *Plantago lanceolata* (ribwort plantain) and *Pteridium aquilinum* (bracken) are probably indicative of local ground disturbance caused by grazing. This is supported by the presence of evidence of bioturbation possibly from large animals within the sediments of context (37). Taxa including Chenopodiaceae (goosefoots and oraches), *Urtica dioica* (common nettle) Brassicaceae (cabbage and mustard family), *Cirsium*-type (thistle), *Cichorium intybus*-type (dandelion/ chicory) and *Solidago virgaurea*-type (daises/ goldenrods) may indicate areas of waste or disturbed ground.

3.27.19 Within LPAZ 109-1 a single pollen grain of *Limonium* (sea lavender) recovered which may indicate some possible estuarine influence upon the site, especially as it is found in conjunction with the increase of Chenopodiaceae (goosefoots and oraches) pollen. Pollen of the latter is commonly found to increase within saltmarsh deposits as it occupies the exposed mud. A similar pollen assemblage was also recovered from Trench 67, though there dismissed as indicating local estuarine/ brackish conditions due to its geographical location and/ or storm surges. However, the diatom assemblage from the upper sediments (1.22m OD) does contain a number of halophilous, mesohalobus and allochthonous polyhalobous diatoms indicative of direct contact with tidal water. The presence of pollen which may be associated with an estuarine influence may have become deposited upon the site as a result of a northward tidal surge and the incorporation of reworked estuarine sediments into the sites alluvium.

3.27.20 LPAZ Tr109-2 shows further reductions in *Alnus glutinosa* and some other wetland taxa (notably Cyperaceae and *Sparganium emersum*-type), probably replaced by grass dominated wetland taxa, along with the continuation of taxa such as *Glyceria*-type and *Arrhenatherum*-type. A radiocarbon date from the base of LPAZ Tr109-2 gave a calibrated date of cal AD 60-220 (SUERC-31386, 1885±30 BP) indicating that it is of early to middle Romano-British age.

3.27.21 In conclusion, the trench shows that an initial floodplain wet woodland environment existed consisting of alder woodland with sedge-reed marshy deposits locally abundant. The area was generally open with indications of local pastoral activity and areas of disturbed/waste ground within a largely grassy floodplain environment. There is evidence for disappearance of the local presence of alder woodland along with a change in the flora composition of the local wetland vegetation. Possible estuarine influence is suggested which is partially supported by the diatom assemblage.

Table 139: Pollen zone descriptions for Trench 109, Monolith <1>

Zone	Depth (m OD)	Description
Tr109-2	1.30 to 0.94	Dominated by Poaceae (43-63%) and Cyperaceae (3-19%). *Quercus* (1-4%), *Alnus glutinosa* (up to 3%) and *Corylus avellana*-type (up to 6%) are present, with occurrences of *Pinus sylvestris* (up to 4%), *Ulmus* (up to 3%), *Fagus sylvatica* (up to 1%), *Tilia cordata* (up to 1%), *Acer campestre* (up to 1%), *Salix* (up to 1%) and *Sambucus nigra* (up to 2%). A diverse dwarf shrub/herb assemblage is recorded including occurences of *Caltha palustris*-type (up to 1%), *Ranunculus acris*-type (2-4%), *Urtica dioica* (up to 1%), *Rumex sanguineus*-type (up to 1%), Brassicaceae (1-2%), *Filipendula* (up to 2%), *Solanum dulcamara* (1%), *Plantago lanceolata* (up to 2%), Rubiaceae (up top 2%), *Cichorium intybus*-type (up to 3%), *Solidago virgaurea*-type (1-5%), *Glyceria*-type (2-4%) and *Arrhenatherum*-type (up to 3%). *Sparganium emersum*-type (up to 4% TLP + aquatics) and *Potamogeton natans*-type (up to 2% TLP + aquatics) are present. A continuous presence of *Pteridium aquilinum* (2-3% TLP + pteridophytes) is recorded along with occurrences of *Equisetum* (up to 2% TLP + pteridophytes), *Polypodium* (up to 1% TLP + pteridophytes) and Pteropsida (monolete) indet. (up to 2% TLP + pteridophytes). Pollen concentrations vary between 138340 - 191548 grains cm^{-3}.
Tr109-1	0.94 – to0.58	Dominated by Poaceae (39-48%), with *Alnus glutinosa* (7-20%), Cyperaceae (7-20%) and *Sparganium emersum*-type (7-18% TLP + aquatics). *Quercus* (3-7%), *Corylus avellana*-type (1-5%) and *Cichorium intybus*-type (up to 9%) are also important components. A range of tree taxa are present including *Pinus sylvestris* (1-4%), *Ulmus* (up to 2%), *Fagus sylvatica* (up to 1%), *Betula* (up to 1%), *Tilia cordata* (up to 1%) and *Populus* (up to 1%). A diverse dwarf shrub/herb assemblage is recorded including occurences of *Caltha palustris*-type (up to 5%), *Ranunculus acris*-type (up to 2%), Chenopodiaceae (1%), *Polygonum* (up to 2%), *Limonium* (up to 1%), *Filipendula* (1-2%), Apiaceae undiff. (up to 1%), *Plantago media* (up to 2%), *Plantago lanceolata* (up to 2%), Rubiaceae (up to 1%), *Cirsium*-type (up to 1%), *Solidago virgaurea*-type (1-3%), *Glyceria*-type (1-5%) and Arrhenatherum-type (up to 2%). A continuous presence of *Polypodium* (1-6% TLP + pteridophytes) and *Pteridium aquilinum* (4% TLP + pteridophytes) and Pteropsida (monolete) indet. (1-6% TLP + pteridophytes) is recorded along, with occurrences of *Equisetum* (up to 4% TLP + pteridophytes). Pollen concentrations vary between 35934 – 155937 grains cm^{-3}.

Diatoms

3.27.22 Four slides were prepared for diatom analysis from Trench 109. The three lower samples are from a humic silty clay loam and the top sample is from a moderately calcareous silty clay loam. Of these slides, three are suitable for diatom counting and diatom percentage counts have been made (Figure 53). The sample from 0.74m OD is not suitable for diatom counting because diatom numbers are very low (Table 140), but a poorly-preserved diatom assemblage of moderate species diversity was recorded (Table 141). The diatom assemblage at 0.74m OD is comprised of freshwater non-planktonic diatoms from shallow water habitats. The attached species *Gomphonema angustatum* is the most common taxon, with a range of other attached and benthic (eg. *Gyrosigma attenuatum, Pinnularia major*) diatoms present. Aerophilous diatoms such as *Hantzschia amphioxys* and *Ellerbeckia arenaria* are present but not common.

3.27.23 The diatom diagram (Figure 53) shows that, at the base of the sequence at 0.58m OD, freshwater diatoms with wide environmental tolerances are most common, with *Fragilaria pinnata* (almost 40% of the total) and *Fragilaria brevistriata* (almost 25% of total diatoms) dominant. A small, poorly preserved, fragment was tentatively identified as the marine diatom *Paralia sulcata*. However, the flora at 0.58m OD is dominated by oligohalobous indifferent taxa. At 0.98m OD there is a decline in the percentage of *Fragilaria* spp. with wide environmental tolerances, and *Achnanthes lanceolata* increases in abundance to over 15% of the total diatoms. However, *Fragilaria pinnata, F. capucina, F.construens* var. *venter, F. vaucheriae, F. brevistriata* and *F. virescens* form important components of the flora. Again planktonic species such as *Cyclotella kuetzingiana* and *Cyclotella meneghinina* are present in small numbers compared to the non-planktonic diatoms.

3.27.24 Benthic diatoms such as *Stauroneis smithii* and *Navicula elginensis* are uncommon compared with the many attached taxa and this probably reflects abundant macrophyte growth with a smaller area of bare mud for diatom colonisation. In the top sample at 1.22m OD *Fragilaria* spp. remain important, whilst the epiphyte *Cocconeis placentula* increases to about 15% of the total and a diverse range of non-planktonic oligohalobous indifferent diatoms, though at low individual percentages, remain important overall (eg. *Amphora libyca, Cymbella affinis, Gyrosigma attenuatum* and *Navicula tripunctata*). However, at 1.22m OD, there is a consistent input of halophilous, mesohalobous and allochthonous polyhalobous diatoms indicating direct contact with tidal water at this time. The marine diatoms include *Campylosira cymbelliformis, Cymatosira belgica, Paralia sulcata, Plagiogramma van-heurkii, Rhaphoneis amphiceros, Rhaphoneis minutissima* and *Rhaphoneis surirella*. Estuarine mesohalobous diatoms include the benthic species *Nitzschia navicularis* and *Diploneis aestuari* and the planktonic diatom *Cyclotella striata*.

Table 140: Diatom evaluation results for one sample (0.74m OD) from Trench 109 for which percentage diatom counting is not possible

Sam. No.	Depth (m OD)	Diatoms	Diatom numbers	Quality of preservation	Diversity	Assemblage type	Potential for % count
<20>	0.74	present	very low	poor	moderate	fw aero non-pk	none

(fw – freshwater, aero – aerophilous, non-planktonic – non-pk)

Table 141: Diatom species assessment from Trench 109, 0.74m OD

Sample	**<20>**
Depth (m OD)	**0.74**
Salinity Group/ Taxon	
Oligohalobous Indifferent	
Achnanthes clevei	+
Achnanthes lanceolata	+
Amphora libyca	+
Cocconeis placentula	+
Cymbella affinis	+
Epithemia sp.	+
Fragilaria brevistriata	+
Fragilaria leptostauron	+
Fragilaria pinnata	+
Ellerbeckia arenaria	+
Gyrosigma attenuatum	+
Gomphonema angustatum	++
Hantzschia amphioxys	+
Meridion circulare	+
Synedra ulna	+
Pinnularia major	+
Pinnularia sp.	+
Unknown Salinity Preference	
Fragilaria sp.	+
Gyrosigma sp.	+

+ diatom present; ++ diatom more common

Ostracods and Foraminifera

3.27.25 Four samples taken from monolith <1> have been assessed for the presence, preservation and environmental significance of their ostracod content, with results shown in Table 142.

3.27.26 As no ostracods and few other environmental remains were recovered from the lower three samples, at 0.62, 0.8 and 0.96m OD, little can be said about the depositional environment.

3.27.27 The sample at 1.25m OD is however of more interest as a decent ostracod fauna was recovered dominated by adults and instars of the ostracods *Ilyocypris bradyi* and *Candona neglecta. Ilyocypris bradyi* prefers springs, slow waters flowing from springs and ponds fed by springs. It can tolerate slight increases in salinity and is also reported from temporary pools. *Candona neglecta* is known to inhabit a wide range of environments including springs, brooks, wells, ponds and ditches. It is known from the littoral and profundal zones of lakes and also known to be tolerant of slightly brackish waters. *Candona neglegta* is not uncommon in the Baltic Sea with a maximum recorded salinity tolerance of 16‰ (Meisch 2000). *Candona candida* which was also recovered has similar ecological preferences to *Candona neglecta* although has a maximum salinity tolerance of 5.77‰ (Hiller 1972). Although tolerant of increases in salinity, these ostracods are “non marine” taxa and the lack of any brackish/ marine faunal remains within this sample confirms the interpretation of a freshwater environment.

3.27.28 Represented by fewer numbers in the sample at 1.25m OD were *Cyclocypris ovum, Darwinula stevensoni, Fabaeformiscandona* sp*., Ilyocypris decipiens* and *Ilyocypris gibba. Cyclocypris ovum* occurs in a wide range of habitats and is common in the littoral zone of lakes and is also found in temporary waters, springs, slightly salty waters, waters enriched with iron oxide, and swampy habitats. *Darwinula stevensoni* occurred in all three productive samples and is a cosmopolitan taxa which prefers ponds, lakes and slow streams. It can tolerate increases in salinity up to 15‰ and has been recorded in water depths up to 12m (Meisch 2000). Species of the genus *Fabaeformiscandona* were also recovered from this sample. This genus is known to inhabit non-marine environments although difficult to identify to species level as taxonomic differences are based upon the morphology and number of natatory setae which are rarely preserved in sub-fossil assemblages. *Ilyocypris decipiens* is known from (fish)ponds, the littoral zones of lakes, slow flowing brooks and rivers and temporary pools and can tolerate slight increases in salinity. *Ilyocypris gibba*, recovered from the sample at 1.35m prefers small and shallow permanent waterbodies with clayey fine mudded or sandy substrates. The taxon has also been recorded from temporary pools, spring, brooks, slightly salty waters and rice fields (Meisch 2000).

3.27.29 The ostracod fauna at 1.25m OD is in summary indicative of a potentially spring fed, shallow, slow moving or still freshwater body. There is some question as to whether, at the southern end of the development site, a marine influence could be inferred. Although the speed of water flow within the Lea Valley may be affected by the tidal Thames at these levels, at 1.25m OD the salinity of the water is not affected greatly as there are no brackish/ marine ostracods or foraminifera in this sample.

Table 142: Microfaunal content of ostracod/ foraminifera samples from Trench 109

Sample/ monolith number	**<1>**	**<1>**	**<1>**	**<1>**
Depth (m OD)	**0.62**	**0.8**	**0.96**	**1.25**
Ostracoda				
Candona candida				x
Candona neglecta				xx
Cyclocypris ovum				x
Darwinula stevensoni				x
Fabaeformiscandona sp.				x
Ilyocypris bradyi				xx
Ilyocypris decipiens				x
Ilyocypris gibba				x
Other remains				
Sponge spicules	xx			
Charcoal	x			

Abundance: x = 1 to 9 specimens; xx = 10 to 50 specimens; xxx = over 50 specimens

Molluscs

3.27.30 Two samples were examined for molluscan remains from the clayey peat and alluvial clay deposits at Trench 109, with results shown in Table 143.

3.27.31 The sediments of this sample sequence are described in Table 136. No shells were recovered from the clayey peat deposit, context (38), but a large assemblage with a wide range of species was recorded from the alluvial clay deposit, context (37). No brackish water or marine shells were recovered.

3.27.32 The context (37) assemblage was dominated by the fresh water species, in particular *Lymnaea peregra, Bithynia tentaculata* and *Lymnaea auricularia*. *Lymnaea peregra* can live in a wide range of aquatic habitats, whereas *Bithynia tentaculata* favours areas of slow moving, well oxygenated water, especially those with dense growths of aquatic plants. *Lymnaea auricularia* is found in sizable bodies of still or slowly moving water, usually in places with good aquatic flora. The combination of these species, which represent about two thirds of the assemblage, indicates a well oxygenated, densely vegetated slow-moving permanent water environment. A further indication of a slow-moving water environment is the ratio of the *Bithynia* opercula to apices in this assemblage. Large differences between the two can be the result of major transportation of material and may therefore indicate the presence of a significant allochthonous component within the assemblage. In this instance 1.4 opercula to every *Bithynia* apex were recorded.

3.27.33 Other species present in this assemblage which are indicative of moving water include *Valvata piscinalis, Pisidium amnicum, Valvata cristata* and *Planorbis planorbis.* In addition *Bathyomphalus contortus* exploits a large number of aquatic habitats apart from those liable to seasonal desiccation.

3.27.34 A small number of species, namely *Anisus Leucostoma* and *Lymnaea truncatula*, which only represent 5% of the assemblage, are more typical of marshy grassland and swampy ditches, and thrive in areas of seasonal desiccation. It is likely that these species were exploiting local marshy, water meadow or moist pasture environments near the channel edge.

3.27.35 A very few land snails were recovered from this deposit. *Vallonia pulchella* and *Carychium minimum* can also live in marshy, water meadow or moist pasture environments. The single specimen of *Clausilia bidentata* is not typical of this environment. It is a rupestral species, generally found living on walls and trees, in ground litter and in woods, hedgerows and scrub. Its presence here is somewhat anomalous in respect of the immediate vicinity but the pollen evidence has indicated a small presence of trees and some shrubs in the wider landscape.

3.27.36 The mollusc assemblage obtained from context (37) is indicative of a permanently wet, well vegetated, slow-moving water channel edge environment with a small marshy, water meadow or moist pasture element. There are similarities between this assemblage and those observed elsewhere in the development area. It may be possible to draw inferences of the wider landscape and land use across the area once the date of this deposit has been ascertained.

Table 143: Mollusc Assemblages from Trench 109

Sample	**<2>**	**<3>**
Context	**(38)**	**(37)**
Sediment Type	**Clayey peat**	**Alluvial clay**
Original Sample Size (litres)	**5**	**5**
Land snails		
Carychium minimum	-	1
Vallonia excentrica/ pulchella	-	1
Limicidae	-	1
Clausilia bidentata	-	1
Fresh and Brackish Water Snails		
Valvata cristata	-	48
Valvata piscinalis	-	21
Bithynia tentaculata	-	105
Bithynia leachii	-	11
Bithynia spp.	-	87
Bithynia opercula	-	277
Lymnaea truncatula	-	5
Lymnaea palustris	-	11
Lymnaea auricularia	-	151
Lymnaea peregra	-	355
Lymnaea spp.	-	17
Planorbis planorbis	-	48
Anisus leucostoma	-	49
Bathyomphalus contortus	-	54
Gyraulus albus	-	3
Gyraulus crista	-	1
Pisidium amnicum	-	20
Pisidium spp.	-	66
Taxa	0	18
Total	0	1056
% Shade - loving species	0	0.2
% Intermediate species	0	0.1
% Open country species	0	0.1
% Amphibious species	0	5.1
% Intermediate species	0	40.2
% Ditch species	0	9.1
% Moving water species	0	23.1
% Unassigned species	0	22.2

3.28 Trench 111 (PDZ8 5.41(c))

Introduction

3.28.1 Trench 111 is located towards the southern end of the Site. It was selected for further work due to its deep (>1m) organic deposits and potential for elucidating channel conditions and chronology in this area, as well as providing palaeoenvironmental proxy data (Figure 54).

Sediments

3.28.2 Sediment descriptions and interpretations can be found in Table 144.

Table 144: Sediment descriptions for Monolith <18>, Trench 111

Level (m OD)	Context	Sediment description	Interpretation
2.29 to 1.70	67	10YR4/ 1 dark grey clay, massive, <0.5% fine macropores, common freshwater mollusca above 2.10m OD. clear to diffuse boundary	Alluvial clay
1.70 to 0.65	68,78,79	10YR3/ 1 very dark grey silty clay loam, very high organic content. Horizontal laminations throughout, occasionally with horizontal recognisable plant remains (inc *Menyanthes* seed at 0.95m OD). Many sandy inwash layers within main context; 10YR7/ 2 light grey sand OD 0.72-0.75; 1.02-1.03; 1.03-1.13; 1.14-1.17; 1.19-1.25; 1.30-1.33; and 1.36-1.40m OD. Some solid sand, some with sand and organic silty clay loam (1.03-1.13). Sand band at 1.37-1.39m OD is 10YR7/ 6 yellow – appears iron stained, unclear if pre- or post-depositional. Sand boundaries sharp; basal boundary sharp. This deposit is almost a peat but not quite; shallow standing water marsh environment likely.	Highly organic alluvium with sandy inwashes
0.65 to 0.53		10Y3/ 2 very dark greyish brown loamy sand with abundant gravel. Quite humic gravel top; no indication of a dry land-surface.	Upper gravel with organics

3.28.3 Basal gravels of probable Pleistocene date were recorded at 0.65m OD. Above this to 1.8m OD a fine organic alluvium with horizontal laminations and plant remains is indicative of a probable marsh environment with shallow standing water. Repeated inwashes of sand are the result of higher energy alluvial events.

3.28.4 Above the organic alluvium to 2.29m OD and above fine overbank alluvia typical of floodplain deposits elsewhere on Site were recorded.

Dating

3.28.5 Three radiocarbon dates have been obtained from Monolith <18> (Table 145).

3.28.6 The dating indicates that probably all of the sampled deposits are broadly of 7th to 9th century date.

Table 145: Radiocarbon dates from Trench 111

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<18> (67)	1.75	Bulk sediment with *Phragmites* stems	SUERC-25620	1315±40	-29.4	cal. AD 640-780	1
<18> (78)	0.95 to 0.96	Seeds: 10 x *Menyanthes trifoliata*	SUERC-25619	1245±40	-26.1	cal. AD 670-880	1
<18> (79)	0.67 to 0.68	Plant material: *Phragmites* stem	SUERC-25618	1295±40	-27.5	cal. AD 650-860	1

Plant macrofossils

3.28.7 Four bulk samples were examined from contexts (19), (20), (23) and (26) alongside two taken for radiocarbon dating (Table 146).

Table 146: Waterlogged plant macrofossils from Trench 111

Sample		<18>	<18>	<19>	<20>	<23>	<26>
Context		*0.95 to 0.96	*0.67 to 0.68	(67)	(68)	(78)	(79)
Period					Saxon	Saxon	Saxon
Sample Size (litres)		1	1	5	5	5	5
Flot size (ml)		20	15	40	200	150	40
Chara (gametes)	stonewort	-	-	-	-	10+	-
Nuphar lutea	yellow water lily	-	-	-	-	-	1
Caltha palustris	marsh-marigold	-	-	-	+	2	-
Ranunculus subg. *Ranunculus* (arb)	buttercup	2	-	38	++	10+	6
Ranunculus sardous	hairy buttercup	-	-	-	+	-	-
Ranunculus sceleratus	celery-leaved buttercup	-	-	2	++	2-5	11
Ranunculus lingua/ flamula	greater/ lesser spearwort	-	-	-	++	1	-
Ranunculus subg. *Batrachium*	water-crowfoots	-	-	2	1	20+	18
Thalictrum flavum	common meadow-rue	-	-	-	1	-	-
Ficus carica	fig	-	-	-	1	-	-
Urtica dioica	common nettle	1	-	35	-	10+	4
Chenopodium rubrum	red goosefoot	-	-	-	-	cf.1	-
Chenopodium ficifolium	fig-leaved goosefoot	-	-	-	-	1	-
Chenopodium album	fat-hen	-	-	-	1	1	2
Atriplex sp.	orache	-	-	1	+	-	-
Montia fontana subsp. *chondrosperma*	blinks	-	-	-	-	-	1
Stellaria sp.	stitchwort	-	-	1	+	2	-
Cerastium sp.	mouse-ears	-	-	-	-	-	1
Lychnis flos-cuculi	ragged-robin	-	-	-	-	1	-
Persicaria minor	small water-pepper	-	-	-	-	-	cf.1
Rumex sp.	dock	-	-	-	+	2-5	11
Rumex hydrolapathum	water dock	-	-	-	-	-	2
Rumex conglomeratus	clustered dock	-	-	-	-	-	9
Rumex maritimus (whole fruit)	golden dock	-	-	-	+	1	-
Rorippa nasturtium-aquaticum	water-cress	cf.1	-	1	++	-	2
Rorippa microphylla	narrow-fruited water-cress	-	-	-	-	-	1
Rubus sp.	bramble	-	-	-	-	2	2
Rubus/ Rosa type sp. (thorn)	bramble/ rose type thorns	cf.1	-	-	-	-	1
Potentilla/ Fragaria sp.	cinquefoil/ strawberry	-	-	-	-	-	1
Epilobium sp.	willowherb	-	-	-	-	1	-
Hydrocotyle vulgaris	marsh pennywort	-	-	-	-	1	-
Oenanthe fistulosa	tubular water-droplet	cf.1	-	-	-	cf.2-5	10
Oenanthe cf. *fluviatilis*	water-dropworts	cf.12	-	-	1	cf.20+	cf.39
Conium maculatum	hemlock	-	-	-	2	-	-
Apium sp.	celery/ water-cress	1	-	-	1	2-5	3
Cicuta virosa	cowbane	1	-	-	-	-	-
Solanum cf. *dulcamara*	bittersweet	-	-	-	-	+	-
Menyanthes trifoliata	bogbean	10	-	1	+++	20+	14
Verbena officinalis	vervain	-	-	-	-	1	-
Stachys cf. *sylvatica*	hedge woundwort	-	-	-	+	?1	5
Lycopus europaeus	gypsywort	-	-	1	1	2-5	5
Mentha sp.	mint	1	2	26	++	50+	61
Callitriche stagnalis	common water-starwort	-	+	-	+	1	-
Digitalis cf. *purpurea*	foxglove	-	-	-	-	cf.1	-
Galium palustre	marsh bedstraw	-	-	-	-	1	-
Sambucus nigra	elder	-	-	-	-	2-5	1
Valeriana dioica	marsh valerian	-	-	-	-	-	1
Cirsium/ Carduus sp.	thistle/ knapweed	-	-	1	+	2-5	1
Sonchus asper type	prickly sow-thistle	-	-	-	-	1	3

Sample		**<18>**	**<18>**	**<19>**	**<20>**	**<23>**	**<26>**
Context		***0.95 to 0.96**	***0.67 to 0.68**	**(67)**	**(68)**	**(78)**	**(79)**
Period					**Saxon**	**Saxon**	**Saxon**
Sample Size (litres)		**1**	**1**	**5**	**5**	**5**	**5**
Flot size (ml)		**20**	**15**	**40**	**200**	**150**	**40**
Sonchus asper type	prickly sow-thistle	-	-	-	+	-	2
Crepis tectorum	hawks beard	-	-	-	-	1	-
Anthemis cotula	stinking chamomile	-	-	-	-	2	-
Bidens cf. *cernua*	nodding bur-marigold	-	-	-	+	-	-
Eupatorium cannabinum	hemp-agrimony	-	-	-	1	2	-
Sagittifolia sagittifolia	arrowhead	-	-	-	+	2-5	11
Baldellia ranunculoides	lesser water plantain	-	-	-	-	-	1
Alisma plantago-aquatica	water-plantain	-	1	2	++	2-5	34
Potamogeton sp.	pondweeds	-	-	-	-	2-5	-
Zannichellia palustris	horned pondweed	-	-	-	-	1	2
Juncus sp.	rush	-	3	-	-	+	-
Eleocharis sp.	spike-rush	-	-	-	1	10+	3
Schoenoplectus sp.	club rushes	-	1	2	+++	20+	++++
Carex sp. (flat)	sedge (lenticular)	-	-	1	-	-	34
Carex sp. (trigonous small)	sedge (trigonous)	-	-	-	-	-	5
Carex sp. (trigonous)	sedge (trigonous)	5	-	-	+	20+	25
Charred culm	grass/ cereal stem	-	-	-	-	-	1
Lolium sp. (charred)	rye-grass	-	-	-	-	1	-
Glyceria sp.	sweet-grasses	-	-	10	+	-	-
Triticum glume bases	wheat	-	-	-	-	2	-
Phragmites australis ?stems/ rhizomes	common reed	-	-	-	++	-	-
Sparganium erectum (fruit/ achene)	branched bur-reed	-	-	2	++	10+	4
Sparganium erectum (inner seed/ embryo)	branched bur-reed	1	-	-	+	10+	3
Indet. Catkin bud scale		-	-	-	-	1	-
Charcoal	charred wood indet.	-	-	-	-	+frags.	-
Charred indet. (tuber?)		-	-	-	-	-	1
Daphnia sp. (*Ephippium*)	water flea	-	1	2	-	-	-

+C – denotes material that was preserved by charring. cf. compares with. Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more

3.28.8 Most of the samples were fairly rich in waterlogged remains and dominated mainly by wetland species, for example, rush (*Juncus* sp.), sedge (*Carex* sp.), club-rush (*Schoenoplectus lacustris*), water-crowfoot (*Ranunculus* subg. *Batrachium*), water plantains (*Alisma plantago-aquatica* and *Baldellia ranunculoides*), branched bur-reed (*Sparganium erectum*), arrowhead (*Sagittifolia sagittifolia*), and pondweed (*Potamogeton* sp.), with overgrown water bodies, such as water-crowfoot. In particular seeds of bogbean (*Menyanthes trifoliata*) and water-dropwort (*Oenathe* sp.) were very common in the samples.

3.28.9 There were also reasonable numbers of seeds of buttercup (*Ranunculus* sp.), with dense patches of nettle and occasional seeds of Cheonopodiaceae, possibly indicating some animal trampling/ manure, but were very rare within the samples. However, in general species of drier soils were poorly represented in the samples.

3.28.10 The samples are probably more indicative of wet marsh, bordering on bog with less indication of drier shrubland or grassland being present in the immediate vicinity of the deposit.

Pollen

3.28.11 Pollen assessment was carried out on seven samples from monolith <18> in Trench 111. The pollen diagram (Figure 55) has been split into two local pollen assemblage zones (LPAZ), Tr111-1 and -2 – see Table 147 for zone descriptions.

3.28.12 The pollen assemblage is dominated by dwarf shrub/ herb taxa, in particular Cyperaceae (sedges) and Poaceae (grasses) and, with a clear change in the dominance of these taxa, shifting from the former at the base of the sequence to the later at the top, coinciding with the change in the stratigraphy from highly organic alluvium to overbank alluvium. With the reduction in Cyperaceae is an associated reduction in other local wetland taxa including *Ranunculus acris*-type (buttercup), *Filipendula* (meadowsweet), *Sparganium emersum*-type (bur reeds) and *Equisetum* (horsetails). The lower sediments also contain other aquatic pollen types including *Myriphyllum verticillatum* (whorled water-milfoil), *Callitriche* (water starworts), *Potamogeton natans*-type (pondweeds) and *Typha latifolia* (bulrush) also indicative of a locally vegetated wetland. The reduction in these taxa indicates a transition from wet marsh-type deposits through to more minerogenic alluvial floodplain sequences. There is also a reduction in tree and shrub/climber pollen, which may be a response to floodplain expansion as a result of overbank flooding. The presence of *Fagus sylvatica* (beech) pollen within the sequence is contemporary with the Anglo-Saxon dates derived from the radiocarbon dating and other similarly dated sequences from the Olympic Park, along with the recorded expansion of *Fagus sylvatica* has been recorded in Epping Forest as dating from the Romano-British period (Grant and Dark 2006).

3.28.13 Towards the top of the sequence there is a general increase in Brassicaceae (cabbage and mustard family) and *Glyceria*-type (sweet-grass). The expansion of these taxa coincides with the sandy inwash layers related to higher energy alluvial events. The increase in *Glyceria*-type probably indicates an increase in damp pasture or channel edge wetland associated with increased flooding. Areas of grassland are also indicated by the presence of *Silene vulgaris*-type (bladder champion) and *Prunella vulgaris*-type (selfheal), with *Urtica dioica* (common nettle), *Persicaria maculosa*-type (redshank), Chenopodiaceae (goosefoot and oraches), *Cichorium intybus*-type (dandelion/ chicory) and *Solidago virgaurea*-type (aster/goldenrods) indicating areas of disturbed/waste ground. The presence of *Trifolium* (clover), *Rumex acetosella* (sheep's sorrel), *Plantago media* (hoary plantain) and *Plantago lanceolata* (ribwort plantain) probably indicates local grazing activity.

3.28.14 The pollen sequence shows a wet highly vegetated marsh-type environment with local grassland supporting pastoral activity. Increased overbank alluvium deposition has resulted in a change in the local wetland vegetation, shifting towards grass dominated communities. The surrounding area is very open with little tree pollen arriving at the site.

Table 147: Pollen zone descriptions for Trench 111, Monolith <18>

Zone	Depth (m OD)	Description
Tr109-2	1.30 to 0.94	Dominated by Poaceae (58-60%), Cyperaceae (7-22%) and *Glyceria*-type (3-13%). *Quercus* (2%) and *Alnus glutinosa* (1-2%) are present, with occurrences of *Pinus sylvestris* (up to 1%), *Tilia cordata* (up to 1%), *Corylus avellana*-type (up to 1%) and *Sorbus*-type (up to 1%). Dwarf shrub/herb taxa include *Ranunculus acris*-type (6%), Caryophyllaceae undiff. (up to 1%), *Rumex acetosella* (up to 1%), Brassicaceae (4-6%), *Filipendula* (1%), Rosaceae undiff. (up to 1%), Apiaceae undiff. (up to 1%), *Cichorium intybus*-type (1-2%), *Solidago virgaurea*-type (up to 1%) and *Arrhenatherum*-type (up to 2%). *Sparganium emersum*-type (1-2% TLP + aquatics), *Polypodium* (up to 1% TLP + pteridophytes), *Pteridium aquilinum* (1-5% TLP + pteridophytes) and Pteropsida (monolete) indet. (1-4% TLP + pteridophytes) are also present. Pollen concentrations range between 72885 - 255094 grains cm^{-3}.
Tr109-1	0.94 to 0.58	Dominated by Poaceae (17-53%) and Cyperaceae (17-71%).*Quercus* (1-6%), *Alnus glutinosa* (1-3%) and *Corylus avellana*-type (1-4%) are present throughout the zone, with *Pinus sylvestris* (up to 2%), *Fagus sylvatica* (up to 2%), *Betula* (up to 3%), *Tilia cordata* (up to 1%), *Populus* (up to 1%), *Salix* (up to 2%), *Sorbus*-type (up to 1%) and *Sambucus nigra* (%) also present. Dwarf shrub/herb assemblage includes *Ranunculus acris*-type (up to 7%), *Thalictrum* (up to 1%), *Urtica dioica* (up to 1%), Chenopodiaceae (up to 2%), *Cerastium*-type (up to 1%), *Silene vulgaris*-type (up to 1%), *Rumex acetosella* (up to 1%), Brassicaceae (up to 2%), *Filipendula* (up to 1%), Apiaceae undiff. (1-4%), *Prunella vulgaris*-type (up to 1%), *Plantago media* (up to 0.5%), *Plantago lanceolata* (up to 3%), Rubiaceae (up to 3%), *Valeriana officinalis* (up to 1%), *Cichorium intybus*-type (1-3%), *Solidago virgaurea*-type (up to 2%), *Glyceria*-type (up to 3%) and Arrhenatherum-type (up to 1%). Aquatic taxa include *Myriophyllum verticillatum* (up to 1% TLP + aquatics), *Potamogeton natans*-type (up to 1% TLP + aquatics), *Sparganium emersum*-type (2-7% TLP + aquatics) and *Typha latifolia* (up to 2% TLP + aquatics). *Equisetum* (up to 12% TLP + pteridophytes), *Polypodium* (up to 1% TLP + pteridophytes), *Pteridium aquilinum* (up to 3% TLP + pteridophytes) and Pteropsida (monolete) indet. (1-5% TLP + pteridophytes) are also recorded. Pollen concentrations range between 20302 - 757773 grains cm^{-3}.

Diatoms

3.28.15 Eight samples were prepared from this sequence (Figure 56). The top two samples are from context (67); an alluvial clay. Diatoms are absent from the uppermost sample at 2.09m OD. A single valve of *Pinnularia microstauron* was found at 1.79m OD; this aerophilous species is found in soils as well as aquatic habitats. Diatoms are present in moderate to high concentrations in the four samples between 0.84 and 1.45m OD and the quality of preservation is generally good with moderate to high species diversity. Diatom analysis has been carried out on these samples which are from a highly organic alluvium with sandy inwashes. Diatom numbers are lower in the basal sample at 0.68m OD and the quality of preservation poor, with low species diversity. However, it has been possible to carry out diatom analysis on this sample in addition to the four over-lying levels.

3.28.16 The diatom assemblages in Monolith <18> from 0.68 to 1.45m OD are again dominated by non-planktonic freshwater diatoms with smaller numbers of halophilous and mesohalobous diatoms, such as *Navicula menisculus, Rhoicosphaenia curvata* and *Gomphonema olivaceum* indicating slightly elevated salinity, but there is no direct input of diatoms from tidal waters. The lithology of the sequence indicates sandy inwashes into the alluvium and this is reflected by the shifting percentages of the dominant taxa. The most common species include *Achnanthes clevei, Achnanthes kolbei, Achnanthes lanceolata* agg.*, Amphora libyca, Amphora pediculus, Cocconeis disculus, Cocconeis placentula, Fragilaria brevistriata, Fragilaria pinnata, Gomphonema angustatum, Cocconeis thumensis* and *Synedra ulna*.

3.28.17 The abundance of epipsammic (diatoms adnate on sand grain surfaces) species such as *Achnanthes clevei* and *Achnanthes kolbei* is positively related to the sand inwashes. Whilst epiphytes such as *Cocconeis placentula* and *Epithemia* spp. are from the submerged stems of macrophytes in the shallow standing water. A number of *Navicula* spp. and *Gyrosigma* spp. represent the benthic, mud-surface habitat. Flowing water and aerophilous taxa form a relatively small component of the assemblages.

Ostracods and Foraminifera

3.28.18 The ostracod content of the five samples is given in Table 148. Very few ostracods were recovered from the samples with ostracods present in only the lower three samples at 0.6, 0.84 and 1.21m OD. The samples at 1.62 and 2.08m OD contained no ostracods. The ostracods recovered from the three samples were adult specimens of *Candona neglecta* and *Candona candida* and were most abundant in the sample at 0.84m OD.

Table 148: Microfaunal content of ostracod/ foraminifera samples from Trench 111

Sample number	**<18>**	**<18>**	**<18>**	**<18>**	**<18>**
Depth (m OD)	**0.60**	**0.84**	**1.21**	**1.62**	**2.08**
Ostracoda					
Candona candida		xx	x		
Candona neglecta	x	x			
Other remains					
Molluscs					x
Bithynia opercula		x	xx		
Bithynia apices					
Cladoceran egg case		x			
Fish teeth		x			
Insect remains			x		
Charophyte oogonia	xx		xx		
Radiate diatoms		x			
Rhizomes	x				
Seeds	x	x	xx		
Sedge				x	
Plant stems/ remains		x		x	
Charcoal			x		

x = 1 to 9 specimens; xx = 10 to 50 specimens; xxx = over 50 specimens

3.28.19 Plant remains including seeds (at 0.60, 0.84 and 1.21m OD), sedge and plant stems (at 1.62m OD) frequent charophyte oogonia (at 0.6 and 1.21m OD), radiate diatoms (at 0.84m OD) and a small piece of charcoal at 1.21m OD were recovered. Animal remains including molluscs (2.08m OD), *Bithinia opercula* (at 0.84 and 1.21m OD), insect remains (at 1.21m OD), cladoceran egg cases and fish teeth (0.84m OD) were recovered. The numbers of ostracods recovered from the samples are too low to make any detailed environmental interpretation of the depositional environment.

3.28.20 The Candoniid ostracods within the sample the assemblages at 0.60, 0.84 and 1.21m OD (*Candona candida* and *Candona neglecta*) are known to inhabit a wide range of environments including springs, brooks, wells, ponds and ditches. They are also are known from the littoral and profundal zones of lakes. Both are also known to be tolerant of slightly brackish waters. *Candona candida* and *Candona neglecta* are not uncommon in the Baltic Sea (Meisch 2000) with a maximum recorded salinity tolerance of 16‰ for *Candona neglecta* and 5.77‰ for *Candona candida* (Hiller 1972). Despite this these taxa are indicative of non-marine "freshwater" environments which are confirmed in this case by the absence of any commonly occurring brackish water taxa. *Candona candida* and *Candona neglecta* are both usually found in permanent water-bodies although the juveniles of *Candona candida* and the eggs, juveniles and adults of *Candona neglecta* are desiccation resistant. These taxa are often indicative of colder water and a "*candida* fauna" is often found in post-glacial sediments of small European water-bodies (Boomer 2002). The desiccation resistance of these taxa and parthenogenesis reproductive cycle of *Candona candida* make them suitable for pioneer colonisation of habitats.

3.28.21 The other plant and animal remains within these samples, particularly the molluscs *Bithynia* (including opercula) would confirm a freshwater depositional environment at this level. The paucity of ostracods and molluscs at 1.62 and 2.08m OD may be due to a reducing depositional environment.

3.28.22 No foraminifera were recovered from these samples despite a detailed search. If a tidal influence were to be inferred for these samples then foraminifera would be expected. The agglutinating foraminifera which can be preserved within the most reducing environments were not observed.

Molluscs

3.28.23 Four samples were examined for molluscan remains at Trench 111 through the Anglo-Saxon alluvial deposits.

3.28.24 The sediments of this sample sequence are described in Table 149. Shell numbers were very low but there were a significant number of *Bithynia* opercula recovered.

Table 149: Mollusc Assemblages from Trench 111

Sample	**<19>**	**<20>**	**<23>**	**<26>**
Context	**(67)**	**(68)**	**(78)**	**(79)**
Sediment Type	**alluvial clay**	**highly organic alluvium with sandy inwashes**		
Sample Size (litres)	**5**	**5**	**5**	**5**
Date	**Saxon**	**Saxon**	**Saxon**	**Saxon**
Land snails				
Limicidae	-	-	-	1
Fresh and Brackish Water Snails				
Bithynia opercula	-	1	17	83
Planorbis planorbis	1	-	1	-
Taxa	1	0	1	1
Total	1	0	1	1
% Intermediate species	0	0	0	100
% Ditch species	100	0	100	0

3.28.25 The small snail assemblages comprised two occurrences of *Planorbis planorbis*, a single Limicidae and the numbers of Bithynia opercula, particularly in context (79). *Planorbis planorbis* favours well-vegetated aquatic habitats, in particular shallow pools and swampy ditches. The complete absence of any apical fragments of *Bithynia* within the assemblages, while a number of opercula were recorded is noteworthy as the ratio of *Bithynia* opercula to apices can be used as an 'index of 'assemblage transport', ie. an *in situ* accumulation should have equal numbers of both; over-representation of either is indicative of transport' (Sidell *et al.* 2000). The presence of the *Bithynia* opercula indicates that the aquatic environment is one of moving water. The rise in numbers of opercula in context (79) may have been a result of faster moving water.

3.28.26 The limited mollusc assemblages obtained from the Saxon alluvial deposits are indicative of a well vegetated, moving water environment. These assemblages are compatible with the marshy slow-moving water environment suggested by the plant remains analysis and insect analysis for this sequence. The occurrence of faster flowing water events would coincide with the sandy in washes seen within the highly organic alluvium, contexts (68), (78) and (79). These small snail assemblages only reflect the very localised environment rather than the wider landscape.

Insects

3.28.27 The insect taxa recovered are listed in Table 150. Samples that produced no insects are not included in these samples. The majority of the taxa present are beetles (Coleoptera) though the cases and head capsules of both cased and caseless caddis flies (Tricoptera) were seem in several samples.

3.28.28 The insect faunas recovered from sample <26> were small, fragmented and poorly preserved. The fauna recovered, however, do contain a few species that suggest that the area contained slow flowing water and bankside vegetation. The faunas therefore have a limited role in terms of archaeological interpretation and should only be used to confirm and supplement the results from other proxy environmental data. No identifiable insect faunas were recovered from sample <20>.

3.28.29 Given the frequently poor preservation and limited potential of these insect faunas, it is recommended that further analysis of these deposits should only occur if the analysis of the plant and pollen from these sites suggests it is warranted.

Table 150: Insect assemblage from Trench 111, Samples <26> and <20>

Sample number	**<26>**	**<20>**
Context number	**(78)**	**(68)**
Depth (m OD)	**1.33**	**1.53**
Coleoptera		
Hydraenidae		
Helophorus spp.	+	-
Staphylinidae		
Oxytelus spp.	+	-
Stenus spp.	+	-
Dryopidae		
Dryops spp.	+	-
Curculionidae		
Notaris acridulus (L.)	+	-
Degree of preservation	fragmented, eroded	fragmented, eroded
Comparative size of faunas	small	Small and not identifiable
Water conditions	*Dryops* suggests slow flowing	-
Landscape	*Notaris* is often found upon *Glyceria maxima* (reed sweet-grass) and other *Glyceria* species (sweet-grasses).	-
Overall potential of this location	poor	none

+ = 1-2 individuals, ++ = 2-5 individuals, +++= 5-10 individuals

3.29 Trench 118 (PDZ12 12.01)

Introduction

3.29.1 Trench 118 lay towards the south of the Site. The geoarchaeological deposit model suggests that it lies close to the early confluence between the main river channel in the valley, and another channel (whose line was later followed by Channelsea River), south of the raised gravel area upon which Trench 9 was located. The evaluation trench revealed a series of alluvial and dry-land deposits within and on the margins of prehistoric and historic water channels which crossed the trench. Due to the recovery, and apparent association, of sherds of unabraded Early Neolithic pottery, flint debitage and animal bone (including horse), as well as a small timber stake structure, the base of the trench was extended.

3.29.2 The excavation revealed the clear riverine influence at this location, in the form of a series of channel incisions dating to the Neolithic, the Bronze Age, and the Romano-British and medieval periods, overlying the earlier course of Late Glacial and Early Holocene river patterns (Figure 57). It also exposed additional worked timbers, some of which proved indeed to be of Neolithic date. The Neolithic finds were given added significance by the recovery of a finely made flint axe. The stake structure revealed during the evaluation, however, proved to be of Romano-British date, as did the horse bone. The course of the medieval channel revealed in the trench may reflect that of the early Waterworks River before the 12th century construction of the Bow to Stratford causeway resulted in its diversion.

3.29.3 Unfortunately a number of samples from the evaluation and the majority from the mitigation were either not marked on section drawings or were not taken from well recorded exposed sections. Examination of the section drawings, in combination with discrepancies in samples from supposedly equivalent contexts and anomalies in the radiocarbon dating clearly indicated that in several cases contexts had either been muddled or severely overcut and hence incorporating older and/ or younger deposits. These problems were mainly evident for the mitigation work conducted within the south-west end of the trench. As such the phasing for some of these contexts still have some anomalies associated with them. In particular it should be noted that context (580) is used for securely stratified, sampled deposits dating to the Early Holocene in the base of the Trench, seen in particular in the north-east facing section. However, complex (580) refers to a large number of less securely stratified finds and deposits that were incorrectly ascribed to context (580) during the excavation of the Trench and clearly cover a multitude of dates including Early Holocene, Early and Late Neolithic and Bronze Age.

Sediments

3.29.4 Three monolith series were looked at from this trench: <1> (M1 to M5), <9> (M6 to M11) and <122> (M1 and M2). These represent the south-east (monolith <1>; Table 151) and north-east facing sections (monoliths <9> and <122>; Table 152, Table 153, Table 154 and Table 155). Monoliths were collected during the initial evaluation trench, with the exception of monolith <122> which was sampled during the extension of this trench during the mitigation phase of work. Monolith <9> is divided into two series – monolith <9> represents the upper four monoliths (M6 to M9) taken from the evaluation trench step at the south-west corner of the trench, whereas monolith M11 of this series is discussed separated as this is derived from a step in the centre of the trench located c. 8m NE of the other monoliths and associated with a different sedimentary fill (see Figure 57). Monolith series <109> from the south-west facing section was not investigated as it was found to contain very dried out samples and previous pollen assessment (Scaife in Howell and Spurr 2009) had implied very poor organic preservation.

Table 151: Sediment descriptions for Monolith <1> (<M1> to <M5>), Trench 118

Level (m OD)	Context	Sediment description	Interpretation
1.34 to 1.29	?171	10YR3/ 4 dark yellowish brown silty clay loam. Slightly gritty. Strong iron staining. Contact with the unit below is clear and horizontal.	
1.29 to 1.09	173	10YR4/ 3 brown clay to silty clay loam firm with iron staining. Contact with the unit below is gradual.	Mineralogenic fine alluvium, probable overbank deposit.
1.09 to 0.57	172	10YR3/ 1 very dark grey to 2/ 1 black clay loam, hard, with occasional sandy lenses and black organic patches. Contact with the unit below is gradual.	Low energy alluvium, organic, possible marshy channel edge
0.57 to 0.29	174	10YR4/ 1 dark grey clay, firm, with root material and iron staining. From 0.40m OD down is slightly gritty. Some indication of structure, small blocky/ angular. Contact with the unit below is clear and horizontal.	Low energy alluvial clay with some indication of soil formation
0.29 to 0.15m	177	Very dark brown/black firm silty clay loam, very humic / organic, lumps of sediment similar to above context in it. Possible gross bioturbation. With occasional large flint clasts. Contact with the unit below is clear and horizontal.	Highly organic alluvium/ channel edge
0.15 to -0.18	185	10YR5/ 2 greyish brown clay loam (with significant coarse silt component). Exhibits patches of black organic matter/ Mn and FE stained root channels, wood fragments and occasional sandy lenses. (worm granules noted in ostracods samples) Contact with the unit below is clear and horizontal.	Mineralogenic alluvium near channel edge
-0.18 to -0.59 (to -0.59m and below not -0.49 as previously recorded)	187	Light brown/yellow medium SAND with occasional silty sand bands, organic root and iron staining. Contact with the unit below is not sampled due to step in section.	Late Pleistocene sands: active channel/ sandbank
-0.49 to -0.82 (NB overlaps with above)	223	10YR4/2 dark grayish brown silt loam (coarse silt) with some v fine sand component. Some siltier bands and sandier ones. Exhibits iron staining and plant root macro fossils. Contact with the unit below is gradual.	Silty deposits with inwashes of coarser material at edge of active channel
-0.82 to -0.98 and below	63	10YR4/ 2 greyish brown loamy sand with occasional gravel and vertical roots. Grades into SANDY GRAVEL at the base of the unit.	Gravels of Late Pleistocene or Holocene date

Table 152: Sediment descriptions for Monolith <9> (<M6> to <M9>), Trench 118

Level (m OD)	Context	Sediment description	Interpretation
1.07 to 0.85	207	10YR4/ 2 dark greyish brown firm clay to silty clay becoming increasingly silty towards the top of the unit. Contact with unit below is gradual	Fine alluvium overbank
0.85 to 0.50	208	10YR3/ 2 very dark grayish brown clay loam, very humic / organic. With occasional shell fragments, wood/plant material. Nearly a peat. Contact with unit below is gradual	Very humic channel edge/ marshy
0.50 to 0.18	210	10YR4/ 2 very dark grayish brown silt loam, humic. With occasional shell fragments, wood/plant material. The base of the unit contains occasional lenses of fine sand and becomes slightly clayey. Contact with unit below is gradual.	Humic channel edge/ marshy
0.18 to -0.50	182	Interbedded greyish yellow SANDS and brown/black silty clay loam. Sands contain flint pebbles, shell fragments. Silty clays contain moderate shell fragments/whole gastropods with some woody organic matter. Sands dominate towards base of layer with silty clay loams to top. Coherent sand layers at 0.04 to -0.03m OD and -0.12 to -0.46m OD. NB Huge pot sherd (100x100mm) at -0.21m OD. Contact with unit below is sharp.	Active channel sands with periods of lower energy deposition in vegetation – channel edge or vegetated bar
-0.50 to -0.71	183	10YR4/ 2 dark greyish brown silty clay loam with noticeable fine sand content. Iron staning (clear) at -0.56 to –0.63m OD, thin sandy inwash -0.63m OD, generally becoming sandier to base. Not bottomed	Channel edge

Table 153: Sediment descriptions for Monolith <9> (<M11>), Trench 118

Level (m OD)	Context	Sediment description	Interpretation
-0.33 to -0.44	162	10YR4/ 2 dark greyish brown silty clay loam with fine sand content. Clear to sharp boundary.	Vegetated margin of channel
-0.44 to -0.49	196	Heavily iron stained sand with flint gravel. Sharp boundary.	Channel/ bar sands
-0.49 to -0.73	197	10YR4/ 3 brown loamy sand, occasional to q common flint gravel up to 30mm. Some patches are siltier / clayier and more cohesive. Sharp boundary.	Humic sands, possibly soil development
-0.73 to -0.83	198	Heavily iron stained sand with occasional flint gravel.	Channel / bar sands

Table 154: Sediment descriptions for Monolith <122> (<M2>), Trench 118

Level (m OD)	Context	Sediment description	Interpretation
-0.64 to -0.85	574	10YR4/ 1 to 3/ 1 dark grey to grey loamy sand, with abundant small gravel 2-25mm (subrounded), common woody fragments up to 30mm, occ shell fragments observed also. At base is a thin sharply bounded layer of clean yellow (2.5Y6/ 4 light yellowish brown) sand. Sharp boundary.	Gravely detrital sand
-0.85 to -1.07	596	Black very fine humified peat, stonefree, becoming browner and mized with iron staining around rootholes from -0.96m OD down. Boundary quite sharp but undulating and sloping downwards to the northwest (-1.02 to -1.07m OD slope in 100mm tin)	Peat
-1.07 to -1.14	?580	2.5Y4/ 2 dark grayish brown silt loam, fine silt, occasional root imprint, rare v small stones and rare sand grains	Fine alluvium

Table 155: Sediment descriptions for Monolith <122> (<M1>), Trench 118

Level (m OD)	Context	Sediment description	Interpretation
-0.91 to -0.96	596	Peat	Peat
-0.96 to -1.07	?580	Fine alluvium	Fine alluvium
-1.07 to -1.34	580	10YR4/ 3 brown sand, loamy at upper and lower thirds and loose sand in central third. Rare gravel subrounded. Clear boundary	Sand
-1.34 to -1.41	585	Gravel, rounded <30mm in brown sand matrix	Gravel

Dating

3.29.5 Forty five radiocarbon dates were obtained from Trench 118, of which only those associated with the palaeoenvironmental samples discussed below are given in Table 156. For a full listing of all radiocarbon dates see Appendix 1: Radiocarbon Dates.

Table 156: Selected Radiocarbon dates from Trench 118

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)	C:N	Calibrated date (95.4%, 2σ range)	Reliability of Date
<1(M1)> (223)	-0.82	Sediment (acid/alkali/acid)	Beta-250594	5110±40	-28.3			3990–3790 cal BC	3
<1(M3)> (177N)	0.19	Sediment (acid/alkali/acid)	Beta-250595	4120±40	-28.3			2880–2570 cal BC	2
<1(M4)> (172 lower)	0.67	Sediment (acid wash)	Beta-250596	2630±40	-28.2			900–670 cal BC	3
<1(M5)> (172 upper)	1.07	Sediment (acid/alkali/acid)	Beta-250597	990±40	-26.9			cal AD 980–1160	2
<9(M11)> (183-191)	-0.4	Sediment (acid/alkali/acid)	Beta-250598	4250±40	-27.2			2930–2670 cal BC	2
<9(M6)> (183)	-0.44	Sediment (acid/alkali/acid)	Beta-250599	2970±40	-24.3			1380–1050 cal BC	1
<9(M8)> (210)	0.20	Sediment (acid wash)	Beta-250600	3080±40	-28.5			1440–1220 cal BC	3

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)	C:N	Calibrated date (95.4%, 2σ range)	Reliability of Date
<9(M9)> (208)	0.64	Sediment (acid wash)	Beta-250601	1790±40	-27.9			cal AD 120–350	1
<9(M9)> (207)	1.05	Sediment (acid/alkali/acid)	Beta-250602	550±40	-24.4			cal AD 1300–1440	1
<126> (580 complex = 596)	1.11 to 1.13	Waterlogged wood: has bark, but possibly large root.	SUERC-33680	2960±30	-29.6			1300–1050 cal BC	3
<121> (580 complex = 596)	1.36 to 1.38	Seeds: 25 x *Alnus glutinosa,* 2 x *Ranunculus, Persicaria hydropiper, Schoenoplectrus, Galeopsis*	SUERC-33681	3005±30	-26.9			1380–1120 cal BC	2
<127> (585)	1.13 to 1.18	Plant material: twig with clearly identifiable bud scales cf. *Alnus glutinosa*	SUERC-33682	4605±30	-29			3510–3130 cal BC	3
(526)	-	Bone: *Equus* sp. femur (7g	SUERC-34938	395±35	-23.1	3.4	3.3	cal AD 1430–1640	1
(569)	-0.26 to -0.41 or 0.09 to -0.15	Bone: *Bos* femur (5g)	SUERC-34939	2040±35	-22.2	6.2	3.3	170 cal BC–cal AD 50	1
<21> (182)	0.95 to 0.96	Charred cereal: 2 x *Hordeum* grains	SUERC-34944	1865±35	-24.5			cal AD 70–240	1
<1(M3)> (177N)	1.75	Sediment (humic acid)	SUERC-34948	4480±35	-28.3			3350–3020 cal BC	1
<122(M2)> (580)	-0.82	Sediment	SUERC-34949	10,325±40	-29.8			10,440–10,040 cal BC	1
<125> (574)	0.19	Plant material: 11 x *Alnus glutinosa* seeds + cone	SUERC-34950	2935±35	-28.8			1270–1020 cal BC	1
<38> (162)	0.67	Plant material: *Alnus glutinosa* cone	SUERC-34951	4650±35	-26.9			3520–3360 cal BC	1
<27> (177S)	1.07	Seeds: 5 x *Schoenoplectus*, 2 x *Carex*, 2 x *Oenanthe.*	SUERC-34952	2235±35	-27			390–200 cal BC	3
<12> (182)	-0.4	Plant material: 2 x *Nuphar lutea* seeds, *Alnus glutinosa* cone	SUERC-34953	2970±35	-27.3			1320–1050 cal BC	3
<14> (210)	-0.44	Seeds: 10 x *Ranunculus*, 5 x *Schoenoplectrus*	SUERC-34954	1900±35	-26.2			cal AD 20–220	1
<5> (177N)	base is at -0.36	Plant material: *Corylus avellana* nut shell	SUERC-36226	4120±30	-29.3			2870–2570 cal BC	2
<126> (596)	?-0.61 to -0.81	Seeds: 100 x *Carex* sp.	SUERC-36287	10,000±35	-25.3			9750–9330 cal BC	1
<11> (183)	0.53 to -0.35	Seeds: 26 x *Ranunculus*, 8 x *Persicaria hydropiper*, 4 x *Potentilla*, 30 x *Rumex*	SUERC-36571	3055±35	-26.7			1420–1210 cal BC	1
<24s7> (183)	0.26	Plant material: 2 x *Corylus avellana* fragments, 2 x *Alnus glutinosa* cones	SUERC-36575	4680±35	-29.5			3630–3360 cal BC	1

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)	C:N	Calibrated date (95.4%, 2σ range)	Reliability of Date
<101> (532)	-1.1	Seeds: 12 x *Thalictrum flavum,* 15 x *Stachys*	SUERC-36576	1920±35	-27.6			cal AD 1–220	1
<24s3> (182)	-0.85 to -0.51	Seeds: 10 x *Oenanthe*, 3 x *Ranunculus*	SUERC-36577	1945±35	-27.5			40 cal BC–cal AD 130	1
<113> (572)	-0.7 to -0.4	Plant material: 5 x *Alnus glutinosa* cones	SUERC-36578	2040±35	-28.5			170 cal BC–cal AD 50	1

OSL Quartz Dating

3.29.6 OSL quartz dating was undertaken on samples from a series of sandy contexts in Trench 118 (Toms 2008). In total six samples were analysed, with results summarised in Table 8.4. A number of the resultant dates contained associated caveats which are also listed in Table 8.2. Samples were collected in daylight from sections by means of opaque plastic tubing (150 x 45 mm) forced into each face. For each sample, an addition 100g of sediment was collected for laboratory-based assessment of radioactive disequilibrium. Full details of preparation, measurement and evaluation are given in Toms (2008) and Howell and Spurr (2009).

Plant Macrofossils

3.29.7 Around 45 samples, including subsamples from monoliths, were examined from Trench 118, listed in Table 158, Table 159, Table 160 and Table 161. Unfortunately a number of samples from the evaluation and the majority from the mitigation were either not marked on section drawings or were not taken from well recorded exposed sections. Examination of the section drawings, in combination with discrepancies in samples from supposedly equivalent contexts and anomalies in the radiocarbon dating clearly indicated that in several cases contexts had either been muddled or severely overcut and hence incorporating older and/ or younger deposits.

3.29.8 Regarding the periods represented, the samples covered the Late Glacial, quite probably including the Greenland Interstadial 1, Early Holocene eg. c. 10,000 to 9,000 BC, Neolithic, Bronze Age, Iron Age, Romano-British and post-medieval periods.

3.29.9 While it is possible that deposits within the base of the south-west end of the trench, comprising (580) and (595), touch upon the earliest Mesolithic, deposits of this date were generally absent from the Trench. The Early Neolithic is represented within three dated deposits from (162), the base of (183) and probably (585). It is also suspected that a very peaty, tufaceous deposit (191) and (570) may be reworked and of potential Neolithic date. The deposits stratigraphic position suggests that this reworking probably occurred in the Middle to Late Bronze Age, however, at it lies at the interface with the Late Iron Age/ Early Romano-British channel, it is very possible it relates to this event.

3.29.10 The Late Neolithic is poorly represented, only being securely dated in context (177N) in the south-east facing section of the evaluation, although antler fragments of this date were recovered from complex (580). The Early Bronze Age is not represented by any deposits, while the Middle to Late Bronze Age is well represented in (574), (562) and (183). While sampled deposits straddle the Middle Bronze Age to Late Bronze Age transition, no deposits spanning the Late Bronze Age to Middle Iron Age were recovered from the Trench. A channel in the south-west of the trench, probably formed in the Late Iron Age period, continued to infill into the Romano-British period, comprising contexts (569). (564), (532), (572) and the lower part of (182) and of more definite Early to Middle Romano-British date, (532), (208), (210) and the upper part of (182).

Table 157: D_r, D_e and Age data of OSL samples from Trench 118 (from Toms 2008). Uncertainties in age are quoted at 1σ confidence, are based on analytical errors and reflect combined systematic and experimental variability and (in parenthesis) experimental variability alone. [a] Calculated from concentrations of U, Th and K determined by *in situ* NaI gamma spectrometry. [b] Calculated from concentrations of U, Th and K determined by neutron activation analysis. [c] Estimates obtained using the method described by Prescott and Hutton (1994). [d] Accept tentatively due to insufficient sample mass for all diagnostics

OSL Sample	Depth (m OD) [Context]	Grain size (µm)	Moisture content	NaI γ-spectrometry (in situ) K (%)	Th (ppm)	U (ppm)
GL08007	-0.415 [187]	18-250	0.17±0.04	0.26±0.01	1.49±0.11	0.80±0.07
GL08008	-0.33 [187]	125-180	0.23±0.06	0.79±0.02	3.40±0.15	1.92±0.11
GL08009	0.015 [193]	125-180	0.21±0.05	0.57±0.02	2.99±0.14	1.72±0.10
GL08010	0.82 [247]	125-180	0.22±0.16	0.64±0.02	4.78±0.18	2.31±0.18
GL08011	1.085 [219]	125-180	0.16±0.04	0.62±0.02	4.33±0.19	2.10±0.13
GL08012	1.585 [219]	125-180	0.35±0.09	0.86±0.02	5.44±0.20	2.20±0.13

OSL Sample	γD_r [a] (Gy ka^{-1})	Ge γ-spectrometry (lab based) K (%)	Th (ppm)	U (ppm)	βD_r [b] (Gy ka^{-1})
GL08007	0.23±0.01	0.31±0.02	1.68±0.30	0.50±0.06	0.25±0.03
GL08008	0.57±0.02	1.24±0.06	5.37±0.42	1.25±0.08	0.87±0.10
GL08009	0.48±0.02	1.25±0.06	6.10±0.46	1.61±0.09	0.95±0.10
GL08010	0.64±0.03	1.01±0.05	6.95±0.53	1.50±0.09	0.81±0.09
GL08011	0.59±0.02	0.91±0.05	5.34±0.41	1.15±0.08	0.76±0.07
GL08012	0.72±0.03	1.43±0.07	10.77±0.61	1.57±0.09	0.90±0.14

OSL Sample	Cosmic D_r [c] (Gy ka^{-1})	Total D_r (Gy ka^{-1})	D_e (Gy)	Age ka before 2008	Date (BC; 1σ range; rounded to nearest 10 years)
GL08007	0.13±0.01	0.61±0.03	8.3±0.4	13.7±1.0 (0.8)	12,690–10,690
GL08008	0.13±0.01	1.57±0.11	21.8±0.8	13.9±1.1 (0.8)	12,990–10,790
GL08009	0.14±0.01	1.56±0.11	19.7±0.9	12.6±1.0 (0.8)	11,590–9590
GL08010	0.16±0.02	1.62±0.10	5.4±0.2	3.3±0.2 (0.2)	1490–1090
GL08011	0.18±0.02	1.54±0.08	5.2±0.4	3.4±0.3 (0.3)	1690–1090
GL08012	0.16±0.01	1.77±0.14	10.6±0.5	6.0±0.6 (0.5) [d]	4590–3390

3.29.11 The latest sampled deposits examined from the site comprise those associated with a deep channel cut that was dated to the mid 15th to mid 17th century, and included samples from (169), (207), (172) and (177S). It should be noted that this channel cut was clearly seen to divide deposits that were ascribed to a single context (177). Examination of photographs, sediments and eventually substantiated radiocarbon, demonstrated that (177) clearly comprised two different deposits, renamed (177N) which dated to the Middle to Late Neolithic and was cut by the channel and (177S) which was within the fill of the channel. Waterlogged material from a further context cut by this channel (174) failed to produce a radiocarbon date, but this has been broadly ascribed as probably belonging to the Middle Bronze Age to Romano-British period.

INTERGLACIAL TO EARLY HOLOCENE (GI-1 TO C. 9000 CAL. BC)

3.29.12 The earliest samples from the Greenland Interstadial 1 had generally little in the way of waterlogged remains and it is probable that such material had been largely destroyed when the deposits dried out during the following interstadial (GS-1). Only a few seeds of water-crowfoot (*Ranunculus* subg. *Batrachium*) from (506) tentatively ascribed to this period were recovered.

3.29.13 Radiocarbon dates on humic acids from sediments within the base of the channel fill (580) within the south-west of the Trench placed the lower part of this sequence within the Greenland Stadial 1 (GS1) 10,440-10,040 cal. BC (SUERC-34949, 10325±40 BP). Further dates from plant material within the upper peat (596) sealing (580) indicated that the peat had formed during the Early Holocene, 9750-9330 cal BC (SUERC-36287, 10000±35 BP). Sub-samples for plant macrofossils from the monolith associated with these lower lying deposits indicated the presence of stonewort, bulrush, water-plantain and pondweeds. As also seen within Trench 71, the channel would appear to have become cut-off in the Early Holocene with peat (596) forming within a highly vegetated environment with little to no water-flow. Waterlogged plant remains from this peat (596) indicated species, such as club-rush, stonewort, water-crowfoot, water-plantain, mare's tail and pondweed present. The general environment beyond the channel can be seen to be an expansive marshland with evidence for grassland, including buttercup, thistle, docks, silverweed and self-heal along with reeds, rushes and sedges, with low levels of meadowsweet.

NEOLITHIC

3.29.14 In total three contexts were radiocarbon dated to the Neolithic. Two dates came from similar channel edge deposits (162) immediately overlying the Late Glacial/ Early post-glacial deposits at the base of the Trench and the lowest part of context (183) lying at a similar level at the base of the north-east facing evaluation section. These dates, both on alder cones, returned Early Neolithic dates of 3520-3360 cal BC, (SUERC-34951, 4650±35 BP) for (162) and from (183) 3630-3360 cal BC (SUERC-36575, 4680±35 BP,). As stated above a third radiocarbon date, 3510-3130 cal BC (SUERC-33682, 4605±30 BP) came from a sample originally recorded as coming from late Pleistocene gravels (585) in the base of the north-east facing section. The other Neolithic dated sequence came from a clearly visible channel cut within the south-east facing section was dated upon sediments and waterlogged hazelnut shells from (177N) to the Middle to Late Neolithic. The earlier date 3510-3130 cal BC (SUERC-33682, 4605±30 BP) was on hazelnut shells, while the later date from below was on humic acids, 2870-2570 cal BC (SUERC-36226, 4120±30 BP).

3.29.15 Both the assemblages from (162) and (223) indicated high amounts of alder-carr woodland extending up to the channel edge. As with the Late Mesolithic sample described from Trench 33, woody scrub components, including elder, hawthorn, willow, sloe and bramble were common, while winter-cress and nettle are indicative of lower growing herbaceous communities on the edge of such scrub. The presence of the three-nerved sandwort (*Moehringia trinervia*) is of some interest as it tends to be associated with more peaty-mull soils within woodland or areas of relict woodland. A similar grassland element to that described for the Mesolithic sample is also present with buttercup, dock, tormentil, self-heal, cinquefoil and thistle probably giving way to a more fen-marsh grassland, with a great many seeds of club rush, along with water-droplet, mint and gypsywort, and bog bean all recorded. Along with nettle are similar elements of disturbance although slightly less common that seen previously.

3.29.16 The Middle to Late Neolithic deposit (177N) indicated a broadly similar woodland Carr environment, although aquatics and species of open environments are less well represented in the macrofossils and the pollen evidence. Remains of alder, along with nut shell of hazel and fragments of acorn cups, indicate that alder, hazel and oak are all likely to have grown right up to the edge of this channel edge.

MIDDLE TO LATE BRONZE AGE

3.29.17 Within the south-west of this Trench was a thick deposit of channel fills dating to the Middle to Late Bronze Age these included in approximate chronological order, oldest to youngest; (574), (562) and (183), the latter two potentially being part of the same context. It is notable that (183), as recorded in the north-east facing section, is identifiable with (562), a thick (0.7m+) organic, alluvial silty-clay deposit. However, it is also described as a peaty silt tufa, and also a mixed deposit of "gravel, wood, mollusc shell, bone and tufa", which might be more readily equated with (574) below.

3.29.18 Radiocarbon dates from the north-east facing section showed (183) to be dated to the Middle to Late Bronze Age; 1420-1210 cal BC (SUERC-36571, 3055±35 BP), and 1320-1050 cal BC (SUERC-34953, 2970±35 BP), this latter date technically coming from (182/ 183) the interface with the overlying channel. Two further radiocarbon determinations were carried out on contexts relating to this same channel fill recorded within the mitigation. One was on gravely detrital sand recorded as (574) that underlay (562/ 183) in the base of the channel cut in the north-east facing section of the Mitigation trench. This produced a date on alder seeds and a cone, similar to those above, 1270-1020 cal BC (SUERC-34950, 2935±35 BP). A second date, 1380-1120 cal BC (SUERC-33681, 3005±30 BP), was obtained on alder fruits and other seeds allegedly from (596). However, as seen above, this sample is more likely to come from the base of (574), and indeed the molluscan and waterlogged plant assemblage add to the evidence from the radiocarbon dates that these two samples are broadly analogous. For this reason both are treated as coming from (574). It was also notable that deposited tree stumps, broken tree trunks and a tufaceous deposit (570)/ (191) may date to this period, but appear to be redeposited in the base of the Late Iron Age/ Romano-British channel, usually found straddling the upper Bronze Age contexts.

3.29.19 The aquatic part of the assemblage reflect a relatively vegetated channel, with plant macrofossils indicating the presence of chara, water-crowfoots, marsh yellow cress, mare's tail, water-plantain, pondweed, horned-pond weed, bur-reed and common club-rush.

3.29.20 There was quite a degree of variation seen in the waterlogged plant remains within the samples from (183) and (562). The lower samples from (183) had very few aquatics, while the upper samples showed a reversion to an assemblage more similar to that from (574), with the addition of water-lily, water-starwort, and arrowhead, while mare's tail was absent. That from (562) had little a slightly different array of aquatics, although marsh yellow cress, lesser water-plantain, water-plantain and duck weeds were all present.

3.29.21 By comparison with the Neolithic it likely that the Middle to Late Bronze Age floodplain was less wooded than in previous periods, although it still appears to form a fairly substantial component of the assemblage.

3.29.22 The Bronze Age plant macrofossils from contexts (183), (562) and (574) all indicate alder carr woodland, along with evidence for the localised presence of hazel and willow. Occasional acorns also indicate oak trees on this part of the floodplain, although only low amounts of its pollen were seen. There are also scrub elements within this woodland, including elder, sloe, hawthorn, and bramble. Unlike the Mesolithic and Neolithic samples winter-cress was largely absent, although bugle which is often found within grassy areas bordering fen carr was present, and water-pepper (*Persicaria hydropiper*) is often found within more shaded places. There were several other elements associated with more open wet grassland pasture, including seeds of buttercup, marsh marigold, ragged robin, *Plantago lanceolata*, *Plantago* *media*, *Rumex* sp., self-heal, with several also indicative of more marshy fen sedge-grassland eg. fairly high numbers of sedge, marsh valerian, mint, and gypsywort. These species, along with the presence of several associated with disturbance, including seeds and pollen of Polygonaceae, goosefoots, in particular fat-hen, and orache all indicate probable pasture and grazing. Notably such species appear more common within the upper fills of the Bronze Age channel, than for example (574).

<u>Late Iron Age/Romano-British</u>

3.29.23 A Late Iron Age/ Early Roman channel cut was identified within the south-west end of this trench dissecting the earlier Middle-Late Bronze Age fills. The full extent of the channel cut was difficult to establish given that it was heavily truncated by the medieval channel running across the centre of the trench. The fills of this channel as seen within south-east and north-west facing sections, or with the evaluation contexts could not always be directly correlated with either the samples or each other. However, broadly the sequence is as follows, the basal fills of the channel comprised deposits (569), the lower to middle part of (182), and lowest part of (572); with (572), (182) and (564), probably (532), followed by the upper part of (564), (210) and most likely (533) at the top. It is possible that two further contexts (208), (209), and either lie within the channel or are sealed by it.

3.29.24 The basal dates from this channel indicated that it is likely to have been formed around the Middle to Late Iron Age, with two identical dates of 170 cal BC - cal AD 50 (SUERC-36578, 2040±35 BP; SUERC-34939, 2040±35 BP) on alder cones from (572) and a cattle bone from context [569] respectively. Further dates indicate that organic deposits were still accumulating in the channel during the early Romano-British period with dates of cal AD 1-220 (SUERC-36576; 1920±35 BP) cal AD 20-220 (SUERC-34954, 1900±35 BP) on seeds from (532) and (210) respectively.

3.29.25 Of aquatic species, waterlogged remains of chara, pondweed, horned pondweed, water lily and water plantain, along with water-droplet (*Oenanthe fluviatilis*) were commoner in the lower lying samples, but absent from the uppermost fills (533), (532) and (210) of the channel. While water-crowfoots, arrowhead (*Sagittifolia sagittifolia*) and common club-rush (*Schoenoplectus lacustris*) were present within all samples, with mare's tail (*Hippuris vulgaris*) only present within the uppermost context (210).

3.29.26 Alder is still frequent within at least the lowest fills of this Late-Iron Age to Romano-British channel, as seen from the presence of seeds and catkins/ "cones". Some of these may be reworked, but the cones dated from (572) would confirm its presence in at least the Late Iron Age. One noticeable difference with earlier samples was the considerably greater number of buds of willow/ popular (*Salix/ Populus*) within these samples, suggesting a reasonably extensive area scrub dominated the river edge. However, the possibility that they come from hedges or even deliberately managed osiers, especially given the evidence for nearby settlement is a distinct possibility.

3.29.27 Other evidence for scrub includes seeds and stones of elder, hawthorn, sloe, and bramble, with winter-cress no doubt associated with the margins of such vegetation. Water-pepper (*Persicaria hydropiper*), tasteless water-pepper (*Persicaria mitis*), and small water-pepper (*Persicaria minor*) and water-mint (*Mentha aquatica*) are also all associated with such shaded environments along the water edge.

3.29.28 Indicators of general species associated with grassland pasture/meadow are frequent within these assemblages, including buttercup, common meadow-rue (*Thalictrum flavum*), ragged-robin (*Lychnis flos-cuculi*), dock (*Rumex* sp.), silverweed (*Potentilla argentea*) and tormentil (*Potentilla erecta*), and in the pollen meadowsweet (*Filipendula* sp.) and ribwort plantain (*Plantago lanceolata*). Further, were seeds of marshy fen-grassland, including bogbean (*Menyanthes trifoliata*) and gypsywort (*Lycopus europaeus*), and this marshland element is also clearly visible in the mollusc assemblage as well as the high numbers of sedge, along with common club-rush.

3.29.29 A number of seeds of plants of disturbed, often nitrogen enriched, soils that are found in both arable fields, as well as trampled areas of grazed pasture were present including fumitory (*Fumaria* sp.), nettle, goosefoots, stitchwort (*Stellaria* sp.), knotgrass (*Polygonum aviculare*), and thistles (*Carduus/ Cirsium* sp.), although these all were generally less common in the pollen record. It was notable that celery-leaved buttercup (*Ranunculus sceleratus*) was common, particularly in the later fills. This species is particularly characteristic of low-lying, nitrogen enriched pastures in wetter areas, especially around estuaries.

MID 15TH CENTURY TO MID 17TH CENTURY

3.29.30 A single channel crossing the trench broadly north to south was visible in both the south-east and north-west facing sections. That the channel could be seen to truncate earlier channel fills in the south-east facing section, including (182) and (170) that were seen to be Roman in date, suggested a Saxon or later date for the channel. The dating of a horse femur from (526) from the main fill, provided a date of around cal AD 1430-1640 (SUERC-34938, 395±35 BP) demonstrated that this major channel is likely to be 15th to 17th century.

3.29.31 The vegetation within the channel fills had stonewort, water crowfoot, river water-droplet, water-plantain, bur-reed, common clubrush and arrowhead and characterise a vegetated active channel existed for much of the deposition of these deposits.

3.29.32 There are high numbers of worm cocoons within the uppermost channel contexts (169) and (207) that might imply a higher input of such material from eroding banks or possibly that the top of the channel dried out, although it might be noted that seeds of aquatics are frequent enough in both context as to imply the former rather than the latter. The samples provided evidence for buttercup and celery-leaved buttercup (*Ranunculus sceleratus*), meadowsweet (*Filipendula ulmaria*), dock, and silverweed, along with bogbean, gypsywort, mint, local presence of a number of species indicative of disturbance including nettle, goosefoots, henbane (*Hyoscyamus niger*), thistles and ribwort plantain. Very little evidence for trees is present within the samples, with willow, hazel and alder. The sample from context (177N) did have some remains of alder (*Alnus glutinosa*), and willow (*Salix* sp.) but in these cases there’s a possibility that some of this material is reworked, especially given the Iron Age radiocarbon date from this context 390-200 cal BC (SUERC-34952, 2235+35 BP).

3.29.33 Of some interest was a single seed of sun spurge from (177N). While Stace (1997) notes this plant as a native, and the New Atlas of the British and Irish Flora as a pre-AD 1500 introduction (Hill *et al*. 2004), it is almost certainly a more recent introduction. There are no archaeobotanical records listed within Tomlinson and Hall (1996) that predate the medieval period and a Late Saxon to early medieval introduction seems more probable. This alone would at least insinuate that not all of the material from (177N) is necessarily reworked.

Table 158: Waterlogged plant remain samples taken and examined from the south-east facing section of Trench 118 within the evaluation. NB. Neither samples <39> nor <21> are marked on the section and while associated with contexts within this section they may come from other parts of Trench 118.

Sample		<7>	<27>	<21>	<6>	<5>	<39>	<26>	<22> = <25>	<4>
Context		(172)	(177S)	(182)	(174)	(177N)	(55) =(183?)	(?183/182)	(185)	(185)
Period		15 - 17th Century		LIA / RB	MBA-LIA/RB	Late Neolithic	??	ENEO-MLBA	Early Mesolithic	
Chara sp.	stonewort	-	-	+	-	-	-	-	-	-
Nuphar lutea	yellow water-lily	-	-	6	-	-	+	-	-	-
Ceratophyllum demersum	rigid hornwort	-	-	1	-	-	-	-	-	-
Ranunculus repens	creeping buttercup	2	39	++	-	2	+	17	1	-
Ranunculus sardous	hairy buttercup	-	3	-	-	-	-	-	-	2
Ranunculus sceleratus	celery-leaved buttercup	7	1	+	-	-	-	1	-	-
Ranunculus subg. *Batrachium*	water-crowfoots	1	15	+++	-	-	+	+	-	-
Ranunculus flammula	greater spearwort	-	5	-	-	-	-	-	-	-
Thalictrum flavum	common meadow-rue	-	-	+	-	-	-	-	-	-
Urtica dioica	common nettle	30	20	-	2	-	-	+	-	-
Alnus glutinosa (fruits)	alder fruits	-	3	-	-	-	-	++	-	-
Alnus glutinosa (female catkins)	alder catkins/cones	-	2	21	3	12	-	94	-	-
Alnus glutinosa (male catkins)	alder male catkins	-	2	1	-	1	-	++	-	-
Alnus glutinosa (buds)	alder twig and buds	-	-	-	1	-	-	-	-	-
Corylus avellana	hazelnut	-	-	-	-	7	-	4	-	-
Chenopodium rubrum	red goosefoot	-	-	+	-	-	-	-	-	-
Chenopodium polyspermum	many-seeded goosefoot	-	-	+	-	-	-	-	-	-
Chenopodium album	fathen	-	-	+	-	-	+	50	-	-
Atriplex sp.	orache	1	4	+	-	-	-	-	-	-
Montia fontana sp. *chondrosperma*	blinks	-	-	+	-	-	-	-	-	-
Stellaria media/ nemorum	common/ wood stitchwort	-	1	+	-	-	-	1	-	-
Lychnis flos-cuculi	ragged-robin	-	1	-	-	-	-	-	-	-
Persicaria hydropiper	water-pepper	-	1	1	-	-	-	2	-	-
Persicaria hydropiper/ mitis	water-pepper	-	1	-	-	-	-	-	-	-
Persicaria mitis	tasteless water-pepper	-	-	-	-	-	-	1	-	-
Persicaria minor	small water-pepper	-	-	-	-	-	-	2	-	-
Polygonum aviculare	knotgrass	-	-	+	-	-	-	-	-	-
Rumex sp.	dock	-	15	++	-	1	+	1	-	-

Sample		<7>	<27>	<21>	<6>	<5>	<39>	<26>	<22> = <25>	<4>
Context		(172)	(177S)	(182)	(174)	(177N)	(55) =(183?)	(?183/182)	(185)	(185)
Period		15 - 17th Century		LIA / RB	MBA-LIA/RB	Late Neolithic	??	ENEO-MLBA	Early Mesolithic	
Rumex acetosella group	sheep's sorrel	-	1	-	-	-	-	-	-	-
Rumex hydrolapathum	water dock	-	3	-	-	-	-	-	-	-
Rumex conglomeratus (fruit)	clustered dock	-	1	-	-	-	-	-	-	-
Elatine hexandra	waterwort	1	-	-	-	-	-	-	-	-
Hypericum sp.	St. John's wort	-	-	-	1	-	-	-	-	-
Viola odorata/hirta	sweet/ hairy violet	-	-	-	-	2	-	-	-	-
Salix/ Populus catkin bud scale	willow bud scale	-	3	+++	-	-	+	-	-	-
Barbarea vulgaris	winter-cress	-	-	++	-	-	-	-	-	-
Rorippa cf. *nasturtium-aquaticum*	narrow-fruited watercress	-	4	+	-	-	-	-	-	-
Thlaspi arvense	field-penny cress	-	-	+	-	-	-	-	-	-
Coronopus squamatus	swine-cress	-	1	-	-	-	-	-	-	-
Brassica cf. *nigra*	black mustard	-	-	+	-	-	-	-	-	-
Rubus sp.	bramble	1	2	++	1	5	-	8	-	-
Potentilla anserina	silverweed	-	2	+	-	-	-	-	-	-
Potentilla erecta	tormentil	-	2	+	-	-	-	-	-	-
Prunus spinosa	sloe	-	-	1	-	-	-	11	-	-
Crataegus monogyna	Hawthorn stone	-	-	1	-	-	-	24	-	-
Myriophyllum spicatum	spiked water-milfoil	-	-	+	-	-	-	-	-	-
Euphorbiaceae type	sun spurge	-	1	-	-	-	-	-	-	-
Oenanthe fluviatilis	water-dropworts	1	10	+	-	-	+	-	-	-
Conium maculatum	hemlock	-	-	+	-	-	-	1	-	-
Apium nodiflorum	fool's watercress	-	8	++	-	-	+	1	-	-
Hyoscyamus niger	henbane	-	-	+	-	-	-	-	-	-
Solanum nigrum	black nightshade	-	2	-	-	-	-	-	-	-
Menyanthes trifoliata	bogbean	-	3	-	-	-	+	-	-	-
Verbena officinalis	vervain	-	1	-	-	-	-	-	-	-
Stachys sp.	woundwort	-	1	-	-	-	+	-	-	-
Stachys sylvatica/ arvensis	hedge woundwort	-	-	-	-	-	-	1	-	-
Galeopsis sp.	hemp-nettle	-	2	-	-	1	-	-	-	2
Ajuga reptans	bugle	-	2	+	-	-	-	-	-	-

Sample		<7>	<27>	<21>	<6>	<5>	<39>	<26>	<22> = <25>	<4>
Context		(172)	(177S)	(182)	(174)	(177N)	(55) =(183?)	(?183/182)	(185)	(185)
Period		15 - 17th Century		LIA / RB	MBA-LIA/RB	Late Neolithic	??	ENEO-MLBA	Early Mesolithic	
Prunella vulgaris	self-heal	-	-	++	-	-	-	-	-	-
Lycopus europaeus	gypsywort	1	2	+	-	-	-	1	-	1
Mentha sp.	mint	20	16	+++	1	-	-	++	-	-
Sambucus nigra	elder	2	6	++	1	8	-	34	1	-
Carduus crispus	welted thistle	-	2	-	-	-	-	-	-	-
Carduus/ Cirsium sp.	thistle	-	4	++	-	-	+	-	-	1
Lapsana communis	nipplewort	-	1	-	-	-	-	-	-	-
Taraxacum sp.	dandelion	-	1	-	-	-	-	-	-	-
Senecio/ Solidago type	goldenrod/ ragwort	-	1	-	-	-	-	-	-	-
Sagittifolia sagittifolia	arrowhead	-	6	++	-	-	-	-	-	-
Alisma plantago-aquatica	water-plantain	-	1	+	-	-	-	-	-	-
Potamogeton sp.	pondweeds	-	4	+++	-	-	-	1	-	-
Zannichellia palustris	horned pondweed	-	-	-	-	-	+	-	-	-
Lemna sp.	duckweeds	-	-	+	-	-	-	-	-	-
Juncus sp.	rush	++	+	-	-	-	-	-	-	-
Eleocharis sp.	spike-rush	-	1	+	-	-	-	-	-	1
Schoenoplectus sp.	club rushes	1	88	++++	1	2	++	-	1	1
Carex sp. (flat)	sedge (lenticular)	-	7	+	1	-	-	-	-	-
Carex sp. (trigonous)	sedge (trigonous)	3	30	+++	-	-	+	1	1	2
Cereal grain indet.	cereal grain indet.	-	-	+	-	-	-	-	-	-
Sparganium erectum (embryo)	branched bur-reed	-	1	++	-	-	-	2	-	-
Sparganium erectum (whole fruit)	branched bur-reed	-	37	+++	-	-	-	5	1	-
Wood + twigs		-	+	++	1	++	-	+++	-	-
Buds		-	1	-	-	-	-	++	-	-
charcoal		-	-	-	-	-	-	++	-	-
Lophopus crystallinus	Bryozoan statoblast	-	1	-	-	-	-	-	-	-
Plumatella sp.	Bryozoan statoblast	-	+	-	+	-	-	-	+	-

Table 159: Waterlogged plant remain samples taken and examined from the north-east facing section of Trench 118 within the evaluation. NB. The stratigraphic position of (191) suggests a Middle Bronze Age to Late Iron Age in date. However, it comprised of a peat-type deposit which given the presence of reworked tree-stumps may also be reworked and earlier in date, eg. Neolithic to Early Bronze Age.

Sample		<17>	<16>	<15>	<14>	<13>	<24.1>	<12>	<24.3>	<24.4>	<20>	<11>	<24.5>	<24.6>	<24.7>	<38>
Context		(169)	(207)	(208)	(210)	(182)	(182)	(182)	(182)	(182)	(191)	(183)	(183)	(183)	(183)	(162)
Period		15th to mid 17th C		Romano-British				Late Iron Age/ Romano-British			?MBA -LIA	Middle Bronze Age			Early Neolithic	
Chara sp.	stonewort	-	+	-	-	+	-	++	+	+	-	1	-	-	-	+
Bryophyta (leaf stem)	mosses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
Nuphar lutea	yellow water-lily	-	-	-	-	-	1	2	-	+	-	4	-	1	-	4
Caltha palustris	marsh-marigold	-	-	-	-	-	-	-	-	-	-	7	-	-	-	-
Ranunculus repens	creeping buttercup	+++	++	++	11	+	+	++	++	+	10	32	-	-	-	++
Ranunculus sardous	hairy buttercup	-	+	-	2	+	-	-	-	-	-	-	-	-	-	-
Ranunculus sceleratus	celery-leaved buttercup	+	++	++	2	-	-	-	-	+	-	4	-	-	-	+
Ranunculus subg. *Batrachium*	water-crowfoots	-	+	++	4	++	++	+++	+++	+	3	5	-	-	-	-
Thalictrum flavum	common meadow-rue	-	-	+	1	2	1	+	+	-	-	-	-	-	-	+
Fumaria sp.	fumitory	-	-	-	-	-	1	+	+	-	-	1	-	-	-	-
Urtica dioica	common nettle	++	+	++++	11	+	+	++	+	-	4	31	+	+	-	+
Quercus sp. (immature acorns)	oak	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Alnus glutinosa (fruits)	alder fruits	-	-	-	-	-	1	-	1	2	50	88	1	3	-	+++
Alnus glutinosa (catkins/ cones)	alder female catkins	-	-	-	1	1	3	1	-	1	45	1	11	31	8	+++
Alnus glutinosa (male catkins)	alder male catkins	-	-	-	-	1	3	1	-	-	10	9	+	10	+	11
Alnus glutinosa (buds)	alder twig and buds	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Alnus glutinosa (root nodules)	alder root nodules	-	-	-	-	-	1	-	-	-	++	2	-	-	-	++
Corylus avellana	hazelnut	-	-	-	1	-	-	-	1	-	2	-	-	+	2	-
Chenopodium polyspermum	many-seeded goosefoot	-	+	-	-	-	-	-	-	+	-	8	-	-	-	-
Chenopodium ficifolium	fig-leaved goosefoot	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Chenopodium album	fat-hen	-	-	+	-	+	1	++	-	-	3	81	1	-	-	+
Atriplex sp.	orache	-	-	-	-	+	-	-	+	-	-	25	-	-	-	+
Atriplex cf. *prostrata*	orache	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Montia fontana ssp. *chondrosperma*	blinks	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Stellaria *palustris/ graminea*	marsh/ lesser stitchwort	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Moehringia trinervia	three-nerved sandwort	-	-	-	-	-	-	-	-	-	-	1	-	-	-	+
Stellaria media/ nemorum	common/ wood stitchwort	-	-	-	1	-	-	-	+	-	-	28	-	-	-	+

Sample		<17>	<16>	<15>	<14>	<13>	<24.1>	<12>	<24.3>	<24.4>	<20>	<11>	<24.5>	<24.6>	<24.7>	<38>
Context		(169)	(207)	(208)	(210)	(182)	(182)	(182)	(182)	(182)	(191)	(183)	(183)	(183)	(183)	(162)
Period		15th to mid 17th C		Romano-British				Late Iron Age/ Romano-British			?MBA -LIA	Middle Bronze Age			Early Neolithic	
Lychnis flos-cuculi	ragged-robin	-	-	-	1	-	-	-	-	-	-	11	-	-	-	-
Persicaria hydropiper	water-pepper	-	-	-	1	+	2	+	+	+	-	15	-	-	-	+
Persicaria hydropiper/ mitis	water-pepper	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Persicaria mitis	tasteless water-pepper	-	-	-	-	-	-	-	-	-	-	1	+	-	-	+
Polygonum aviculare	knotgrass	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-
Rumex sp.	dock	-	-	-	1	+	+	+	+	-	3	36	-	-	-	++
Rumex acetosella group	sheep’s sorrel	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Rumex conglomeratus (whole fruit)	clustered dock	-	-	-	-	-	-	-	-	-	-	2	-	-	-	1
Rumex crispus (whole fruit)	curled dock	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-
Viola odorata/ hirta	sweet/ hairy violet	-	-	-	-	+	-	+	-	-	-	1	-	-	-	-
Salix/ Populus catkin bud scale	Willow/ poplar bud scale	-	-	+	-	+	+	+	++	-	-	-	-	-	-	+
Barbarea vulgaris	winter-cress	-	-	-	2	1	+	-	-	-	-	-	-	-	-	+
Rorippa cf. *nasturtium-aquaticum*	narrow-fruited watercress	-	-	-	2	-	1	-	-	-	1	-	-	-	-	+
Camelina sativa	gold of pleasure	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Raphanus raphanistrum	runch	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Brassica cf. *nigra*	black mustard	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-
Rubus sp.	bramble	+	-	+	-	1	+	+	+	+	5	13	-	+	2	++
Rubus/ Rosa type sp. (thorn)	bramble/ rose type thorns	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Potentilla sp.	cinquefoil/tormentil	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Potentilla anserina	silverweed	-	-	-	-	1	-	-	-	+	-	14	-	-	-	-
Potentilla erecta	tormentil	-	-	-	-	-	-	+	+	-	-	18	-	-	-	+
Potentilla/ Fragaria sp.	cinquefoil/ strawberry	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Prunus spinosa	sloe	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
P. spinosa/ C. monogyna (thorns)	hawthorn/ slow thorns	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Crataegus monogyna (fruit stones)	hawthorn berries	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1
Myriophyllum spicatum	spiked water-milfoil	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-
Linum usitatissimum	capsule fragment	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Oenanthe cf. *fistulosa/ silaifolia*	tubular/ narrow-leaved water-droplet	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Oenanthe fluviatilis	water-dropwort	-	+	++	-	+	-	+	++	-	-	-	-	-	-	+

Sample		<17>	<16>	<15>	<14>	<13>	<24.1>	<12>	<24.3>	<24.4>	<20>	<11>	<24.5>	<24.6>	<24.7>	<38>
Context		(169)	(207)	(208)	(210)	(182)	(182)	(182)	(182)	(182)	(191)	(183)	(183)	(183)	(183)	(162)
Period		15th to mid 17th C		Romano-British				Late Iron Age/ Romano-British			?MBA -LIA	Middle Bronze Age			Early Neolithic	
Aethusa cynapium	fool's parsley	-	-	-	-	-	-	-	+	-	-	1	-	-	-	-
Apium nodiflorum	fool's watercress	-	-	+	-	-	-	+	+	-	-	-	-	-	-	-
Hyoscyamus niger	henbane	-	-	-	-	1	-	-	+	+	-	-	-	-	-	-
Solanum nigrum	black nightshade	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Menyanthes trifoliata	bogbean	-	+	-	-	-	-	-	-	-	-	-	-	-	-	+
Myosotis sp.	Forget-me-nots	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Stachys sp.	woundwort	-	-	-	6	-	-	-	+	+	1	-	-	1	-	+
Stachys sylvatica/arvensis	hedge woundwort	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Ballota nigra	black horehound	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Lamium sp.	dead nettle	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-
Galeopsis sp.	hemp-nettle	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
Glechoma hederacea	ground-ivy	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1
Prunella vulgaris	self-heal	-	-	-	-	-	+	-	-	-	-	3	-	-	-	+
Clinopodium acinos	basil thyme	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-
Lycopus europaeus	gypsywort	++	+	++	-	-	+	-	-	-	-	4	-	-	-	+
Mentha sp.	mint	+++	++	++++	4	-	-	-	+	-	-	27	-	-	-	+
Hippuris vulgaris	mare's-tail	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
Callitriche sp.	water-starwort	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Sambucus nigra	elder	-	-	-	-	-	+	+	++	-	10	7	-	+	-	++
Dipsacus cf. *fullonum*	wild teasel	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-
Arctium cf. *lappa*	greater burdock	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Carduus/ Cirsium sp.	thistle	++	-	-	1	+	+	++	++	-	1	7	-	-	-	+
Leontodon sp.	hawkbit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
Sonchus oleraceus	smooth sow-thistle	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Sonchus asper type	prickly sow-thistle	+	-	-	-	-	-	+	+	-	-	9	-	-	-	-
Senecio/ Solidago type	goldenrod/ ragwort	-	-	-	1	-	-	-	-	-	-	3	-	-	-	-
Sagittifolia sagittifolia	arrowhead	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-
Baldellia ranunculoides	lesser water plantain	-	-	+	-	-	-	-	-	-	-	3	-	-	-	-
Alisma plantago-aquatica	water-plantain	-	+++	++	1	1	-	+	+	+	-	18	-	-	-	-
Potamogeton sp.	pondweeds	-	-	-	-	++	++	++	+	+	15	4	-	-	-	+

Sample		<17>	<16>	<15>	<14>	<13>	<24.1>	<12>	<24.3>	<24.4>	<20>	<11>	<24.5>	<24.6>	<24.7>	<38>
Context		(169)	(207)	(208)	(210)	(182)	(182)	(182)	(182)	(182)	(191)	(183)	(183)	(183)	(183)	(162)
Period		15th to mid 17th C		Romano-British				Late Iron Age/ Romano-British			?MBA -LIA	Middle Bronze Age			Early Neolithic	
Zannichellia palustris	horned pondweed	-	-	-	-	1	-	-	+	-	-	-	-	-	-	-
Juncus sp.	rush	++	+++	+++	-	-	-	-	-	-	-	-	-	-	-	-
Eleocharis sp.	spike-rush	-	+	++	-	-	-	+	+	+	-	1	-	-	-	+
Schoenoplectus sp.	club rushes	-	-	+	6	++	+++	+++	+++	+	45	4	-	-	-	++++
Carex sp. (flat)	sedge (lenticular)	+++	+	+	1	-	-	-	+	+	-	-	-	-	-	-
Carex sp. (trigonous)	sedge (trigonous)	++	++	+++	3	1	3	++	++	+	10	9	-	-	1	+
Carex nigra/ divulsa type	sedge	++	++	-	-	-	-	-	-	-	-	-	-	-	-	-
Cereal/ Poaceae culm node indet.	culm node indet.	-	-	-	-	-	1c	-	1c	-	-	-	-	-	-	-
Glyceria sp.	sweet-grasses	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Hordeum vulgare sl	barley	-	-	-	-	-	-	-	1c	-	-	-	-	-	-	-
Triticum dicoccum (glume base)	emmer glume bases	-	-	-	-	-	-	1c	-	-	-	-	-	-	-	-
Triticum spelta (glume base)	spelt wheat glume bases	-	-	-	-	-	-	-	+c	-	-	-	-	-	-	-
Sparganium erectum (embryo)	branched bur-reed	+	+	+	1	-	-	-	+	-	-	2	-	-	-	-
Sparganium erectum (whole fruit)	branched bur-reed	-	-	-	6	+	+	+	+	+	18	-	-	+	2	+
Typha latifolia/ angustifolia	bulrush	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Wood twigs		-	-	-	-	-	+	-	++	-	++	++	-	-	-	+++
Wood		++	-	-	-	-	-	++	+	-	+++	-	++	-	++++	+++
Large roots		-	-	+	-	-	-	-	-	+	-	-	-	-	-	-
Worm cocoons		+++	++	-	-	-	+	++	+	-	-	-	-	-	-	-
Buds		-	+	-	-	-	-	-	++	-	-	-	-	-	-	-
charcoal		-	+	-	-	-	-	-	-	-	-	-	-	-	-	+
Lophopus crystallinus (Statoblasts)	Freshwater bryozoan	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
Plumatella sp. (Statoblasts)	Freshwater bryozoan	-	-	-	++	-	+	++	++	-	-	-	-	-	-	-

Table 160: Waterlogged plant remains samples from the mitigation phase of Trench 118: north-west, south-east and north-east facing sections.

Sample		<100>	<121>	<116>	<112>	<113>	<111>	<115>	<110>	<101>
Context		(506)	(574/183)	(562)	(570) = (191)	(572)	(569)	(564)	(564)	(532)
Period		GI-1	Middle Bronze Age		MBA- / LIA	Late Iron Age/Early Romano-British				
Chara sp.	stonewort	-	+	-	3	+	+	+	+	-
Nuphar lutea	yellow water-lily	-	-	-	3	2	10	2	11	-
Ceratophyllum demersum	rigid hornwort	-	-	-	-	1	-	-	-	-
Caltha palustris	marsh-marigold	-	-	+	-	+	+	+	-	+
Ranunculus repens	creeping buttercup	-	2	-	6	++	+++	++	+++	++
Ranunculus sardous	hairy buttercup	-	-	-	-	-	-	1	-	-
Ranunculus parviflorus	small flowered buttercup	-	-	-	-	-	+	-	-	-
Ranunculus sceleratus	celery-leaved buttercup	-	1	-	-	-	++	-	-	-
Ranunculus subg. *Batrachium*	water-crowfoots	2	1	-	1	+++	++++	+++	++	++
Thalictrum flavum	common meadow-rue	-	-	1	-	+	+	-	-	12
Fumaria sp.	fumitory	-	-	+	-	-	+	-	-	-
Urtica dioica	common nettle	-	4	+++	5	+	+++	+	+++	++
Alnus glutinosa (fruits)	alder fruits	-	31	+++	12	+	++	-	-	-
Alnus glutinosa (female catkins)	female catkins/cones	-	-	10	10	27	17	2	4	-
Alnus glutinosa (male catkins)	alder male catkins	-	-	++	7	-	+	-	-	-
Alnus glutinosa (buds)	alder twig and buds	-	-	-	1	-	-	-	-	-
Alnus glutinosa (root nodules)	alder root nodules	-	-	+	-	-	-	-	-	-
Corylus avellana	hazelnut	-	-	-	-	3	-	-	-	-
Chenopodium polyspermum	many-seeded goosefoot	-	-	+	-	-	++	+	+	-
Chenopodium ficifolium	fig-leaved goosefoot	-	-	+	-	-	-	-	-	-
Chenopodium album	fat-hen	-	-	++	-	+	++	+	-	-
Atriplex sp.	orache	-	-	++	-	++	+	-	++	-
Montia fontana ssp. *chondrosperma*	blinks	-	-	-	-	-	++	+	-	-
Stellaria *palustris/ graminea*	marsh/ lesser stitchwort	-	-	+	-	+	+	-	-	-
Moehringia trinervia	three-nerved sandwort	-	-	+	-	-	-	-	-	-
Stellaria media/ nemorum	common/ wood stitchwort	-	-	+	3	+	+	-	+	-
Lychnis flos-cuculi	ragged-robin	-	-	+	-	-	+	-	-	-
Silene sp.	campions	-	1	-	-	-	-	-	-	-
Persicaria maculosa/ lapathifolium	redshank/ pale persicaria	-	-	-	-	-	+	-	-	-
Persicaria hydropiper	water-pepper	-	1	+++	1	++	++	+	++	-
Persicaria mitis	tasteless water-pepper	-	-	-	1	+	-	-	+	-
Persicaria minor	small water-pepper	-	-	-	-	+	-	-	+	-
Polygonum aviculare	knotgrass	-	-	-	-	-	+	+	-	-
Fallopia convolvulus	black bindweed	-	-	1	-	-	-	-	-	-
Rumex sp.	dock	-	-	++	2	++	++	+	++	+
Rumex acetosella group	sheep's sorrel	-	-	-	-	-	+	-	-	-
Rumex conglomeratus (whole fruit)	clustered dock	-	-	+	-	+	+	-	-	+
Rumex crispus (whole fruit)	curled dock	-	-	-	-	-	+	-	-	-

Sample		<100>	<121>	<116>	<112>	<113>	<111>	<115>	<110>	<101>
Context		(506)	(574/183)	(562)	(570) = (191)	(572)	(569)	(564)	(564)	(532)
Period		GI-1	Middle Bronze Age		MBA- / LIA	Late Iron Age/Early Romano-British				
Rumex palustris	marsh dock	-	-	-	-	-	1	-	-	-
Rumex maritimus (whole fruit)	golden dock	-	-	-	-	-	-	-	1	-
Salix/Populus catkin bud scale	willow bud scale	-	-	-	-	++	+++	++	+++	+
Barbarea vulgaris	winter-cress	-	-	-	1	+	+	++	+	-
Rorippa cf. *nasturtium-aquaticum*	narrow-fruited watercress	-	-	-	-	+	+	-	+	+
Rorippa palustris	marsh yellow-cress	-	++	+	-	-	-	+	-	-
Thlaspi arvense	field-penny cress	-	-	-	-	1	-	-	-	-
Raphanus raphanistrum	runch	-	-	-	-	1	1	-	2	-
Brassica cf. *nigra*	black mustard	-	-	-	-	-	+	-	-	-
Rubus sp.	bramble	-	-	+	3	++	++	+	++	-
Rubus/ Rosa type sp. (thorn)	bramble/ rose type thorns	-	3	-	-	-	+	-	-	-
Potentilla sp.	cinquefoil/tormentil	-	-	-	-	-	-	+	-	-
Potentilla anserina	silverweed	-	1	+++	-	+	++	+	+	-
Potentilla erecta	tormentil	-	-	++	-	-	+	-	1	-
Prunus spinosa	sloe	-	-	1	-	-	3	-	-	-
Prunus domestica	wild plum	-	-	-	-	-	-	-	2	-
Prunus avium	wild cherry	-	-	-	-	-	-	-	1	-
Crataegus monogyna (fruit stones)	hawthorn berries	-	-	5	-	-	-	-	-	-
Epilobium sp.	willowherb	-	-	1	-	-	-	-	-	-
Oenanthe cf. *fistulosa/ silaifolia*	tubular/ narrow-leaved water-droplet	-	-	-	-	+	+	-	1	-
Oenanthe fluviatilis	water-dropwort	-	-	+	-	+	+++	+	+	-
Aethusa cynapium	fool's parsley	-	-	-	-	-	+	-	-	-
Conium maculatum	hemlock	-	-	1	-	-	-	-	-	-
Apium nodiflorum	fool's watercress	-	-	-	-	+	++	+	+	-
Solanum nigrum	black nightshade	-	1	-	-	1	-	-	-	-
Menyanthes trifoliata	bogbean	-	-	-	1	-	+	-	+	-
Myosotis sp.	foget-me-nots	-	-	-	-	-	-	-	-	+
Stachys sp.	woundwort	-	-	+	-	+	+	+	+	-
Stachys sylvatica/ arvensis	hedge woundwort	-	-	++	1	-	++	-	-	32
Galeopsis sp.	hemp-nettle	-	1	-	-	-	+	-	-	-
Scutellaria galericulata	skullcap	-	-	1	-	-	-	-	-	-
Ajuga reptans	bugle	-	-	-	1	-	-	-	-	-
Glechoma hederacea	ground-ivy	-	-	-	-	+	+	-	-	-
Clinopodium acinos	basil thyme	-	-	-	-	+	-	-	-	-
Lycopus europaeus	gypsywort	-	-	++	-	-	+	+	+	+
Mentha sp.	mint	-	-	+++	3	-	+++	+	-	+++
Hippuris vulgaris	mare's-tail	-	3	-	-	-	-	-	-	-
Callitriche sp.	water-starwort	-	-	+	-	-	-	-	-	-
Sambucus nigra	elder	-	-	++	5	+	+++	+	++	-
Valeriana dioica	marsh valerian	-	-	-	-	-	-	-	-	++

Sample		<100>	<121>	<116>	<112>	<113>	<111>	<115>	<110>	<101>
Context		(506)	(574/183)	(562)	(570) = (191)	(572)	(569)	(564)	(564)	(532)
Period		GI-1	Middle Bronze Age		MBA- / LIA	Late Iron Age/Early Romano-British				
Dipsacus cf. *fullonum*	wild teasel	-	-	-	-	-	+	-	-	-
Arctium cf. *lappa*	greater burdock	-	-	-	-	2	-	-	-	-
Carduus/ Cirsium sp.	thistle	-	-	-	-	+	+++	++	++	+
Centaurea cyanus/nigra	knapweed	-	-	-	-	-	-	-	+	-
Sonchus oleraceus	smooth sow-thistle	-	-	-	-	-	+	-	-	-
Sonchus asper type	prickly sow-thistle	-	-	+	1	-	+	-	-	-
Anthemis arvensis	corn chamomile	-	-	-	-	-	-	-	1	-
Bidens cf. *cernua*	nodding bur-marigold	-	-	-	-	-	-	-	+	-
Sagittifolia sagittifolia	arrowhead	-	-	-	-	+	++	+	-	+
Baldellia ranunculoides	lesser water plantain	-	-	1	-	-	-	-	-	-
Alisma plantago-aquatica	water-plantain	-	1	++	1	+	-	+	+	-
Potamogeton sp.	pondweeds	-	-	+	1	++	+++	++	++	-
Zannichellia palustris	horned pondweed	-	1	-	-	-	+	+	+	-
Lemna sp.	duckweeds	-	-	+	-	-	-	-	-	-
Juncus sp.	rush	-	-	-	-	-	-	-	-	+
Eleocharis sp.	spike-rush	-	-	-	-	+	+	+	-	+
Schoenoplectus sp.	club rushes	-	1	-	1	++++	++++	++++	++++	+++
Carex sp. (flat)	sedge (lenticular)	-	-	++	-	-	++	-	++	-
Carex sp. (trigonous)	sedge (trigonous)	-	2	+++	-	++	+++	++	++	++
Cereal grain indet.	cereal grain indet.	-	-	-	-	1	-	-	-	-
Cereal culm node indet.	cereal culm node indet.	-	-	-	-	-	1	-	-	-
Avena sp. L. (grain)	oat grain	-	-	-	-	2	-	-	-	-
Bromus sp.	Brome grass	-	-	-	-	-	1	-	-	-
Hordeum vulgare sl. (charred)	barley	-	-	-	-	2	-	-	-	-
Sparganium erectum (embryo)	Sparganium erectum	-	-	+	-	+	+	++	-	-
Sparganium erectum (whole fruit)	Sparganium erectum	-	-	+	55	++	+++	+	+++	-
Iris pseudacorus	yellow iris	-	-	2	-	-	-	-	-	1
Wood twigs		-	-	+++	-	++	-	-	-	-
Wood		-	+	++	+	++	+	-	++	-
Large roots		-	-	-	-	-	+	-	-	-
Worm cocoons		-	-	-	-	++	-	-	-	-
Buds		-	1	++	-	-	-	-	-	-
Lophopus crystallinus (Statoblasts)	Freshwater bryozoan	-	-	-	-	-	-	-	-	+
Plumatella sp. (Statoblasts)	Freshwater bryozoan	-	++	-	++	-	+	++	+++	+

*NB: No samples were recorded on the section drawings and while the samples were ascribed to these sections this information may be incorrect. Sample 121 from (574) was original ascribed to (596). However dating of the sample and errors within the recording of the section suggest that it was taken from (574) within the south-east facing section, the context as such is probably broadly contemporary with (183) and (562). Context (570) is not marked on any section but is believed to be equivalent to (191) and hence possibly reworked. Context (572) was in places not distinguished from (569) and (564), however, radiocarbon dating of this sample confirms that it is was taken from a 1st century AD, Late Iron Age to Early Romano-British, context and hence all three are likely to be broadly contemporary.

Table 161: Waterlogged plant remains samples from the mitigation phase of Trench 118: north-east facing section , including sub-samples taken from monolith <122>.

Sample		<125>	<127>	<126>	<123>	<124>	M2 <122>	M2 <122>	M2 <122>	M1 <122>
Context		(574)	(585)	(580/596)	(580/596)	(580/596)	-0.76m OD	-0.9 to - 0.95m OD	-1.07 to -1.14m OD	-1.19m OD
Period		Middle Bronze Age	Neolithic	Early Holocene/Early Post-glacial						
Chara sp.	stonewort	+	+++	++	-	-	-	-	++	-
Ranunculus repens	creeping buttercup	20	1	2	+	2	1	-	-	-
Ranunculus sardous	hairy buttercup	2	-	-	-	-	-	-	-	-
Ranunculus sceleratus	celery-leaved buttercup	6	-	-	-	-	-	-	-	-
Ranunculus subg. *Batrachium*	water-crowfoots	3	+	2	-	-	-	-	-	-
Thalictrum flavum	common meadow-rue	-	1	3	-	-	-	-	-	-
Ficus carica	fig	1	-	-	-	-	-	-	-	-
Urtica dioica	common nettle	6	1	13	-	-	-	1	-	-
Alnus glutinosa (fruits)	alder fruits	36	1	-	-	-	-	-	-	-
Alnus glutinosa (female catkins)	female catkins/cones	1	-	-	-	-	-	-	-	-
Alnus glutinosa (male catkins)	alder male catkins	1	1	2	-	-	-	-	-	-
Alnus glutinosa (buds)	alder twig and buds	-	1	-	-	-	-	-	-	-
Chenopodium polyspermum	many-seeded goosefoot	3	-	-	-	-	-	-	-	-
Chenopodium album	fat-hen	4	1	12	-	-	-	-	-	-
Atriplex sp.	orache	-	-	1	-	-	-	-	-	-
Stellaria media/ nemorum	common/wood stitchwort	2	-	-	-	-	-	-	-	-
Lychnis flos-cuculi	ragged-robin	1	-	-	-	-	-	-	-	-
Silene sp.	campions	-	3	-	-	-	-	-	-	1
Persicaria maculosa/ lapathifolium	redshank/pale persicaria	-	-	-	-	1	-	-	-	-
Persicaria hydropiper	water-pepper	4	-	1	-	-	-	-	-	-
Persicaria mitis	tasteless water-pepper	+	-	-	-	-	-	-	-	-
Rumex sp.	dock	4	1	2	-	-	-	-	1	-
Rumex palustris	marsh dock	2	-	-	-	-	-	-	-	-
Viola odorata/hirta	sweet/ hairy violet	1	-	-	-	-	-	-	-	-
Salix/Populus catkin bud scale	willow bud scale	-	1	3	-	-	-	-	-	-
Barbarea vulgaris	winter-cress	-	1	-	-	-	-	-	-	-
Rorippa palustris	marsh yellow-cress	-	+	-	-	-	-	-	-	-

Sample		<125>	<127>	<126>	<123>	<124>	M2 <122>	M2 <122>	M2 <122>	M1 <122>
Context		(574)	(585)	(580/596)	(580/596)	(580/596)	-0.76m OD	-0.9 to - 0.95m OD	-1.07 to -1.14m OD	-1.19m OD
Period		Middle Bronze Age	Neolithic	Early Holocene/Early Post-glacial						
Filipendula ulmaria	meadowsweet	-	-	10	-	-	-	-	-	-
Rubus sp.	bramble	1	-	1	+	-	-	-	-	-
Potentilla sp.	cinquefoil/tormentil	1	-	4	-	-	1	-	-	-
Potentilla anserina	silverweed	2	1	1	-	-	-	-	-	-
Potentilla erecta	tormentil	4	-	2	-	-	-	-	-	-
Crataegus monogyna (fruit stones)	hawthorn berries	1	-	-	-	-	-	-	-	-
Aethusa cynapium	fool's parsley	1	-	-	-	-	-	-	-	-
Heracleum sphondylium	hogweed	1	-	-	-	-	-	-	-	-
Solanum nigrum	black nightshade	-	-	1	-	-	-	-	-	-
Galeopsis sp.	hemp-nettle	-	-	1	-	-	-	-	-	-
Ajuga reptans	bugle	1	-	-	-	-	-	-	-	-
Prunella vulgaris	self-heal	1	-	1	-	-	-	-	-	-
Lycopus europaeus	gypsywort	1	-	8	+	1	-	-	-	-
Mentha sp.	mint	2	1	1	-	-	-	-	-	-
Hippuris vulgaris	mare's-tail	1	1	2	-	-	-	-	-	-
Callitriche sp.	water-starwort	1	-	-	-	-	-	-	-	-
Sambucus nigra	elder	-	-	1	-	-	-	-	-	-
Valeriana dioica	marsh valerian	1	-	-	-	-	-	-	-	-
Carduus/ Cirsium sp.	thistle	2	1	23	+	-	-	-	-	-
Leontodon sp.	hawkbit	-	1	-	-	-	-	-	-	-
Sonchus arvensis	perennial sow-thistle	-	-	-	+	-	-	-	-	-
Alisma plantago-aquatica	water-plantain	11	-	9	+	-	-	1	-	-
Potamogeton sp.	pondweeds	1	+	50	+	3	-	3	+	-
Juncus sp.	rush	1	+	-	-	-	1	-	-	-
Eleocharis sp.	spike-rush	-	1	-	-	-	-	-	-	-
Schoenoplectus sp.	club rushes	1	+	70	++	-	-	2	-	-
Carex sp. (flat)	sedge (lenticular)	3	-	1	-	-	-	-	-	-
Carex sp. (trigonous)	sedge (trigonous)	7	-	400	++	-	-	15	-	-
Large Poaceae/cereal (culm node)	large grass/ cereal	-	-	1	-	-	-	-	-	-

Sample		<125>	<127>	<126>	<123>	<124>	M2 <122>	M2 <122>	M2 <122>	M1 <122>
Context		(574)	(585)	(580/596)	(580/596)	(580/596)	-0.76m OD	-0.9 to - 0.95m OD	-1.07 to -1.14m OD	-1.19m OD
Period		Middle Bronze Age	Neolithic	Early Holocene/Early Post-glacial						
Sparganium erectum (whole fruit)	branched bur-reed	1	-	1	-	-	-	-	-	-
Typha latifolia/ angustifolia	bulrush	-	-	+	+++	-	-	-	-	-
Worm cocoons		-	-	+	-	-	-	-	+	-
Buds		-	1	-	-	-	-	-	-	-
Plumatella sp. (Statoblasts)	Freshwater bryozoan	-	-	1	-	-	-	-	-	-

*NB: While the monoliths are marked on the North east facing section, none of the bulk samples are marked on the section and it is only assumed that the samples come from this section. Samples 123 and 124 are drawing upon the north-east facing section within contexts (580/596) however the depths written on the sample bags themselves are different from their position within the section drawing and to this extent it is unclear as to their exact relationship to the monolith. The location of context (585) in the section under context (580) would suggest a Late glacial to Early Holocene date. However, a date on a twig of alder (with a bud) yielded an Early to Middle Neolithic date. The presence of alder catkins and occasional fruits also indicate that the deposit is unlikely to be of a Late Glacial/Early Holocene date. While the material could be intrusive, there was no indication of any such material within the more securely located and stratified deposits. Given that antlers and animal bones had been dated to the Late Neolithic and Middle Bronze Age from the overlying context, ascribed to context (580) it is quite probable that the sample was not taken from the section at the base of the Late Glacial/ Early Holocene channel, but from less securely stratified deposits on the channel edge that included material of Neolithic date.

Pollen

3.29.34 A total of twenty pollen samples were taken from four monoliths: <1> (8 samples), <9> (5 samples), <M11> (1 sample) and <122> (4 samples).

NORTH-EAST FACING SECTION

3.29.35 This has been divided into six LPAZs and described in Table 162 and shown in Figure 58.

3.29.36 The pollen from LPAZ Tr118 M122-1, M11-1 and M9-1 can be said to be broadly contemporary, showing an assemblage dominated by Poaceae (grasses) and Cyperaceae (sedges), with *Pinus sylvestris* (pine) and *Betula* (birch) important components. Other notable taxa present include *Juniperus communis* (juniper), *Helianthemum* (rock-rose), *Saxifraga granulata*-type (meadow saxifrage), *Saxifraga oppositifolia*-type (purple saxifrage), *Filipendula* (meadowsweet), *Dryas octopetala* (mountain avens) and *Plantago maritima* (sea plantain). These are all typical of the cooler conditions found during Greenland Stadial 1 (GS-1) and the Early Holocene, confirmed by radiocarbon dates of 10440-10040 cal BC (SUERC-34949, 10325±40 BP) and 9750-9330 cal BC (SUERC-36287, 10000±35 BP) from contexts (580) (within monolith <122>) and (596) respectively.

3.29.37 LPAZ Tr118 M9-2 shows the local presence of alder woodland during the Late Iron Age/ Romano-British period, though this is found to reduce (along with other woodland taxa) in the overlying LPAZs (Tr118 M9-3 and -4) as Poaceae and Cyperaceae increase, indicating an expansion locally of open habitats and change in local wetland vegetation, the later supported by increases in *Glyceria*-type (sweet-grass) implying reduced canopy cover and increased ground vegetation. Local disturbance is also identified by increases in *Plantago lanceolata* (ribwort plantain) and *Pteridium aquilinum* (bracken), possibly implying local grazing activity.

SOUTH-EAST FACING SECTION

3.29.38 This has been divided into six LPAZs and described in Table 163 and shown in Figure 59.

3.29.39 The pollen from LPAZ Tr118 M122-1, M11-1 and M9-1 shows an assemblage dominated by Poaceae and Cyperaceae, with *Pinus sylvestris* and *Betula* important components. Other notable taxa present include *Saxifraga granulata*-type, *Saxifraga oppositifolia*-type and *Dryas octopetala*. These are all typical of the cooler conditions found during the Late Pleistocene, which is confirmed by the OSL dates derived from the intervening sand bar (context (187)) of 12950-10950 BC (GLO-8008) and 12750-10750 BC (GLO-8007). The presence of deciduous woodland taxa, including *Ulmus* (elm) and *Tilia cordata* (small leaved lime), are clearly erroneous and either the result of reworked pollen or intrusive younger material. A previous radiocarbon date obtained from bulk sediment from the monolith within context (223) yielded a date of 3990-3790 cal BC (Beta-250594, 5110±40 BP) which is clearly much younger that the overlying OSL dates. Given the absence of identifiable plant remains within this context with the exception of root material penetrating from overlying younger contexts, some organic sediment intrusion within these contexts may explain some of the aberrant pollen types found here. The pollen assemblage in LPAZ Tr118 M1-1 is slightly different to those from the north-east facing section (LPAZ Tr118 M122-1, M11-1 and M9-1), notably by the absence of *Filipendula* and *Juniperus communis* which were found elsewhere. It is therefore possible that this sequence might predate those found in the north-east facing section, which is also implied by the older OSL dates on context (187) compared to those from context (580) and (596) in the south of the trench (SUERC-34949 and SUERC-36287). However, it should be achknowledged that making direct comparisons between OSL and radiocarbon dates like this is not without its own limitations.

3.29.40 LPAZ Tr118 M1-2 shows the local presence of alder and hazel woodland during the Middle to Late Neolithic. Other aspects of deciduous woodland are indicated by the presence of *Quercus* (oak) and *Tilia cordata*, though these lower values are likely to be the result of the local dominance of *Alnus glutinosa* (alder) leading to a suppression of percentages in other pollen types which would have originated from a greater distance.

3.29.41 LPAZ Tr118 M1-3 conversely shows a largely open environment where *Alnus glutinosa* is no longer locally dominant, and instead open areas of grass and marsh are locally prevalent. Some local *Corylus avellana*-type (hazel) is likely in the form of low shrubs. Much of the pollen is likely to originate from damp grassland and local wetland communities on the floodplain, and likely to be contemporary with pollen from LPAZ Tr118 M9-3/ 4, and records from across the Olympic Park site during the Romano-British to medieval periods.

Table 162: Pollen zone descriptions for Trench 118, north-east facing section (Monoliths <9> and <122>)

Zone	Depth (m OD)	Description
Tr118 M9-4	0.81 to 0.635	The pollen sample is derived from context (208). The pollen assemblage is dominated by Poaceae (38%) and Cyperaceae (31%). Tree and shrub taxa include *Ulmus* (1%), *Quercus* (3%), *Betula* (1%), *Alnus glutinosa* (3%), *Corylus avellana*-type (2%) and *Salix* (3%). Dwarf shrub and herb taxa include *Ranunculus acris*-type (1%), Brassicaceae (2%), *Filipendula* (2%), Apiaceae undiff. (1%), *Plantago lanceolata* (3%), Lactuceae undiff. (2%), *Solidago virgaurea*-type (2%) and *Glyceria*-type (1%). *Sparganium emersum*-type (2% TLP + aquatics), *Pteridium aquilinum* (2% TLP + pteridophytes) and Pteropsida (monolete.) indet. (5% TLP + pteridophytes) are also present. Pollen concentration is 49692 grains cm^{-3}.
Tr118 M9-3	0.635 to 0.015	The pollen sample is derived from contexts (182) and (210). The pollen assemblage is dominated by Poaceae (48-57%) and Cyperaceae (7-16%). Tree and shrub taxa include *Pinus sylvestris* (1-3%), *Ulmus* (up to 1%), *Quercus* (up to 4%), *Alnus glutinosa* (6-10%), *Corylus avellana*-type (1-6%) and *Salix* (up to 2%). Dwarf shrub and herb taxa include *Caltha palustris*-type (1%), *Ranunculus acris*-type (1-4%), *Rumex acetosa* (up to 2%), Brassicaceae (up to 2%), *Filipendula* (up to 3%), Apiaceae undiff. (up to 2%), *Plantago lanceolata* (4-6%), Lactuceae undiff. (1-2%), *Solidago virgaurea*-type (1-2%) and *Glyceria*-type (1-3%). *Sparganium emersum*-type (2-5% TLP + aquatics), *Typha latifolia* (up to 1% TLP + aquatics), *Pteridium aquilinum* (up to 4% TLP + pteridophytes) and Pteropsida (monolete.) indet. (2-5% TLP + pteridophytes) are also present. Pollen concentrations are between 36074 and 78180 grains cm^{-3}.
Tr118 M9-2	0.015 to -0.325	The pollen sample is derived from context (182/183). The pollen assemblage is dominated by Poaceae (28%), Cyperaceae (14%) and *Alnus glutinosa* (21%). Tree and shrub taxa also include *Ulmus* (1%), *Quercus* (4%), *Betula* (2%), and *Corylus avellana*-type (10%). Dwarf shrub and herb taxa include *Caltha-palustris*-type (1%), *Ranunculus acris*-type (2%), Chenopodiaceae (1%), *Rumex acetosa* (2%), *Filipendula* (1%), Apiaceae undiff. (2%), *Plantago lanceolata* (4%), Lactuceae undiff. (2%) and *Glyceria*-type (1%). *Sparganium emersum*-type (4% TLP + aquatics), *Typha latifolia* (1% TLP + aquatics), *Pteridium aquilinum* (1% TLP + pteridophytes) and Pteropsida (monolete.) indet. (3% TLP + pteridophytes) were also present. Pollen concentration is 30540 grains cm^{-3}.
Tr118 M9-1	-0.325 to -0.67	These pollen sample is derived from context (183/197). The pollen assemblage is dominated by Poaceae (16-27%) and Cyperaceae (39%). Tree and shrub taxa are dominated by *Pinus sylvestris* (10-18%) with *Picea* (up to 2%), *Juniperus communis* (1-5%), *Quercus* (1%), *Betula* (3-5%), *Alnus glutinosa* (1%), *Populus* (up to 2%) *Corylus avellana*-type (1-2%) and *Salix* (1-4%) also recorded. Dwarf shrub and herb taxa include *Ranunculus acris*-type (1%), *Saxifraga oppositifolia*-type (1%), *Filipendula* (1%), *Dryas octopetala* (1%), Apiaceae undiff. (3%) and *Gentianella campestris*-type (up to 1%). *Sparganium emersum*-type (2-6% TLP + aquatics), *Pteridium aquilinum* (up to 2% TLP + pteridophytes)) and Pteropsida (monolete.) indet. (3% TLP + pteridophytes) were also present. Pollen concentrations were between 13973 and 15409 grains cm^{-3}.
Tr118 M11-1	-0.67	The pollen sample is derived from context (197). The pollen assemblage is dominated by Poaceae (25%) and Cyperaceae (45%). Tree and shrub taxa are dominated by *Pinus sylvestris* (9%) and *Betula* (6%), with Picea (2%), *Juniperus communis* (1%), *Alnus glutinosa* (1%), *Corylus avellana*-type (2%) and *Salix* (2%) also recorded. Dwarf shrub and herb taxa include *Saxifraga granulata*-type (2%), *Lotus* (1%), Apiaceae undiff. (2%), Lactuceae undiff. (1%), *Artemisia*-type (1%) and *Glyceria*-type (1%). Aquatic taxa include *Potamogeton natans*-type (1% TLP + aquatics), *Sparganium emersum*-type (5% TLP + aquatics) and *Typha latifolia* (1% TLP + aquatics). Pteropsida (monolete.) indet. (3% TLP + pteridophytes) was also present. Pollen concentration is 10609 grains cm^{-3}.
Tr118 M122-1	-0.88 to -1.26	Pollen samples are derived from the (580)-complex and overlain by context (596). The pollen assemblage is dominated by Poaceae (18-39%) and Cyperaceae (31-38%). Tree and shrub taxa are dominated by *Pinus sylvestris* (3-16%) and *Betula* (2-11%), with occurrences of *Juniperus communis* (up to 2%), *Corylus avellana*-type (up to 3%) and *Salix* (1-3%). Dwarf shrub and herb taxa include *Thalictrum* (up to 1%), Chenopodiaceae (up to 2%), *Helianthemum* (up to 1%), *Saxifraga granulata*-type (1-6%), *Filipendula* (2-10%), *Lotus* (up to 1%), *Plantago maritima* (up to 2%), Rubiaceae (1%), Lactuceae undiff. (up to 3%), *Solidago virgaurea*-type (up to 2%), *Artemisia*-type (up to 1%) and *Glyceria*-type (up to 2%). Aquatic taxa include *Pinguicula* (up to 4% TLP + aquatics) and *Sparganium emersum*-type (up to 3% TLP + aquatics). *Polypodium* (up to 1% TLP + pteridophytes) and Pteropsida (monolete.) indet. (1-9% TLP + pteridophytes) were also present. Pollen concentrations increased from 7472 to 225419 grains cm^{-3}.

Table 163: Pollen zone descriptions for Trench 118, south-east facing section (Monolith <1>)

Zone	Depth (m OD)	Description
Tr118 M1-3	1.02 to 0.285	The pollen sample comes from contexts (174) and (172). The pollen assemblage is dominated by Poaceae (%) and Cyperaceae). Tree and shrub taxa include *Pinus sylvestris* (1-8%), *Quercus* (1-4%), *Betula* (up to 3%), *Alnus glutinosa* (3-4%), *Carpinus betulus* (up to 1%), *Tilia cordata* (up to 1%), *Populus* (up to 3%), *Corylus avellana*-type (3-7%) and *Salix* (up to 1%). Dwarf shrub and herb taxa include *Ranunculus acris*-type (up to 2%), *Urtica dioica* (up to 1%), Apiaceae undiff. (1-3%), *Plantago lanceolata* (up to 1%), Lactuceae undiff. (2-5%), *Solidago virgaurea*-type (1-2%), *Glyceria*-type (up to 5%) and *Arrhenatherum*-type (up to 2%). *Sparganium emersum*-type (4-7% TLP + aquatics), *Polypodium* (up to 7% TLP + pteridophytes), *Pteridium aquilinum* (1-2% TLP + pteridophytes) and Pteropsida (monolete.) indet. (3-16TLP + pteridophytes) are also present. Pollen concentration increase from 20620 to 133427 grains cm^{-3}.
Tr118 M1-2	0.285 to 0.045	The pollen sample comes from contexts (177). The pollen assemblage is dominated by *Alnus glutinosa* (55%) and *Corylus avellana*-type (21%). Additional tree and shrub taxa include *Pinus sylvestris* (3%), *Quercus* (5%), *Tilia cordata* (4%) and *Salix* (1%). Dwarf shrub and herb taxa include *Ranunculus acris*-type (0.5%), *Plantago lanceolata* (0.5%), Rubiaceae (0.5%), Cyperaceae (5%) and Poaceae (4%). *Sparganium emersum*-type (5% TLP + aquatics), *Polypodium* (3% TLP + pteridophytes) and Pteropsida (monolete.) indet. (6%TLP + pteridophytes) are also present. Pollen concentration was 136460 grains cm^{-3}.
Tr118 M1-1	0.045 to -0.75	The pollen samples are derived from contexts (223) and (185). The pollen assemblage is dominated by Poaceae (22-41%) and Cyperaceae (32-47%). Tree and shrub taxa are dominated by *Pinus sylvestris* (10-15%) and *Betula* (3-6%), with occurrences of *Ulmus* (up to 1%), *Quercus* (up to 1%), *Alnus glutinosa* (up to 3%), *Tilia cordata* (up to 1%), *Populus* (up to 1%), *Corylus avellana*-type (1-4%) and *Salix* (up to 2%). Dwarf shrub and herb taxa include *Ranunculus acris*-type (up to 1%), Chenopodiaceae (up to 2%), Brassicaceae (up to 3%), *Saxifraga granulata*-type (up to 1%), *Saxifraga oppositifolia*-type (up to 1%), *Dryas octopetala* (up to 1%) and Apiaceae undiff. (3-4%). *Sparganium emersum*-type (1-6% TLP + aquatics), *Selaginella selaginoides* (up to 1% TLP + pteridophytes), *Pteridium aquilinum* (up to 1% TLP + pteridophytes) and Pteropsida (monolete.) indet. (3-9% TLP + pteridophytes) are also present. Pollen concentrations were between 7570 and 14154 grains cm^{-3}.

Diatoms

3.29.42 Diatoms from this trench had been previously assessed during Phase 3a (Howell and Spurr 2009). Of these previously assessed samples, four were selected for analysis for diatoms from monolith series <9> (Table 164). In addition, four samples were also selected for assessment from monolith series <122> (see Table 164), though diatoms were absent in all samples.

Table 164: Diatom samples assessed from Trench 118, showing those subject to full analysis

Monolith sequence (Mono number)	Context	Depth (m OD)	Comments
<122> (M1)	(580)	-1.00	No diatoms present
<122> (M1)	(580)	-1.14	No diatoms present
<122> (M2)	(574)	-0.80	No diatoms present
<122> (M2)	(580)	-1.10	No diatoms present
<9> (M8)	(210)	0.485	Sample subject to full analysis
<9> (M8)	(210)	0.335	Sample subject to full analysis
<9> (M8/M7)	(210)	0.195	Sample subject to full analysis
<9> (M7)	(182)	-0.035	Sample subject to full analysis

3.29.43 The results of diatom analysis for the Monolith <9> sequence are shown in Figure 60. At the base of the sequence at -0.035m OD the diatom assemblage comprises freshwater non-planktonic species. These diatoms include attached, epiphytic and epilithic species such as *Achnanthes clevei, Achnanthes conspicua/holsatica, Achnanthes kolbei, Achnanthes lanceolata* and *Cocconeis placentula*. Other non-plankton includes *Amphora ovalis Amphora pediculus, Cocconeis disculus* and *Fragilaria* spp. such as *Fragilaria brevistriata, Fragilaria construens* and *Fragilaria pinnata*. Fewer benthic, epipelic, diatoms such as *Gyrosigma attenuatum* are present. There are a relatively high proportion of opportunistic *Fragilaria* taxa that are tolerant of fluctuating water levels and water quality, along with aerophillic taxa such as *Ellerbeckia arenaria* (epipsammon, sand-surface aerophile) and *Hantzschia amphioxys*.

3.29.44 In the top three samples significant percentages of *Fragilaria* spp. (*Fragilaria pinnata, Fragilaria brevistriata, Fragilaria construens* and var.) are maintained and *Fragilaria pinnata* increases to a maximum of 25% of the total assemblage in the top sample. In the sample at 0.195m OD the freshwater epiphyte *Cocconeis placentula* dominates the diatom assemblage with a maximum of 35%, declining to less than 5% in the top sample. This decline along with the expansion of *Fragilaria pinnata* indicates increasingly less stable conditions in the aquatic environment. There are a diverse range of attached and benthic oligohalobous indifferent taxa in the top three samples including *Achnanthes* spp., *Amphora* spp. and *Cymbella* spp. The benthic, epipelic, species *Gyrosigma attenuatum* reaches a maximum of almost 10% in the top sample (0.485m OD) and epipsammic, aerophile *Ellerbeckia arenaria* reaches almost 5% of the total flora. At 0.335m OD the consistent increase in the number of halophilous taxa (*Cyclotella meneghiniana, Navicula lanceolata, Navicula mutica, Diploneis ovalis, Navicula menisculus, Rhoicosphaenia curvata*) suggests increasing solute concentrations, but there are no estuarine or marine diatoms present. Overall in the Monolith <9> sequence there are only small numbers of planktonic diatoms such as *Cyclotella kuetzingiana* and the halophile *Cyclotella meneghiniana* and reflect a shallow water sedimentary environment.

Ostracods and Foraminifera

3.29.45 12 samples taken from monolith series <122> (monoliths <M1> and <M2>), <1> (monoliths <M1>, <M2> and <M3>) and <9> (monoliths <M6>, <M7> and <M11>). The full results of the ostracod content of the twelve samples is given in Table 165 and are summarised below, grouped by monolith series number.

MONOLITH SERIES <122>

3.29.46 At -1.19m OD, monolith <M1>, a few mostly broken specimens of the ostracod *Candona negecta* were recovered. Other remains within this sample included some plant remains, with an identifiable seed of *Silene campia* present.

3.29.47 At -1.09m OD, monolith <M1>, no ostracods were recovered, although occasional plant remains and fossilised foraminifera.

3.29.48 At -1.07m OD, monolith <M2>, no ostracods were recovered. Other remains in the sample included abundant Charophyte oogonia, fossilised foraminifera and plant remains including a tubercle of *Rumex* sp. fruit.

3.29.49 At -0.76m OD, monolith <M2>, ostracods were recovered including *Candona candida*, *Candona neglecta* and *Herpetocypris reptans*. Other remains included molluscs (*Bithynia* sp., *Pisidium* sp., *Theodoxus fluviatilis* and Planorbids) plant remains (including seeds of *Ranunculus* sp. and *Juncus* sp.).

MONOLITH SERIES <1>

3.29.50 At -0.70m OD, monolith <M1>, a few Candoniid ostracods including *Candona neglecta* were recovered. Other remains within the sample include fossilised foraminifera and plants including a seed of *Potomageton*.

3.29.51 At -0.55m OD, monolith <M2>, a decent ostracods asssmblage was recovered including *Candona* sp., *Candona neglecta*, *Herpetocypris* sp. and *Limnocythere inopinata*. Fossilised foraminifera and plant remains were also common within the sample.

3.29.52 At -0.41m OD, monolith <M2>, no ostracods were recovered although occasional fossilised foraminifera and plant remains were noted within the sample.

3.29.53 At 0.00m OD, monolith <M3>, no ostracods were recovered although plant remains were frequent, in addition to some fossilised foraminifera and tufa was noted within the sample.

MONOLITH SERIES <9>

3.29.54 At -0.77m OD, monolith <M11>, no ostracods were recovered. No other organic remains were recorded within this sandy sample.

3.29.55 At -0.52m OD, monolith <M11>, no ostracods were recorded. Other remains noted within the sample were fossilised foraminifera and sponge spicules, and moderate amounts of plant remains.

3.29.56 At -0.30m OD, monolith <M6>, several specimens of Candoniid ostracods were recorded, including *Candona* sp. and predominantly the taxon *Candona neglecta*. Other remains within the sample included molluscs (*Bithynia* sp. *Pisidium* sp. *Ancylus fluviatilis* and *Theodoxus fluviatilis*), plant remains and charcoal.

3.29.57 At 0.00m OD, monolith <M7> one broken ostracod valve (possibly *Candona candida)* was recovered. Other remains within the sample included molluscs (*Bithynia* sp. *Pisidium* sp., Planorbids and *Theodoxus fluviatilis*), fossilised foraminifera, tufa, charophyte oogonia, plant remains and charcoal.

DISCUSSION

3.29.58 The numbers of ostracods recovered from the samples where absent or very low and generally insufficient to make any firm environmental interpretation of the depositional environment from the ostracods alone. It is also noted that no united carapaces or assemblages consisting of the instar and adult growth stages of taxa, were recorded. It is likely therefore that some redeposition of ostracod valves has occurred in these samples.

3.29.59 Within monolith series <122> the samples all contain remains indicative of deposition freshwater environments. *Candona neglecta*, recorded in the basal (at -1.19m) and uppermost (at -0.76m OD) samples, is known to inhabit a wide range of freshwater environments although is widespread in spring fed waters including ponds and brooks. The two samples inbetween (at -1.09m OD and -1.07m OD) are likely also to have been deposited in similar environments with the large numbers of *Chara* oogonia at -1.07m OD indicative of a vegetated waterbody. The uppermost sample at -0.76m OD contained the greatest number of ostracods; *Candona candida, Candona neglecta* and *Herpetocypris* sp.. These ostracods are known to inhabit a wide range of freshwater environments. The other remains including numerous opercula of *Bithynia* and broken pieces of other freshwater molluscs (*Bithynia* sp., *Pisidium* sp., *Theodoxus* sp. and Planorbids) indicate deposition at this level in a flowing freshwater environment.

3.29.60 Within monolith series <1> ostracods were recovered from the basal two samples at -0.7m OD and -0.55m OD. The samples were dominated by the taxon *Candona neglecta* (monospecific in the basal sample), which as stated above is known to inhabit a wide range of freshwater environments although is widespread in spring fed waters including ponds and brooks. A more diverse assemblage, including *Limnocythere inopinata* and *Herpetocypris* sp., were recovered in the sample at -0.55m OD, with plant remains also indicative of a vegetated freshwater body. The uppermost samples at -0.41m OD and 0.00m OD contained no ostracods.

3.29.61 Within monolith series <9> at -0.77m OD and -0.52m OD no ostracods were recovered. At -0.3m an assemblage dominated by *Candona neglegta* was recovered. These ostracods, in addition to the molluscan remains recovered (including opercula of *Bithynia* sp. and the rheophilic molluscan taxon *Ancylus fluviatilis*), are indicative of a flowing, freshwater body. This sample also contained charcoal, possibly indicative of human activity in the area. The uppermost sample at 0.00m OD contained one broken ostracod valve, but with a similar molluscan fauna (dominated by opercula of *Bithynia*) is indicative of a similar flowing freshwater body.

Table 165: Microfaunal content of ostracod/ foraminifera samples from Trench 118

Monolith series	<122>	<122>	<122>	<122>	<1>	<1>	<1>	<1>	<9>	<9>	<9>	<9>
Monolith	<M1>	<M1>	<M2>	<M2>	<M1>	<M2>	<M2>	<M3>	<M11>	<M11>	<M6>	<M7>
Depth (m OD)	-1.19	-1.09	-1.07	-0.76	-0.70	-0.55	-0.41	0.00	-0.77	-0.52	-0.30	0.00
Ostracoda												
Candona candida				x		x						o
Candona neglecta	x			o	x						x	
Candona spp.	o				x	x					o	
Herpetocypris sp.				x		o						
Limnocythere inopinata						x						
Broken/ unid.								o				
Other remains												
Bithynia opercula											xxx	xx
Bithynia apices											x	
Ancylus fluviatilis											x	
Pisidium spp.											xx	x
Planorbids											xxx	x
Theodoxus fluviatilis											xx	x
Cladoceran egg case											xx	
Charcoal		x									x	x
Charophyte oogonia			xxxx									x
Juncus sp.				o								
Plant stems/ remains	x	x	xxx		xx	xxx	x	xxx		xxx	xxx	
Potomageton sp.				o								
Ranunculus sp.				o								
Roots	x											
Rumex sp. tubercle			x									
Silene campia	o											
Fossil foraminifera		x			x		x	xx		xx		xx
Tufa								xx		x		x

Abundance: o – 1 speciment; x – 2-9 specimens; xx – 9-50 specimens; xxx – greater than 50 specimens; xxxx – greater than 100 specimens

3.29.62 The Candoniid ostracods assemblages (*Candona candida* and *Candona neglegta*) within the samples are known to inhabit a wide range of environments including springs, brooks, wells, ponds, ditches and the littoral and profundal zones of lakes. Both are also known to be tolerant of slightly brackish waters. *Candona candida* and *Candona neglecta* are not uncommon in the Baltic Sea (Meisch 2000) with a maximum recorded salinity tolerance of 16‰ for *Candona neglecta* and 5.77‰ for *Candona candida* (Hiller 1972). Despite this these taxa are indicative of non-marine "freshwater" environments, confirmed in this case by the absence of any commonly occurring brackish water taxa, and the other freshwater indicative floral and faunal remains recovered from these samples. *Candona candida* and *Candona neglecta* are both usually found in permanent waterbodies although the juveniles of *Candona candida* and the eggs, juveniles and adults of *Candona neglecta* are dessication resistant. These taxa are often indicative of colder water and a "*candida* fauna" is often found in post-glacial sediments of small European waterbodies (Boomer 2002). The dessication resistance of these taxa and parthenogenetic reproductive cycle of *Candona candida* make them suitable for pioneer colonisation of habitats.

3.29.63 Fossilised foraminifera recovered are most likely reworked from older geological deposits, with some forms probably derived from upper Cretaceous chalk. The only published record of foraminifera recovered from Holocene deposits in the Lea Valley (from the “marsh clay above the peat” at Broxbourne) also reached a similar conclusion (Warren *et al*. 1934).

Molluscs

3.29.64 A series of 25 large samples and five sub-samples from monolith series <9> were selected for molluscan analysis from Trench 118, taken from sections 21, 22, 202, 204 and 205. Almost all of the assemblages were dominated by fresh water species with no brackish water species recovered. Snail numbers were generally very high. Results are discussed below, grouped by section, with results shown in Table 166, Table 167 and Table 168. Results are also plotted as histograms. Figure 61 shows a composite diagram molluscs from channel deposits in samples from the north-west and south-east sections, while Figure 62 shows the sequence through the north-east section.

SECTION 22 – SOUTH EAST FACING (TABLE 166)

CONTEXT (55), SAMPLE <39>, GRAVEL, POSSIBLY NEOLITHIC

3.29.65 The moderate mollusc assemblage from this deposit was dominated by the moving water species group, in particular shells of *Valvata piscinalis* and *Bithynia*. This combination of species may indicate a large body of flowing water with dense growths of aquatic plants. The relatively high ratio of *Bithynia* operculum to apices, 5 opercula to every apex, is indicative of the transport of material from a fairly fast flowing water environment. The presence of *Theodoxus fluviatilis*, representing 11% of the assemblage, is also indicative of a faster flowing water element and a fully riverine environment (Boycott 1936, 141). A small proportion of the molluscs appear to be species which would exploit the marshy river edge and possibly areas of damp grassland in the vicinity.

CONTEXT (185), SAMPLE <185>, MINERALOGENIC ALLUVIUM NEAR CHANNEL EDGE, GREYISH BROWN CLAY LOAM (WITH SIGNIFICANT COARSE SILT COMPONENT AND OCCASIONAL SANDY LENSES), LATE NEOLITHIC

3.29.66 Only a very few shells were recovered from this deposit. Although the assemblage was too small to assist in determining the local environment in any detail, it is noteworthy that all the specimens recorded were land snails. These shells included a specimen of *Columella edentula*, which can be ‘found in a wide variety of damp places from grasslands and woodlands to marshes’ (Davies 2008, 174). The other species recovered can also inhabit damp grassland habitats.

CONTEXT (182), SAMPLE <26>, ACTIVE CHANNEL SANDS WITH PERIODS OF LOWER ENERGY DEPOSITION IN VEGETATION – CHANNEL EDGE OR POSSIBLE VEGETATED BAR, INTERBEDDED GREYISH YELLOW SANDS AND BROWN/BLACK SILTY CLAY LOAM, MIDDLE BRONZE AGE

3.29.67 The large mollusc assemblage is again dominated by the moving water species *Valvata piscinalis* and *Bithynia*, although this group has declined from representing 79% of the assemblage in context (55) to 66%. *Theodoxus fluviatilis* is also still present, but in smaller quantities. There is a marked increase in the ditch loving species, mainly represented by *Valvata cristata*, and in the intermediate fresh-water species, as reflected in the rise in the numbers of *Gyraulus crista*. *Valvata cristata* is found in all kinds of well-vegetated aquatic habitats, while *Gyraulus crista* ‘lives in most kinds of lowland aquatic habitats apart from those liable to dry up’ (Kerney 1999, 67). These species may be exploiting the river edge environments. The low ratio of *Bithynia* operculum to apices, 1.2 opercula to every apex, is indicative of the transport of material from a very slowly flowing well vegetated water environment, possibly at the channel edge.

3.29.68 The small numbers of amphibious species and land snails recorded, such as *Vertigo antivertigo*, are likely to be exploiting areas of marsh and damp grassland in the vicinity.

SECTION 21 – SOUTH EAST FACING (TABLE 166 AND TABLE 167)

CONTEXT (183), SAMPLE <24.7>, -0.53 TO -0.70 MOD, CHANNEL EDGE, DARK GREYISH BROWN SILTY CLAY LOAM, MIDDLE BRONZE AGE

3.29.69 A high number of molluscs were recovered from this deposit. The assemblage was dominated by the moving water species, in particular *Valvata piscinalis* and *Bithynia*. There were also significant numbers of ditch loving species, mainly *Valvata cristata*. The ratio of *Bithynia* operculum to apices, 2.8 opercula to every apex, and the occurrence of *Theodoxus fluviatilis*, in conjunction with the rest of the mollusc assemblage, is indicative of a slowly flowing well vegetated water environment, probably at the channel edge. Again the small numbers of amphibious species and land snails recorded, such as *Vertigo antivertigo*, are likely to be exploiting areas of marsh and damp grassland in the vicinity

CONTEXT (183), SAMPLE <24.6>, -0.40 TO -0.53 MOD, CHANNEL EDGE, DARK GREYISH BROWN SILTY CLAY LOAM, MIDDLE BRONZE AGE

3.29.70 The very large mollusc assemblage from this deposit was broadly very similar in composition to that in sample <24.7>. There was a small decline in the moving water and ditch species with a corresponding increase in the other species groups. The presence of *Helicigona lapicida* is noteworthy as it is a species which thrives in rocky environments, hedges, woods and on walls. The assemblage may indicate a slightly slower flowing well vegetated channel edge environment with an increase in the exploitation of areas of marsh and damp grassland nearby. There may also have been a small woodland environment, even just a single tree, in the vicinity of the channel.

CONTEXT (183), SAMPLE <24.5>, -0.28 TO -0.40 MOD, CHANNEL EDGE, DARK GREYISH BROWN SILTY CLAY LOAM, MIDDLE BRONZE AGE

3.29.71 The sample produced a high number of molluscs. The assemblage was again very similar to those recorded in samples <24.7> and <24.6>, with a very slight decrease in the numbers of moving water and ditch species.

CONTEXT (182), SAMPLE <24.4>, -0.12 TO -0.28 MOD, ACTIVE CHANNEL SANDS WITH PERIODS OF LOWER ENERGY DEPOSITION IN VEGETATION – CHANNEL EDGE OR VEGETATED BAR?, INTERBEDDED GREYISH YELLOW SANDS AND BROWN/BLACK SILTY CLAY LOAM, MIDDLE BRONZE AGE

3.29.72 The large mollusc assemblage was dominated by the moving water species, which had increased from sample <24.5>, in particular the numbers of *Theodoxus fluviatilis*. There was also a higher ratio of Bithynia opercula to apices. There was an increase in the amphibious species, mainly *Lymnaea truncatula*. The assemblage may indicate a faster flowing well vegetated channel environment with areas of marsh and damp grassland nearby. The occurrence of *Clausilia bidentata* and *Cochlodina laminata* is noteworthy, as *Clausilia bidentata* is 'common in woods, on rocks, walls and in established hedges' and *Cochlodina laminata* is 'largely confined to woodland and well shaded scrub' (Davies 2008, 178) and may be indicative of a small woodland environment, even just a single tree, in the vicinity of the channel.

CONTEXT (182), SAMPLE <24.3>, 0.1 TO -0.12 MOD, ACTIVE CHANNEL SANDS WITH PERIODS OF LOWER ENERGY DEPOSITION IN VEGETATION – CHANNEL EDGE OR VEGETATED BAR?, INTERBEDDED GREYISH YELLOW SANDS AND BROWN/BLACK SILTY CLAY LOAM, MIDDLE BRONZE AGE

3.29.73 This sample contained a large number of shells and the mollusc assemblage was very similar to that observed in sample <24.4>. *Bithynia* declined as *Pisidium* increased and there was a marked decrease in *Theodoxus fluviatilis* but a corresponding rise in *Ancylus fluviatilis*, a moving water species which 'inhabits clean, quicker flowing water, adhering to stones' (Kerney 1999, 72). The assemblage may represent a faster flowing well vegetated clean channel environment with areas of marsh and damp grassland in the vicinity.

CONTEXT (182), SAMPLE <24.1>, 0.15 TO 0.30 MOD, ACTIVE CHANNEL SANDS WITH PERIODS OF LOWER ENERGY DEPOSITION IN VEGETATION – CHANNEL EDGE OR VEGETATED BAR?, INTERBEDDED GREYISH YELLOW SANDS AND BROWN/BLACK SILTY CLAY LOAM,MIDDLE BRONZE AGE

3.29.74 Although there is a slight decline in the moving water species, it is still the dominant component of this large mollusc assemblage. It is similar to sample <24.3>, with a small increase in the amphibious and marsh loving groups. This may be representative of a slightly slower flowing well vegetated channel with areas of marsh and damp grassland in the vicinity.

CONTEXT (162), SAMPLE <38>, GRAVEL, EARLY/MIDDLE NEOLITHIC

3.29.75 A high number of molluscs were recovered from this deposit. The assemblage was dominated by the moving water species, in particular *Valvata piscinalis* and *Bithynia*. There were also significant numbers of ditch loving species, mainly *Valvata cristata*. The low ratio of *Bithynia* opercula to apices, 1.3 opercula to every apex, and the occurrence of *Theodoxus fluviatilis* in small numbers, in conjunction with the rest of the mollusc assemblage, is indicative of a slow flowing well vegetated water environment, probably at the channel edge with areas of marsh and damp grassland in the vicinity.

CONTEXT (183), SAMPLE <11>, CHANNEL EDGE, DARK GREYISH BROWN SILTY CLAY LOAM, MIDDLE BRONZE AGE

3.29.76 Although the large mollusc assemblage predominantly comprised fresh water species, the moving water species only represented 50% of the assemblage, mainly *Valvata piscinalis*, *Bithynia* and *Pisidium*. The ditch loving species, dominated by *Valvata cristata*, formed 34% of the assemblage and there were also significant numbers of *Gyraulus crista*, an intermediate species. The ratio of *Bithynia* opercula to apices was 6 opercula to every apex, indicative of flowing water. The assemblage appears to be representative of faster flowing well vegetated water in the channel with some species exploiting the channel edge environments, together with areas of marsh and damp grassland in the vicinity.

CONTEXT (570), SAMPLE <112>, TUFA DEPOSIT, POSSIBLE MIDDLE BRONZE AGE

3.29.77 The sample from the tufa deposit contained a very high number of shells. The assemblage was dominated by the moving water species, representing 62%, with the ditch loving species (21%) and the intermediate species (13%) components also being significant. The predominant species were *Valvata piscinalis, Bithynia, Valvata cristata* and *Gyraulus crista*. There was also a low ratio of *Bithynia* opercula to apices of 1.6 opercula to every apex. A slow moving well vegetated water environment, probably on the channel edge, with areas of marsh and damp grassland nearby, may be indicated by this assemblage.

CONTEXT (191), SAMPLE <20>, TUFA DEPOSIT, MIDDLE BRONZE AGE

3.29.78 A very large assemblage was recovered from this tufa deposit. The assemblage composition was very similar to that observed from tufa deposit (570).

CONTEXT (182), SAMPLE <12>, ACTIVE CHANNEL SANDS WITH PERIODS OF LOWER ENERGY DEPOSITION IN VEGETATION – CHANNEL EDGE OR POSSIBLE VEGETATED BAR, INTERBEDDED GREYISH YELLOW SANDS AND BROWN/BLACK SILTY CLAY LOAM, MIDDLE BRONZE AGE

3.29.79 The deposit contained a good sized mollusc assemblage, dominated by the moving water species, in particular *Valvata piscinalis, Bithynia* and *Pisidium*. There was also a significant number of shells of *Valvata cristata*, a ditch loving species. This assemblage composition, together with *Theodoxus fluviatilis* forming 5% of the assemblage and the low ratio of *Bithynia* opercula to apices, may indicate moving water in a well vegetated channel with some species exploiting the channel edge environments with areas of marsh and damp grassland in the vicinity.

CONTEXT (182), SAMPLE <21>, ACTIVE CHANNEL SANDS WITH PERIODS OF LOWER ENERGY DEPOSITION IN VEGETATION – CHANNEL EDGE OR POSSIBLE VEGETATED BAR, INTERBEDDED GREYISH YELLOW SANDS AND BROWN/BLACK SILTY CLAY LOAM, MIDDLE BRONZE AGE

3.29.80 A relatively large quantity of shells was recorded from this deposit. The assemblage was dominated by the moving water species, particularly by *Valvata piscinalis*, *Pisidium* and *Ancylus fluviatilis*. There was also a significant number of shells of *Valvata cristata*, while the components of the amphibious and marsh loving species increased slightly. The ratio of 7.2 opercula to every *Bithynia* apex was the highest recorded for this section. The assemblage may represent a faster flowing well vegetated clean channel edge environment with an increase in areas of marsh and damp grassland in the vicinity.

CONTEXT (210), MONOLITH <9>, 0.19M OD, HUMIC CHANNEL EDGE/MARSHY, VERY DARK GRAYISH BROWN SILT LOAM, EARLY ROMANO-BRITISH

3.29.81 Although the small mollusc assemblage recovered from this layer was dominated by the moving water species, 48%, the ditch loving species represented 15% of the assemblage and the amphibious species 16%. Most of the land snails could be classed as marsh loving species. The predominant species were *Valvata piscinalis*, *Bithynia, Pisidium, Ancylus fluviatilis* and *Lymnaea truncatula*. *Lymnaea truncatula* favours marshy grassland and swampy pools subject to seasonal desiccation. The assemblage may represent a slowly flowing well vegetated clean channel edge environment with a further increase in areas of marsh and damp grassland in the vicinity.

CONTEXT (210), MONOLITH <9>, 0.40M OD, HUMIC CHANNEL EDGE/MARSHY, VERY DARK GRAYISH BROWN SILT LOAM, EARLY ROMANO-BRITISH

3.29.82 Snail numbers are too low to assist in determining the nature of the local environment in any detail. It should be noted though that all the shells recovered were those of fresh water species.

CONTEXT (208), MONOLITH <9>, 0.60M OD AND 0.75M OD, VERY HUMIC CHANNEL EDGE/MARSHY VERY DARK GRAYISH BROWN CLAY LOAM, MIDDLE/LATE ROMANO-BRITISH

3.29.83 No molluscs were present

CONTEXT (207), MONOLITH <9>, 0.95M OD, FINE ALLUVIUM, DARK GREYISH BROWN FIRM CLAY TO SILTY CLAY, LATE MEDIEVAL

3.29.84 No molluscs were recovered.

SECTION 205 – NORTH EAST FACING (TABLE 168)

CONTEXT (580), SAMPLE <126>, FINE ALLUVIUM, DARK GRAYISH BROWN SILT LOAM, MIDDLE/LATE BRONZE AGE

3.29.85 Very few shells were recovered from this context. The small assemblage gives an indication of a moving water environment possibly in an area of damp grassland.

CONTEXT (596), SAMPLE <121>, PEAT, BLACK VERY FINE HUMIFIED PEAT, MIDDLE/LATE BRONZE AGE

3.29.86 The moderate assemblage from this context was dominated by the moving water species, in particular *Valvata piscinalis*. The ditch species *Valvata cristata* also represented a large percentage of the assemblage. The presence of *Theodoxus fluviatilis*, together with the high ratio of *Bithynia* opercula to apices, eight opercula to every apex, is indicative of faster flowing water. The assemblage appears to be indicative of a faster flowing well vegetated clean channel aquatic environment probably with damp grassland in the vicinity.

CONTEXT (574), SAMPLE <125>, GRAVELY DETRITAL SAND, DARK GREY TO GREY LOAMY SAND, MIDDLE/LATE BRONZE AGE

3.29.87 The moving water species group rose to 72% in this assemblage, with *Valvata piscinalis* being the dominant species. There was a rise in the numbers of *Theodoxus fluviatilis* and *Bithynia*, while there was a notable decline in the percentage of *Valvata cristata*. There was also a higher ratio of *Bithynia* opercula to apices. The assemblage may represent a well vegetated channel edge environment with slightly faster flowing water than that seen in 596. There was also a small percentage of species present which were indicative of the exploitation of the habitats available in channel edge environments and areas of marsh and damp grassland in the vicinity.

SECTION 202 – SOUTH EAST FACING (TABLE 168)

CONTEXT (562), SAMPLE <116>, ALLUVIAL CLAY, LATE BRONZE AGE

3.29.88 Although the moving water species, mainly represented by *Valvata piscinalis* and *Bithynia*, formed the largest group, it was only 41% of the assemblage and the dominant species was *Valvata cristata*, a ditch species, which comprised 33% of the shells. The presence of *Vertigo angustior* is noteworthy, as this is a species 'which is restricted to moist places which are affected neither by periodic desiccation nor by flooding' (Kerney 1999, 101). The assemblage appears to be representative of slow moving well vegetated water in the channel with some species exploiting the channel edge environments, together with areas of marsh and damp grassland in the locality.

CONTEXT (569), SAMPLE <114>, SAND WITH CLAY, MIDDLE/LATE IRON AGE

3.29.89 Only a single shell of Bithynia was retrieved. The sample appears to have been taken from a sand lens within this context.

CONTEXT (564), SAMPLE <115>, CLAY WITH SAND, LATE IRON AGE/EARLY ROMANO-BRITISH

3.29.90 The large mollusc assemblage recorded from this deposit was dominated by the moving water species group which had increased to 61%. The predominant species were *Valvata piscinalis* and *Pisidium*, but there was also a significant quantity of shells of *Ancylus fluviatilis* (6% of the assemblage). The ditch species group, mainly represented by *Valvata cristata*, had decreased to 16% of the assemblage. There was also a slight rise in the numbers of both the amphibious species and marsh loving species, in particular *Lymnaea truncatula*. There was a much higher ratio of *Bithynia* opercula to apices than that seen in context (562). The assemblage appears to be indicative of a faster moving well vegetated clean aquatic environment probably on the channel edge, with areas of marsh and damp grassland in the vicinity.

SECTION 204 – NORTH WEST FACING (TABLE 168)

CONTEXT (572), SAMPLE <113>, CHANNEL DEPOSIT, MIDDLE IRON AGE

3.29.91 A very high number of shells were recovered from this deposit. Two thirds of the assemblage was formed by the moving water group, mainly *Valvata piscinalis*, *Bithynia* and *Pisidium* but also a reasonable quantity of *Ancylus fluviatilis*. The amphibious and marsh loving groups were relatively large, representing 12% of the assemblage. A slow moving well vegetated clean water channel edge environment with areas of marsh and damp grassland nearby would seem to be indicated by this assemblage.

3.29.92 A single marine shell fragment, of possibly a small scallop (*Chlamys* sp.) was recovered from this deposit. No other marine or brackish water species were present.

CONTEXT (569), SAMPLE <111>, SAND WITH CLAY, MIDDLE/LATE IRON AGE

3.29.93 This deposit produced a very large mollusc assemblage at this sampling point unlike in sample 114. The moving water species are again predominant and there is a slight increase in this component and the ditch group in comparison with the assemblage observed in context 572. This assemblage appears to be indicative of a slightly faster flowing well vegetated, possibly a little less clean, aquatic environment within the channel with areas of marsh and damp grassland in the vicinity.

CONTEXT (564), SAMPLE <110>, CLAY WITH SAND, LATE IRON AGE/EARLY ROMANO-BRITISH

3.29.94 A good sized mollusc assemblage was recorded from this deposit. Although the assemblage is dominated by the moving water species, this group declined a little while the ditch group species increased a small amount from the levels observed in context (569). The major species retrieved were *Valvata piscinalis*, *Pisidium* and *Valvata cristata*. This is similar to the mollusc assemblage recovered from this context from the SE facing section. This assemblage may be indicative again of a slightly faster flowing well vegetated aquatic environment within the channel with areas of marsh and damp grassland in the vicinity.

CONTEXT (532), SAMPLE <101>, ALLUVIAL CLAY, POSSBILY ROMANO-BRITISH OR SAXON

3.29.95 The relatively small mollusc assemblage recovered from this deposit mainly comprised freshwater species. The moving water group had decreased to 28% of the assemblage, while the amphibious species group rose to 28% as well, with an increase in the ditch group to 23%. The main species were *Pisidium*, *Valvata cristata* and *Lymnaea truncatula*. This mollusc assemblage appears to reflect a very slow moving well vegetated aquatic environment on the channel edge with an increase in the areas of marsh and damp grassland in the locality.

DISCUSSION

3.29.96 The mollusc assemblages appear to reflect changing fluctuations within the environment of the channel, in terms of water-flow and levels of vegetation. The molluscan data seems to indicate that the channel was likely to contain moving fresh water with no real evidence for any brackish influences.

3.29.97 During the Neolithic period there appears to be a channel with slow flowing, well oxygenated water with areas of marsh and damp grassland in the vicinity. The presence of *Columella edentula* in the Late Neolithic sample is also indicative of damp grassland or marshy areas.

3.29.98 The molluscan assemblages from the Middle Bronze Age deposits seem to indicate a well-vegetated channel with the water flow fluctuating between very slow and faster moving levels. The water appears to be slightly cleaner at different times during this period. There are likely to have been areas of marsh and damp grassland in the vicinity, exploited by species such as *Vertigo antivertigo*. There may also have been a small woodland environment, even just a single tree, in the vicinity of the channel as indicated by the occurrence of *Clausilia bidentata* and *Cochlodina laminata*.

3.29.99 There is an indication that there was a faster flowing, well vegetated, clean channel, probably with damp grassland, in the vicinity during the Middle/ Late Bronze Age period. A slow moving well vegetated water environment, probably on the channel edge, with areas of marsh and damp grassland nearby, may be indicated by the assemblages from the tufa deposits. During the Late Bronze Age, the channel appears to be well vegetated with slow moving water with areas of marsh and damp grassland in the locality.

3.29.100 A slow moving well vegetated clean water channel edge environment with areas of marsh and damp grassland nearby would seem to be indicated by the assemblage from the Middle Iron Age deposit. By the Middle/ Late Iron Age, it is likely the channel was well-vegetated with slightly faster flowing, possibly a little less clean, water, with areas of marsh and damp grassland in the vicinity. This was also broadly indicated by the mollusc assemblages from the Late Iron Age/ early Romano-British deposits, although there may have been a further small increase in the speed of the water flow and the water probably was a little cleaner again.

3.29.101 It appears that the areas of marsh and damp grassland increase during the Early Romano-British period as the well vegetated channel becomes slower flowing. There is a further rise in the amount of areas of marsh and damp grassland, as the water is likely to have been very slow moving in the well-vegetated channel during the Romano-British or Saxon period.

Table 166: Mollusc Assemblages from Trench 118, Sections 22 and 21 (South East facing)

Sample	<39>	<4>	<26>	<24.7>	<24.6>	<24.5>	<24.4>	<24.3>	<24.1>
Context	**(55)**	**(185)**	**(182)**	**(183)**	**(183)**	**(183)**	**(182)**	**(182)**	**(182)**
Group/ sub group	**6**	**2**	**7**	**7**	**7**	**7**	**7**	**7**	**7**
Feature	**gravel**	**alluvial clay**	**channel deposit**	**channel deposit**	**channel deposit**	**channel deposit**	**channel deposit**	**channel deposit**	**channel deposit**
Sample size (litres)	**5**	**5**	**5**	**5**	**2**	**5**	**5**	**2**	**2**
Depth (m OD)				**- 0.53 to -0.77**	**-0.40 to- -0.53**	**-0.28 to -0.40**	**-0.12 to -0.28**	**0.01 to -0.12**	**0.15 to 0.30**
Phase	**?Neolithic**	**L Neolithic**	**MBA**	**MBA**	**MBA**	**MBA**	**MBA**	**MBA**	**MBA**
Land snails									
Carychium cf. *minimum*	-	-	5	2	23	8	4	3	8
Carychium tridentatum	-	-	3	-	29	3	2	1	3
Carychium spp.	-	-	-	2	47	15	8	8	13
Succinea/Oxyloma spp.	1	-	5	3	11	3	5	12	11
Cochlicopa lubrica	-	-	-	-	1	-	-	-	-
Cochlicopa spp.	-	-	4	2	24	17	3	5	2
Columella edentula	-	1	-	-	-	-	-	-	-
Vertigo cf. *antivertigo*	-	-	1	1	-	-	-	-	-
Vertigo pygmaea	-	-	-	-	-	-	-	1	-
Vertigo spp.	-	-	2	-	-	-	1	-	2
Pupilla muscorum	-	-	-	-	1	-	-	-	-
Vallonia costata	1	-	-	1	9	4	5	5	13
Vallonia pulchella/excentrica	6	-	2	2	15	9	27	49	47
Vallonia spp.	-	1	-	-	2	-	-	2	-
Acanthinula aculeata	-	-	1	-	-	-	-	-	-
Punctum pygmaeum	-	-	1	-	3	2	-	-	-
Discus rotundatus	-	-	2	6	18	21	-	-	5
Vitrea spp.	-	-	-	1	15	8	-	1	-
Nesovitrea hammonis	2	-	-	1	9	4	-	-	-
Aegopinella pura	-	-	-	-	5	1	1	1	1
Aegopinella nitidula	-	-	3	3	18	12	5	2	15
Oxychilus cellarius	-	-	-	1	1	1	-	-	-
Limacidae	24	-	3	7	24	19	18	22	19
Euconulus fulvus	-	-	-	-	1	1	1	-	-
Cochlodina laminata	-	-	-	-	1	-	2	-	-
Clausilia bidentata	-	-	-	-	-	-	1	-	-
Helicella itala	2	-	3	2	2	1	1	1	2
Trichia hispida	4	2	10	7	12	17	13	22	16
Helicigona lapicida	-	-	-	-	1	-	-	-	-
Cepaea/ Arianta sp.	1	-	-	3	8	4	1	1	1
Fresh and Brackish Water Snails									
Theodoxus fluviatilis	42	-	34	112	127	37	126	49	22
Valvata cristata	18	-	193	322	590	185	102	98	135
Valvata piscinalis	110	-	292	589	1099	323	276	496	280
Bithynia tentaculata	12	-	49	40	70	17	25	26	6
Bithynia leachii	-	-	5	4	5	2	6	1	-

Sample	**<39>**	**<4>**	**<26>**	**<24.7>**	**<24.6>**	**<24.5>**	**<24.4>**	**<24.3>**	**<24.1>**
Context	**(55)**	**(185)**	**(182)**	**(183)**	**(183)**	**(183)**	**(182)**	**(182)**	**(182)**
Group/ sub group	**6**	**2**	**7**	**7**	**7**	**7**	**7**	**7**	**7**
Feature	**gravel**	**alluvial clay**	**channel deposit**	**channel deposit**	**channel deposit**	**channel deposit**	**channel deposit**	**channel deposit**	**channel deposit**
Sample size (litres)	**5**	**5**	**5**	**5**	**2**	**5**	**5**	**2**	**2**
Depth (m OD)				**- 0.53 to -0.77**	**-0.40 to- -0.53**	**-0.28 to -0.40**	**-0.12 to -0.28**	**0.01 to -0.12**	**0.15 to 0.30**
Phase	**?Neolithic**	**L Neolithic**	**MBA**	**MBA**	**MBA**	**MBA**	**MBA**	**MBA**	**MBA**
Bithynia spp.	75	-	257	228	461	169	175	171	160
Bithynia opercula	436	-	369	753	1253	606	1066	1189	962
Aplexa hypnorum	-	-	-	-	1	-	-	-	-
Lymnaea truncatula	5	-	9	6	11	3	13	22	33
Lymnaea glabra	-	-	-	-	-	1	-	2	-
Lymnaea palustris	-	-	8	-	12	-	-	9	4
Lymnaea cf. *stagnalis*	-	-	1	1	3				-
Lymnaea cf. *auricularia*	-	-	-	-	-	-	-	1	-
Lymnaea peregra	-	-	3	8	5	2	5	7	6
Lymnaea spp.	6	-	22	7	119	35	73	87	96
Planorbis planorbis	3	-	2	12	31	10	13	30	6
Planorbis carinatus	-	-	-	-	-	-	-	-	1
Anisus leucostoma	1	-	-	-	-	-	7	17	5
Bathyomphalus contortus	1	-	12	35	48	8	2	1	7
Gyraulus albus	1	-	11	9	45	7	21	21	15
Gyraulus crista	4	-	48	58	130	42	17	55	43
Hippeutis complanatus	-	-	1	-	-	-	-	-	-
Planorbids	1	-	26	19	31	16	19	29	16
Ancylus fluviatilis	6	-	22	22	40	14	25	197	92
Acroloxus lacustris	-	-	3	1	14	3	3	43	20
Pisidium cf. *amnicum*	3	-	3	3	10	4	7	12	6
Pisidium spp.	51	-	64	36	252	82	114	266	238
Taxa	20	3	30	30	38	33	31	32	30
Total	379	4	1109	1555	3384	1110	1127	1776	1191
% Open country species	2.37	25	0.63	0.26	0.86	1.26	3.02	3.27	4.75
% Intermediate species	8.18	50	1.62	1.29	2.42	5.77	3.19	2.82	2.82
% Shade - loving species	0	25	1.26	0.96	4.67	6.22	2.04	0.9	3.34
% Unassigned species	0.26	0	0.54	0.26	0.33	0.27	0.44	0.68	0.82
% Amphibious species	1.58	0	0.81	0.39	0.35	0.27	1.77	2.2	2.82
% Intermediate species	1.58	0	7.48	7.07	7.09	5.32	3.99	5.24	5.56
% Ditch species	5.54	0	17.85	21.54	18.76	17.84	10.47	9.63	12.02
% Moving water species	65.44	0	59.78	64.24	53.63	50.99	56.79	53.6	41.99
% Unassigned species	15.3	0	10.1	3.99	11.88	12.07	18.28	21.68	25.96

Table 167: Mollusc Assemblages from Trench 118, Section 21 (South-east facing)

Sample	**<38>**	**<112>**	**<20>**	**<11>**	**<12>**	**<21>**	**mono <9>**	**mono <9>**	**mono <9>**	**mono <9>**	**mono <9>**
Context	**(162)**	**(570)**	**(191)**	**(183)**	**(182)**	**(182)**	**(210)**	**(210)**	**(208)**	**(208)**	**(207)**
Group/ sub group	**2**	**6**	**6**	**6**	**7**	**7**					
Feature	**gravel**	**tufa**	**tufa**	**peat, silt & tufa**	**channel deposit**	**channel deposit**	**mono <9>**	**mono <9>**	**mono <9>**	**mono <9>**	**mono <9>**
Original Sample size	**10 l**	**10 l**	**5 l**	**5 l**	**9 l**	**5 l**	**100 ml**	**50 ml**	**50 ml**	**60 ml**	**60 ml**
Depth (m OD)							**0.19**	**0.40**	**0.60**	**0.75**	**0.95**
Phase	**E/M Neolithic**	**MBA**	**MBA**	**MBA**	**MBA**	**MBA**	**ERB**	**ERB**	**M/LRB**	**M/LRB**	**L med**
Land snails											
Carychium cf. *minimum*	4	9	7	-	1	5	2	-	-	-	-
Carychium tridentatum	4	5	4	1	1	1	-	-	-	-	-
Carychium spp.	8	13	5	13	-	2	4	-	-	-	-
Succinea/Oxyloma spp.	6	10	4	3	4	3	1	-	-	-	-
Cochlicopa lubrica	-	1	1	-	-	-	-	-	-	-	-
Cochlicopa spp.	2	10	6	5	2	1	1	-	-	-	-
Vertigo cf. *antivertigo*	2	-	-	-	-	-	-	-	-	-	-
Vertigo pygmaea	-	-	-	-	-	1	-	-	-	-	-
Vallonia costata	5	2	1	4	5	6	-	-	-	-	-
Vallonia pulchella/ excentrica	26	5	6	22	20	21	4	-	-	-	-
Vallonia spp.	-	2	1	4	1	1	-	-	-	-	-
Punctum pygmaeum	-	1	-	-	-	-	-	-	-	-	-
Discus rotundatus	7	11	5	1	-	+	-	-	-	-	-
Vitrea spp.	1	4	3	1	-	-	-	-	-	-	-
Nesovitrea hammonis	2	2	-	1	-	-	-	-	-	-	-
Aegopinella pura	-	8	1	-	1	3	-	-	-	-	-
Aegopinella nitidula	5	8	4	1	3	3	-	-	-	-	-
Oxychilus cellarius	2	-	1	-	-	1	-	-	-	-	-
Limacidae	3	6	-	-	4	5	-	-	-	-	-
Euconulus fulvus	-	1	-	-	-	-	-	-	-	-	-
Cochlodina laminata	-	1	1	-	-	-	-	-	-	-	-
Helicella itala	1	1	-	2	-	-	-	-	-	-	-
Trichia hispida	14	12	11	8	11	7	2	-	-	-	-
Cepaea/Arianta sp.	-	-	2	1	-	-	-	-	-	-	-
Fresh and Brackish Water Snails											
Theodoxus fluviatilis	31	156	84	8	20	-	1	-	-	-	-
Valvata cristata	533	833	345	257	35	58	7	3	-	-	-
Valvata piscinalis	1004	1568	586	182	107	111	18	-	-	-	-
Bithynia tentaculata	60	166	25	2	24	2	-	-	-	-	-
Bithynia leachii	4	8	2	-	3	-	-	-	-	-	-
Bithynia spp.	360	368	246	50	25	20	10	2	-	-	-
Bithynia opercula	570	863	357	376	88	192	42	4	-	-	-
Bithynia/ Lymnaea spp.	-	-	50	15	25	10	-	-	-	-	-

Sample	**<38>**	**<112>**	**<20>**	**<11>**	**<12>**	**<21>**	**mono <9>**	**mono <9>**	**mono <9>**	**mono <9>**	**mono <9>**
Context	**(162)**	**(570)**	**(191)**	**(183)**	**(182)**	**(182)**	**(210)**	**(210)**	**(208)**	**(208)**	**(207)**
Group/ sub group	**2**	**6**	**6**	**6**	**7**	**7**					
Feature	**gravel**	**tufa**	**tufa**	**peat, silt & tufa**	**channel deposit**	**channel deposit**	**mono <9>**	**mono <9>**	**mono <9>**	**mono <9>**	**mono <9>**
Original Sample size	**10 l**	**10 l**	**5 l**	**5 l**	**9 l**	**5 l**	**100 ml**	**50 ml**	**50 ml**	**60 ml**	**60 ml**
Depth (m OD)							**0.19**	**0.40**	**0.60**	**0.75**	**0.95**
Phase	**E/M Neolithic**	**MBA**	**MBA**	**MBA**	**MBA**	**MBA**	**ERB**	**ERB**	**M/LRB**	**M/LRB**	**L med**
Lymnaea truncatula	14	12	2	4	6	16	7	-	-	-	-
Lymnaea glabra	-	2	-	-	-	-	-	-	-	-	-
Lymnaea palustris	8	15	1	1	-	1	-	-	-	-	-
Lymnaea cf. *auricularia*	-	4	-	-	-	-	-	-	-	-	-
Lymnaea peregra	2	24	1	-	4	-	-	-	-	-	-
Lymnaea spp.	29	69	25	16	10	8	8	1	-	-	-
Planorbis planorbis	10	8	13	17	22	2	4	-	-	-	-
Planorbis carinatus	-	1	-	-	4	-	-	-	-	-	-
Anisus leucostoma	2	3	3	-	8	5	1	-	-	-	-
Bathyomphalus contortus	38	69	45	2	-	-	-	-	-	-	-
Gyraulus albus	42	20	13	4	10	3	4	-	-	-	-
Gyraulus crista	169	289	78	69	13	18	2	-	-	-	-
Hippeutis complanatus	-	-	1	-	1	-	-	-	-	-	-
Planorbids	32	58	51	12	-	1	-	4	-	-	-
Ancylus fluviatilis	24	18	15	11	3	28	8	-	-	-	-
Acroloxus lacustris	5	6	5	9	-	5	4	-	-	-	-
Pisidium cf. *amnicum*	7	28	6	1	13	2	-	-	-	-	-
Pisidium spp.	100	153	62	114	27	45	10	3	-	-	-
Taxa	31	36	31	25	25	24	17	5	0	0	0
Total	2566	3989	1720	841	418	395	98	13	0	0	0
% Open country species	1.25	0.25	0.47	3.8	6.22	7.34	4.08	0	0	0	0
% Intermediate species	0.82	0.83	1.16	1.78	4.07	3.29	3.06	0	0	0	0
% Shade - loving species	1.21	1.48	1.8	2.02	1.44	3.8	6.12	0	0	0	0
% Unassigned species	0.31	0.25	0.23	0.36	0.96	0.76	1.02	0	0	0	0
% Amphibious species	0.62	0.38	0.29	0.48	3.35	5.32	8.16	0	0	0	0
% Intermediate species	10.09	10.45	8.08	9.04	6.7	5.57	6.12	0	0	0	0
% Ditch species	21.36	21.26	21.1	33.65	14.59	16.46	15.31	23.08	0	0	0
% Moving water species	58.07	57.96	58.95	31.99	52.63	43.8	37.76	15.38	0	0	0
% Unassigned species	6.27	7.17	8.02	16.88	9.81	13.67	18.37	61.54	0	0	0

Table 168: Mollusc Assemblages from Trench 118, Sections 205 (North-east facing), 202 (South-east facing) and 204 (North-west facing)

Sample	<126>	<121>	<125>	<116>	<114>	<115>	<113>	<111>	<110>	<101>
Context	**(580)**	**(596)**	**(574)**	**(562)**	**(569)**	**(564)**	**(572)**	**(569)**	**(564)**	**(532)**
Group/ sub group	**3**	**3**	**6**		**7**	**7**	**7**	**7**	**7**	**8**
Feature	**channel deposit**	**peat**	**channel deposit**		**sand with clay**	**clay with sand**	**channel deposit**	**sand with clay**	**clay with sand**	**alluvial clay**
Sample size (litres)	**10**	**30**	**10**	**10**	**5**	**10**	**20**	**30**	**30**	**10**
Phase	**M/LBA**	**M/LBA**	**M/LBA**	**LBA**	**M/LIA**	**LIA/ERB**	**MIA**	**M/LIA**	**LIA/ERB**	**RB or Saxon**
Land snails										
Carychium cf. *minimum*	-	-	-	-	-	2	7	3	1	1
Carychium tridentatum	-	-	-	1	-	3	7	5	1	-
Carychium spp.	-	1	1	-	-	4	17	7	2	-
Succinea/ Oxyloma spp.	-	-	1	-	-	5	21	19	13	4
Cochlicopa lubrica	-	-	-	-	-	-	-	1	-	-
Cochlicopa spp.	-	-	-	1	-	5	14	5	4	-
Vertigo pygmaea	-	-	-	-	-	-	-	1	-	-
Vertigo cf *angustior*	-	-	-	1	-	-	-	-	-	-
Vertigo spp.	-	-	-	-	-	-	2	1	-	-
Pupilla muscorum	-	-	-	-	-	1	2	1	-	1
Vallonia costata	-	-	-	2	-	3	45	16	2	1
Vallonia pulchella/ excentrica	-	-	-	6	-	37	184	102	18	2
Vallonia spp.	-	-	-	-	-	3	-	7	-	-
Punctum pygmaeum	-	-	-	-	-	-	1	-	-	-
Discus rotundatus	-	-	-	-	-	1	2	1	1	-
Vitrea spp.	-	-	-	-	-	-	4	1	1	-
Nesovitrea hammonis	-	-	-	-	-	-	2	1	-	-
Aegopinella pura	-	-	-	-	-	-	3	1	1	-
Aegopinella nitidula	-	-	-	4	-	4	10	4	2	-
Oxychilus cellarius	-	-	-	-	-	2	3	-	-	-
Limacidae	1	1	11	1	-	2	11	9	7	2
Clausilia bidentata	-	-	1	-	-	-	-	-	-	-
Helicella itala	-	-	1	1	-	1	11	3	1	1
Trichia hispida	-	-	8	4	-	4	63	31	10	1
Cepaea/Arianta sp.	1	-	1	-	-	-	1	2	-	-
Fresh and Brackish Water Snails										
Theodoxus fluviatilis	+	2	21	-	-	3	64	69	10	-
Valvata cristata	-	13	21	45	-	101	254	216	68	22
Valvata piscinalis	1	16	80	30	-	155	1114	722	109	3
Bithynia tentaculata	-	-	1	2	1	9	118	63	14	-
Bithynia leachii	-	-	-	-	-	-	14	8	2	-
Bithynia spp.	-	5	28	17	-	79	572	300	36	8
Bithynia opercula	16	40	361	54	1	770	1603	1687	362	25
Bithynia/Lymnaea spp.	-	-	17	-	-	-	-	-	-	10
Aplexa hypnorum	-	-	-	-	-	1	-	-	-	-

Sample	**<126>**	**<121>**	**<125>**	**<116>**	**<114>**	**<115>**	**<113>**	**<111>**	**<110>**	**<101>**
Context	**(580)**	**(596)**	**(574)**	**(562)**	**(569)**	**(564)**	**(572)**	**(569)**	**(564)**	**(532)**
Group/ sub group	**3**	**3**	**6**		**7**	**7**	**7**	**7**	**7**	**8**
Feature	**channel deposit**	**peat**	**channel deposit**		**sand with clay**	**clay with sand**	**channel deposit**	**sand with clay**	**clay with sand**	**alluvial clay**
Sample size (litres)	**10**	**30**	**10**	**10**	**5**	**10**	**20**	**30**	**30**	**10**
Phase	**M/LBA**	**M/LBA**	**M/LBA**	**LBA**	**M/LIA**	**LIA/ERB**	**MIA**	**M/LIA**	**LIA/ERB**	**RB or Saxon**
Physa spp.	-	-	-	-	-	-	-	-	-	-
Lymnaea truncatula	-	1	3	4	-	15	77	44	9	7
Lymnaea glabra	-	-	-	-	-	-	4	2	-	-
Lymnaea palustris	-	-	-	2	-	1	21	8	3	1
Lymnaea cf. *stagnalis*	-	-	-	-	-	-	5	-	-	-
Lymnaea cf. *auricularia*	-	-	-	-	-	-	2	-	-	-
Lymnaea peregra	-	-	-	-	-	-	19	6	1	-
Lymnaea spp.	-	1	8	2	-	40	267	139	13	16
Planorbis planorbis	-	-	2	-	-	7	60	53	8	2
Planorbis carinatus	-	-	-	-	-	-	5	3	2	-
Anisus leucostoma	-	-	-	-	-	9	47	27	3	3
Anisus vortex	-	-	-	-	-	-	-	3	-	-
Bathyomphalus contortus	-	-	1	-	-	1	11	7	2	-
Gyraulus albus	-	-	3	1	-	3	42	39	4	-
Gyraulus crista	-	2	3	3	-	20	127	51	7	3
Hippeutis complanatus	-	-	-	-	-	-	2	-	-	3
Planorbids	-	-	-	1	-	11	50	43	4	-
Ancylus fluviatilis	-	3	9	-	-	49	211	115	16	1
Acroloxus lacustris	-	-	-	1	-	10	33	27	2	1
Pisidium cf. *amnicum*	-	1	2	1	-	3	61	87	5	-
Pisidium spp.	-	8	35	5	-	169	540	756	107	16
small ?scallop shell	-	-	-	-	-	-	1	-	-	-
Taxa	3	10	18	18	1	29	40	37	30	20
Total	3	54	248	135	1	764	4131	2968	487	109
% Open country species	0	0	0.4	6.67	0	5.89	5.91	4.41	4.31	4.59
% Intermediate species	66.67	1.85	8.06	4.44	0	1.44	2.23	1.68	4.31	2.75
% Shade - loving species	0	1.85	0.81	3.7	0	2.23	1.28	0.74	1.85	0.92
% Unassigned species	0	0	0.4	0.74	0	0.65	0.51	0.64	2.67	3.67
% Amphibious species	0	1.85	1.21	2.96	0	3.27	3	2.39	2.46	9.17
% Intermediate species	0	3.7	2.82	4.44	0	3.27	5.37	3.74	3.49	6.42
% Ditch species	0	24.07	9.27	34.07	0	15.45	8.52	10.07	16.43	22.94
% Moving water species	33.33	50	59.68	37.04	100	39.01	52.26	44.51	39.43	20.18
% Unassigned species	0	16.67	17.34	5.93	0	28.8	20.89	31.77	25.26	29.36

Insects

3.29.102 The relatively large insect fauna produced by the early Holocene channel fill (context 580) from Trench 118 (Table 169) is dominated by a range of 'water beetle' species that are associated with slow flowing or standing water, such as *Agabus* spp., *Ochthebius minutus, Limnebius* spp., *Coelostoma orbiculare, Cercyon sternalis, Laccobius* spp. and *Chaetarthria seminulum* (see Nilsson and Holmen 1995; Holmen 1987). This channel also seems to have contained a dense stand of waterside vegetation, such as common club rush (*Schoenoplectus lactustris* (L.) Palla, sedges (*Carex* spp. and rushes (Juncaceae and Cyperaceae) (the food plants of *Donacia impressa*, *Plateumaris sericea*) and *Limnobaris pilistriatus* respectively). Despite the size of the fauna recovered there are actually very few taxa present that indicate the nature of the surrounding landscape, namely a few individuals of *Aphodius* 'dung beetles' and single *Gymetron*, a species associated with plantains, that might indicate grassland nearby and a single *Silvanus* spp. which could be associated with woodland.

3.29.103 The two Bronze Age, two Late Iron Age and medieval channel deposits from this Trench produced insect faunas that were very similar. Again it is clear that these channels must have been associated with fast flowing water since, as with many of the other channels from the Olympic site, relatively large numbers of elmid 'riffle beetles' were recovered. The occurrence of the range of Dytiscidae, Hydreanidae and Hydrophilidae 'water beetles' which were also present in the channels in Trench 75 suggest that the channel contained areas of slow flowing waters as well. Again many of the *Donacia* and *Plateumaris* 'reed beetles', along with a number of weevils, recovered indicate that stands of waterside vegetation such as common club rush, water reed, and reed sweet grass were present in these channels. The recovery of *Phytobius canaliculatus* also suggests that water-milfoil (*Myriophyllum* spp.) was present.

3.29.104 The terrestrial insect faunas recovered suggest that the landscape associated with these Bronze Age, Iron Age and medieval channels was probably open grassland and pasture, indicated by the recovery of a number of *Aphodius* and *Onthophagus* dung beetles in many of the samples from these channels along with a fauna of 'histerid' pill beetles, many of which are also associated with animal dung (Halstead 1963), in context (177) of medieval date. Grassland is suggested the recovery of species associated with clover (*Trifolium* spp.) and plantain (*Plantago lanceolata*). There is evidence that the landscape associated with the Iron Age channels (contexts (182) and (532)) also contained thistles (*Carduus* spp. and *Cirsium* spp – the host plant of *Apion carduorum*) and stinging nettle (Urtica dioica – the host plant of *Brachypterus urticae, Apion urticarium* and *Cidnorhinus quadrimaculatus*). It seems likely that both the Bronze Age and Iron Age landscapes associated with these channels were essentially cleared of woodland and relatively open in this area as there are very few indicators for woodland being present in the insect faunas recovered.

Table 169: Insect assemblage from Trench 118

Sample number		**<126>**	**<125>**	**<11>**	**<27>**	**<12>**	**<101>**	Phytophage plant hosts (nomenclature follows that of Stace 1997)
Context number		**(580)**	**(574)**	**(183)**	**(177)**	**(182)**	**(532)**	
(S) group		**3**	**6**	**6**	**6**	**7**	**8**	
Feature number		**channel deposit**		**peat, silt and tufa**	**aluvial clay**	**layer**	**alluvial clay**	
Feature type		**layer**	**layer**	**layer**	**layer**	**layer**	**layer**	
Date		**early post glacial**	**Bronze age**	**Bronze age**	**medieval**	**Iron age/ Romano British**	**Iron age - Romano British**	
Volume (l.)		**5**	**5**	**1.5**	**5**	**5**	**4**	
COLEOPTERA								
Carabidae								
Notiophilus aquaticus (L.)		1	-	-	-	-	-	
Notiophilus biguttatus (F.)		-	1	1	-	-	-	
Loricera pilicornis (F.)		-	-	-	-	-	1	
Clivina fossor (L.)		-	1	1	-	1	-	
Dyschirius globosus (Hbst.)		1	-	-	-	1	-	
Trechus quadristriatus (Schrk)		-	-	-	-	-	1	
T. quadristriatus (Schrk)/ *T. obtusus* (Er.)		-	-	1	-	-	-	
Bembidion lampros (Hbst.)		1	-	-	-	-	1	
Bembidion aeneum Germ.	ws	-	-	-	1	-	-	
Bembidion guttula (F.)		4	1	-	-	1	-	
Bembidion spp.		8	1	-	-	-	2	
Bradycellus spp.		-	-	-	-	-	2	
Acupalpus dorsalis (F.)		-	-	-	2	-	-	
Stomis pumicatus (Panz.)		-	-	-	1	-	-	
Pterostichus strenuus (Panz.)		-	-	-	-	2	-	
Pterostichus gracilis (Dej.)	ws	-	-	-	-	-	1	
Pterostichus spp.		-	-	1	-	-	-	
Pristonychus terricola (Hbst.)		-	-	-	1	-	-	
Agonum sp.		1	-	-	-	-	-	
Platynus dorsalis (Pont.)		-	-	-	1	-	-	
Amara spp.		1	-	-	-	1	1	
Syntomus foveatus (Fourcr.)		1	-	-	-	-	-	
Dytiscidae								
Hygrotus inaequalis (F.)	a	-	-	-	-	-	1	
Hydroporus piceus Steph. (H.Gyllenhali in Brit. Cat.)		-	-	-	-	-	6	
Hydroporus palustris (L.)	a	-	-	-	1	-	3	
Agabus bipustulatus (L.)	a	1	-	-	-	-	-	
Agabus spp.	a	2	-	-	-	-	1	
Gyrinidae								
Gyrinus spp.	a	1	-	-	-	-	1	
Hydraenidae								
Hydraena britteni (Joy)	a	-	-	-	-	-	1	
H. nigrita (Germ.)	aff	-	-	-	1	-	-	
H. gracilis (Germ.)	aff	-	-	-	2	-	-	
Hydraena spp.	a	2	-	-	-	-	4	
Ochthebius minimus (F.)	a	6	3	-	-	-	-	
Ochthebius spp.	a	8	1	-	1	1	4	
Limnebius spp.	a	2	-	-	-	-	-	
Helophorus grandis (Ill.)	a	-	-	-	-	1	-	
Helophorus spp.	a	6	4	3	-	-	7	

Sample number		<126>	<125>	<11>	<27>	<12>	<101>	Phytophage plant hosts (nomenclature follows that of Stace 1997)
Context number		**(580)**	**(574)**	**(183)**	**(177)**	**(182)**	**(532)**	
(S) group		**3**	**6**	**6**	**6**	**7**	**8**	
Feature number		**channel deposit**		**peat, silt and tufa**	**aluvial clay**	**layer**	**alluvial clay**	
Feature type		**layer**	**layer**	**layer**	**layer**	**layer**	**layer**	
Date		**early post glacial**	**Bronze age**	**Bronze age**	**medieval**	**Iron age/ Romano British**	**Iron age - Romano British**	
Volume (l.)		**5**	**5**	**1.5**	**5**	**5**	**4**	
Hydrophilidae								
Coelostoma orbiculare (F.)	a	1	-	-	-	-	-	
Sphaeridium sp.	df	-	-	-	1	-	-	
Cercyon haemorrhoidalis (F.)	df	-	-	-	2	-	-	
Cercyon unipunctatus (L.)	df	-	-	-	2	-	-	
Cercyon atricapillus (Marsh.)	df	-	-	-	-	-	1	
Cercyon analis (Payk.)		-	-	-	-	-	1	
Cercyon cf. *sternalis* Shp.	ws	7	-	-	-	-	-	
Cercyon spp. (aquatic)		-	-	-	-	-	1	
Cercyon spp.		1	-	-	5	-	-	
Megasternum boletophagum (Marsh.)		-	1	7	-	1	3	
Cryptopleurum minutum (F.)	df	-	1	-	-	-	-	
Hydrobius fuscipes (L.)	a	2	-	-	-	-	1	
Laccobius minutus (L.)		-	-	-	-	-	1	
Laccobius spp.	a	1	-	-	-	-	1	
Chaetarthria seminulum (Hbst.)	a	1	-	-	-	-	-	
Histeridae								
Acritus nigricornis (Hoffm.)	df	-	-	-	1	-	-	
Dendrophilus punctatus (Hbst.)	df	-	-	-	2	-	-	
Paralister purpurascens (Hbst.)	df	-	2	-	-	-	-	
Hister striola (Sahlb.)	df	-	-	-	5	-	-	
Atholus duodecimstriatus (schrk.)	df	-	-	-	2	-	-	
Orthoperidae								
Orthoperus spp.	ws	-	-	-	-	-	1	
Staphylinidae								
Omalium spp.		-	-	-	-	-	1	
Olophrum spp.		1	-	-	-	-	-	
Lesteva longelytrata (Goeze)	ws	2	-	-	-	-	2	
Lesteva spp.	ws	1	-	-	-	1	-	
Trogophloeus arcuatus (Steph.)	ws	-	-	-	-	-	1	
Trogophloeus cf. *corticinus* (Grav.)		2	-	-	-	1	1	
Trogophloeus spp.		-	-	1	-	-	-	
Aploderus caelatus (Grav.)	df	-	-	-	-	-	3	
Oxytelus rugosus (F.)	df	2	-	1	-	1	3	
Oxytelus sculpturatus Grav.	df	-	-	-	-	-	1	
Oxytelus nitidulus Grav.	df	-	1	-	-	1	-	
Platystethus cf. *arenarius* (Fourc.)	df	-	-	1	-	-	-	
Platystethus cornutus (Grav.)	ws	-	-	-	-	1	-	
Platystethus nitens (Sahlb.)	ws	-	-	-	-	-	1	
Bledius spp.	ws	-	-	-	1	-	-	

Sample number		**<126>**	**<125>**	**<11>**	**<27>**	**<12>**	**<101>**	Phytophage plant hosts (nomenclature follows that of Stace 1997)
Context number		**(580)**	**(574)**	**(183)**	**(177)**	**(182)**	**(532)**	
(S) group		**3**	**6**	**6**	**6**	**7**	**8**	
Feature number		**channel deposit**		**peat, silt and tufa**	**aluvial clay**	**layer**	**alluvial clay**	
Feature type		**layer**	**layer**	**layer**	**layer**	**layer**	**layer**	
Date		**early post glacial**	**Bronze age**	**Bronze age**	**medieval**	**Iron age/ Romano British**	**Iron age - Romano British**	
Volume (l.)		**5**	**5**	**1.5**	**5**	**5**	**4**	
Stenus spp.		3	1	4	-	4	8	
Paederus spp.		-	-	1	-	-	-	
Lathrobium spp.		2	-	1	-	-	1	
Cryptobium fracticorne (Payk.)		-	-	-	1	-	-	
Gauropterus fulgidus (F.)		-	-	-	1	-	-	
Gyrohypnus fracticornis (Müll.)		-	-	-	-	-	2	
Xantholinus spp.		1	-	3	-	-	-	
Gabrius spp.		-	1	1	-	-	2	
Philonthus spp.		10	1	-	1	-	4	
Tachyporus spp.		-	-	-	-	-	3	
Bolitobius spp.		1	-	-	-	-	1	
Tachinus rufipes (Geer.)		-	-	-	-	-	1	
Tachinus spp.		1	-	-	-	-	-	
Aleocharinidae gen. & spp. indet.		27	1	-	-	1	17	
Pselaphidae								
Euplectus spp.	-	-	-	-	2	-	-	
Reichenbachia cf. *juncorum* (Leach)	-	-	-	-	1	-	-	
Cantharidae								
Cantharis rufa L.	oa	-	-	-	2	-	-	
Elateridae								
Melanotus rufipes (Hbst.) (*M. erythropus* (Gmel.) in Brit. Cat.)	p	-	-	-	-	-	1	
Athous spp.	p	-	1	-	-	-	-	
Helodidae								
Helodidae Gen. & spp. indet.	a	-	-	-	1	-	-	
Dryopidae								
Helichus substriatus (Müll.)	aff	-	-	1	-	-	1	
Dryops spp.	a	1	1	3	-	2	1	
Stenelmis canaliculata (Gyll.)	aff	-	-	1	-	-	-	
Oulimnius spp.	aff	1	1	3	-	6	2	
Riolus subviolaceus (Müll.)	aff	-	-	-	-	-	2	
Riolus spp.	aff	-	-	-	-	1	-	
Macronychus quadrituberculatus Müll	aff	-	-	1	-	-	1	
Byrrhidae								
Simplocaria semistriata (F.)		-	-	-	2	-	-	
Nitidulidae								
Cateretes spp.		-	-	-	3	-	-	
Brachypterus urticae (F.)	p	-	-	-	1	-	1	*Urtica dioica* (stinging nettle)
O. colon (L.)		-	-	-	1	-	-	

Sample number		<126>	<125>	<11>	<27>	<12>	<101>	Phytophage plant hosts (nomenclature follows that of Stace 1997)
Context number		**(580)**	**(574)**	**(183)**	**(177)**	**(182)**	**(532)**	
(S) group		**3**	**6**	**6**	**6**	**7**	**8**	
Feature number		**channel deposit**		**peat, silt and tufa**	**aluvial clay**	**layer**	**alluvial clay**	
Feature type		**layer**	**layer**	**layer**	**layer**	**layer**	**layer**	
Date		**early post glacial**	**Bronze age**	**Bronze age**	**medieval**	**Iron age/ Romano British**	**Iron age - Romano British**	
Volume (l.)		**5**	**5**	**1.5**	**5**	**5**	**4**	
Rhizophagidae								
Rhizophagus spp.	s	-	-	-	1	-	-	
Cucujidae								
Silvanus spp.	l	1	-	-	-	-	-	
Cryptophagidae								
Atomaria spp.	s	-	-	-	-	-	1	
Coccinellidae								
Coccidula rufa (Hbst.)		1	-	-	-	-	-	
Thea vigintiduopunctata (L.)		-	-	-	-	-	1	
Anobiidae								
Anobium punctatum (Geer)	l	-	-	-	-	-	1	
Scarabaeidae								
Geotrupes spp.	df	-	1	-	-	-	-	
Onthophagus spp.	df	-	1	1	-	-	-	
Aphodius fossor (L.)	df	-	-	-	-	1	-	
Aphodius contaminatus (Hbst.)	df	-	-	-	-	1	-	
Aphodius sphacelatus (Panz.) or *A. prodromus* (Brahm)	df	2	2	-	1	4	2	
Aphodius fimetarius (L.)	df	-	-	-	3	-	-	
Aphodius ater (Geer)	df	1	-	-	-	-	-	
Aphodius spp.	df	-	-	2	-	-	-	
Phyllopertha horticola (L.)	p	-	-	1	-	-	-	
Chyrsomelidae								
Donacia clavipes F	ws	-	-	-	2	-	1	*Schoenoplectus lactustris* Palla (common club rush)
Donacia crassipes F.	ws	1	-	-	1	1	-	*Nymphaea alba* and *Nuphar lutea* (white and yellow water lily)
Donacia impressa (Payk.)	ws	3	-	-	-	-	4	*Schoenoplectus lactustris* (common club rush)
Donacia vulgaris (Zschach)	ws	1	-	-	-	-	-	
Plateumaris braccata (Scop.)	ws	-	-	-	2	-	-	*Phragmites australis* (water reed)
Plateumaris sericea (L.)	ws	5	-	-	-	1	2	Usually on *Carex* spp. (sedges)
Donacia/ Plateumaris spp.	ws	-	-	1	-	1	-	
Lema cf. *cyanella* (L.)	p	1	-	-	-	-	-	*Cirsium* species often *C. arvense* (thistles)
Phaedon spp.	p	-	-	-	-	1	-	
Prasocuris phellandrii (L.)	ws	-	-	-	-	-	1	On aquatic Apiaceae (Umbellifers)
Phyllotreta spp.		1	1	2	1	1	3	
Haltica spp.	l	1	-	-	-	-	-	
Chaetocnema concinna (Marsh.)	p	-	2	-	2	1	-	
Chaetocnema spp.		-	-	1	1	1	-	

Sample number		<126>	<125>	<11>	<27>	<12>	<101>	Phytophage plant hosts (nomenclature follows that of Stace 1997)
Context number		**(580)**	**(574)**	**(183)**	**(177)**	**(182)**	**(532)**	
(S) group		**3**	**6**	**6**	**6**	**7**	**8**	
Feature number		**channel deposit**		**peat, silt and tufa**	**aluvial clay**	**layer**	**alluvial clay**	
Feature type		**layer**	**layer**	**layer**	**layer**	**layer**	**layer**	
Date		**early post glacial**	**Bronze age**	**Bronze age**	**medieval**	**Iron age/ Romano British**	**Iron age - Romano British**	
Volume (l.)		**5**	**5**	**1.5**	**5**	**5**	**4**	
Platypodidae								
Platypus cylindrus (F.)	l	-	-	-	-	1	-	Normally under bark of *Quercus* and *Fagus* spp. (oak and beech)
Curculionidae								
Apion urticarium (Hbst.)	p	-	-	-	-	1	-	*Urtica dioica* (stinging nettle)
Apion carduorum (Kirby)	p	-	-	-	-	1	-	On *Carduus* spp. and *Cirsium* spp. (thistle)
Apion spp.	p	3	2	1	3	1	3	
Ortiohynchus rugifrons (Gyll.)		3	-	-	-	-	-	
Otiorhynchus spp.		1	-	-	-	-	-	
Sitona suturalis (Steph.)	p	-	-	-	-	1	-	*Lathyrus pratensis* L. (Meadow vetchling) and *Vicia* spp. (Vetches spp.)
Sitona flavescens (Marsh.)	p	-	1	-	-	-	-	*Trifolium* species (Clover)
Sitona hispidulus (F.)	p	-	1	-	-	1	-	*Trifolium* species (clover)
Sitona spp.	p	-	-	-	1	-	-	
Bagous spp.	ws	1	1	-	3	1	1	
Tanysphyrus lemnae (Payk.)	a	-	-	1	-	-	-	*Lemna* spp. (duckweed)
Notaris acridulus (L.)	ws	2	1	-	-	1	-	Often on *Glyceria maxima* (reed sweet-grass) and other *Glyceria* species (sweet-grasses)
Thyrogenes spp.	ws	-	-	-	1	-	-	
Alophus triguttatus (F.)	p	-	1	2	-	-	-	
Hypera spp.	p	-	-	-	-	1	-	Mainly *Trifolium* spp. (clover)
Limnobaris pilistriata (Steph.)	ws	2	-	-	-	-	-	Juncaeae (rushes) and Cyperaceae (sedges)
Phytobius canaliculatus (Fahrs.)	a	-	-	-	1	1	-	*Myriophyllum spp.* (water-milfoils)
Ceutorhynchus contractus (Marsh.)	p	-	-	-	-	-	2	Usually associated with Resedaceae and Papaveraceae (migonettes and poppies)
Ceutorhynchus spp.	p	-	-	-	-	2	1	
Cidnorhinus quadrimaculatus (L.)	p	-	-	-	1	-	-	*Urtica dioica* (stinging nettle)
Gymnetron spp.	p	1	1	1	1	2	-	*Plantago lanceolata* (ribwort plantain)
DIPTERA								
SUBORDER NEMATOCERA								
Family, Gen. & spp. indet.		-	40	-	-	-	60+	
SUBORDER CYCLORRHAPHA								
Family, Gen. & spp. indet.		20	-	4	6	-	20	
Total number of individuals		149	39	49	74	55	131	
Total number of taxa		56	30	29	46	40	61	

Sample number		**<126>**	**<125>**	**<11>**	**<27>**	**<12>**	**<101>**	Phytophage plant hosts (nomenclature follows that of Stace 1997)
Context number		**(580)**	**(574)**	**(183)**	**(177)**	**(182)**	**(532)**	
(S) group		**3**	**6**	**6**	**6**	**7**	**8**	
Feature number		**channel deposit**		**peat, silt and tufa**	**aluvial clay**	**layer**	**alluvial clay**	
Feature type		**layer**	**layer**	**layer**	**layer**	**layer**	**layer**	
Date		**early post glacial**	**Bronze age**	**Bronze age**	**medieval**	**Iron age/ Romano British**	**Iron age - Romano British**	
Volume (l.)		**5**	**5**	**1.5**	**5**	**5**	**4**	
% aquatic (a)		22.8	-	-	4.1	9.1	19.1	
% aquatic fast flowing (aff)		0.7	-	-	4.1	12.7	4.6	
% waterside (ws)		18.1	-	-	14.9	12.7	11.5	
% dung/ foul (df)		5.7	-	-	33.3	22.2	11.8	
% woodland/ dead wood (l)		2.3	-	-	0.0	2.8	1.2	
% pasture (p)		5.7	-	-	15.8	33.3	9.4	
% synanthropic (s)		0.0	-	-	1.8	0.0	1.2	

Key to ecological groupings used

a= aquatic water beetles
aff= aquatic taxa normally associated with faster flowing waters
ws = waterside taxa often associated with emergent vegetation
df = taxa often associated with dung
p= taxa associated with grassland and open areas
l= taxa associated with trees
s= taxa normally associated with human settlement

3.30 Trench 120 (PDZ15 15.01)

Introduction

3.30.1 This trench is located in the northern part of the Site and was found to contain a number of tree throws of interest. The monolith sequence from this trench was located on the east facing section and goes through the thin deposits of tree throw [17], the underlying gravels (14) and (15), and the overlying alluvial clays (10) and (9). However, the features of interest in this trench were the Neolithic tree throws which yielded lots of hazelnut shells of archaeological origin from the bulks (see below). Unfortunately these features were not sampled by a monolith. Tree throw [17] was not bulk-sampled, and on inspection of the monoliths no material remotely suitable for dating is present (in fact there is no obvious distinction between the 'tree-throw' fills and the over- and under-lying sediments). For this reason only the bulk samples have been looked at from this trench.

Dating

3.30.2 Two radiocarbon dates have been obtained from Bulk Samples <3> and <4> (Table 170).

3.30.3 Tree-throw hollow [21] contained stuck flint thought to be Bronze Age in date (Pooley *et al.* 2008) although a Late Neolithic date, 2580–2340 cal BC (NZA-32943, 3960±35 BP), has now been ascertained.

Table 170: Radiocarbon dates from Trench 120

Sample/ Context	Depth (m OD)	Sample Material	Lab Code	Radiocarbon Date (BP)	$\delta^{13}C$ (‰)	Calibrated date (95.4%, 2σ range)	Reliability of Date
<4> (20)	-	Seeds: 2 x *Corylus avellana*	NZA-32943	3960±35	-24.5	2580–2340 cal BC	1
<3> (23)	-	Plant material: *Alnus glutinosa* cone, catkin frags., 10 x *Sambucus* seeds	NZA-32944	4628±40	-26.6	3630–3190 cal BC	1

Plant macrofossils

3.30.4 Two possible tree-throw hollows within this trench were deemed of some interest as both contained large amounts of plant material. The dating of these features showed them to contain material spanning the Early to Late Neolithic. The earlier sample came from tree-throw [25], context (23) from which alder cone and elder seeds yielded a date of 3630–3190 cal BC (NZA-32944, 4628±40 BP). Whole hazelnuts were dated from the second tree-throw [21], context (20) and yielded a date of 2580–2340 cal BC (NZA-32943, 3960±35 BP).

3.30.5 Both samples were rich and generally similar in the plant remains they contained (Table 171). Both samples had remains of alder (*Alnus glutinosa*), including of some interest root fragments with the distinctive swollen nodules associated with the actinobacterium *Frankia* sp. Both tree-throw hollows also had some seeds of bramble (*Rubus* sp.), greater stitchwort (*Stellaria holostea*), bugle (*Ajuga reptans*), all of which indicate some fairly dense patches of wooded shrub growing along the channel edge with possibly small occasional open grassy areas probably along the river edge itself.

3.30.6 The Early-Middle Neolithic tree-throw hollow [25] had many seeds of common nettle (*Urtica diocia*), along with a few species indicative of marshy, wet grassland such as marsh-marigold (*Caltha palustris*), buttercup (*Ranunculus* sp.), as well as hedgerows and woodland edge, eg. common hemp-nettle (*Galaeopsis* cf. *tetrahit*).

Table 171: Waterlogged plant macrofossils from Trench 120

Sample		**<3>**	**<4>**
Context		**(23)**	**(20)**
Feature number		**25**	**21**
Feature		**alluvial feature**	**tree-throw**
Sample Size (litres)		**10**	**10**
Flot size (ml)		**200**	**250**
Date		**E/MNEO**	**LNEO**
Species			
Bryophyta (leaf stem)	mosses	1	-
Caltha palustris	marsh-marigold	1	-
Ranunculus subg. *Ranunculus* (arb)	buttercup	1	+
Ranunculus subg. *Batrachium*	water-crowfoots	-	+
Ficus carica	fig	2	-
Urtica dioica	common nettle	+++	+
Alnus glutinosa (male catkins)	alder male catkins	3frgs	-
Alnus glutinosa (female catkins/ cones)	alder cones	1	++
Alnus glutinosa (fruits)	alder fruits	4	+++
Alnus glutinosa roots with *Frankia* sp.	alder roots with actinobacterium (or actinomycete),	2frgs	1lrg frg
Corylus avellana	hazelnut	-	20
Moehringia trinervia	three-nerved sandwort	-	1
Stellaria cf. *holostea*	greater stitchwort	1	1
Lychnis flos-cuculi	ragged-robin	-	1
Rumex sp.	dock	-	+
Rubus sp.	bramble	7	1
Euphorbia helioscopia	sun spurge	1	-
Oxalis acetosella	wood sorrel	-	1
Galeopsis cf. *tetrahit*	common hemp-nettle	2	-
Ajuga reptans	bugle	1	2
Lycopus europaeus	gypsywort	-	+
Mentha sp.	mint	+	+
Sambucus nigra	elder	-	+
Alisma plantago-aquatica	water-plantain	-	1
Juncus sp.	rush	-	+
Carex sp.	sedge	-	1
Carex sp. (trigonous small)	sedge (trigonous)	3	-
Carex sp. (trigonous)	sedge (trigonous)	1	+
Sparganium erectum (inner seed/ embryo)	branched bur-reed	-	+
Charcoal	charred wood indet.	-	+frags
Roots		+	-
Wood		+++	++

+C – denotes material that was preserved by charring. cf. compares with. Where abundant material was present +=10-50 ++=50-100 +++=100-500 or more

3.30.7 Along with remains of alder the Late Neolithic sample from tree-throw hollow [23] had many whole hazelnuts (*Corylus avellana*) within it, as well as seeds of three-nerved sandwort (*Moehringia trinervia*), elder (*Sambucus nigra*), and wood sorrel (*Oxalis acetosa*). These are all general woodland indicators, while gypsywort (*Lycopus europeaeus*) is commonly found on riverbanks, along with ragged-robin (*Lynchis flos-cuculi*) at the edge of alder fen-carr.

3.30.8 Seeds of wetland species were relatively infrequent in these samples, but included those of sedge (*Carex* sp.), rush (*Juncus* sp.), water-plantain (*Alisma plantago-aquatica*) and mint (*Mentha* sp.)

3.30.9 Remains of both sun-spurge (*Euphorbia helioscopia*) and fig (*Ficus* sp.) from tree-throw hollow [25], are more than a little suspicious and might suggest some intrusive modern or at least post-medieval elements have made their way into this sample.

3.30.10 The samples provide good evidence for the presence of alder fen with some evidence of hazel growing alongside the channel edge. There is less evidence for large tracts of marshland or reed swamp as might be found in larger channels suggesting probably either a narrow channel and/ or a high degree of shading from both banks. The samples, in particular that with hazel is highly similar in species composition and general date to those seen to the south at Victoria Dock (Barnett *et al.* 2010).

Insects

3.30.11 The very small insect fauna recovered from the Late Neolithic tree throw in Trench 120 (Table 172) suggest that the deposit is principally water-lain or the feature was flooded. There are almost no indications as to the nature of the surrounding environment beyond the recovery of a single individual of the 'dor beetle' *Geotrupes* spp., which is normally associated with herbivore dung, and the 'cock chaffer' *Melolontha melolontha* which is normally associated with rough grassland (Jessop 1986). Beyond the recovery of a single individual of the weevil *Rhyncolus* which is associated with deadwood there are no indications for woodland at the time.

Table 172: Insect assemblage from Trench 120

Sample number		**<4>**
Context number		**(20)**
Feature number		**21**
Feature type		**Tree throw**
Date		**Neolithic**
Volume (l.)		**5**
HEMIPTERA		
Family, genus and spp. Indet.		2
COLEOPTERA		
Carabidae		
Clivina fossor (L.)		3
Trechus quadristriatus (Schrk.) / *T. obtusus* (Er.)		1
Pterostichus nigrita (Payk.)	ws	1
Hydraenidae		
Hydraena riparia (Kug.)	aff	1
Hydraena spp.	a	6
Ochthebius spp.	a	3
Limnebius spp.	a	1
Helophorus spp.	a	1
Hydrophilidae		
Cercyon spp. (aquatic)		2
Megasternum boletophagum (Marsh.)		3
Ptiliidae		
Ptilidae Gen. & spp. indet.		1
Acrotrichis spp.		1
Staphylinidae		
Lathrimaeum unicolor (Marsh.)	ws	1
Trogophloeus spp.		1
Oxytelus rugosus (F.)	df	2
Stenus spp.		1
Lathrobium spp.		1
Aleocharinidae Gen. & spp. indet.		2

Sample number		**<4>**
Context number		**(20)**
Feature number		**21**
Feature type		**Tree throw**
Date		**Neolithic**
Volume (l.)		**5**
Elateridae		
Athous haemorrhoidalis (F.)	p	1
Dryopidae		
Dryops spp.	a	1
Riolus subviolaceus (Müll.)	aff	1
Phalacridae		
Phalacrus caricis (Sturm.)	ws	1
Ptinidae		
Ptinidae Gen. & spp. indet		1
Scarabaeidae		
Geotrupes spp.	df	1
Melolontha melolontha (L.)	p	1
Curculionidae		
Rhyncolus spp.	l	1
Total number of individuals		40
Total number of taxa		26

Key to ecological groupings used
a= aquatic water beetles
aff= aquatic taxa normally associated with faster flowing waters
ws = waterside taxa often associated with emergent vegetation
df = taxa often associated with dung
p= taxa associated with grassland and open areas
l= taxa associated with trees
s= taxa normally associated with human settlement

Appendix 1: Radiocarbon Dates

All Phases 2–5 dates are included in this appendix. Quoted dates have been checked against original laboratory reports to ensure they are correctly quoted below.
The reliability of each radiocarbon date for dating the sedimentary context within which it has been obtained is noted, using a scale of 1–3 (1 = reliable; 2 = questionable; 3 = problematic/rejected); # = unreliability of dates on bone based on C:N ratios above 3.5.
All dates are AMS unless indicated by * (radiometric) or + (method unknown)

Trench	Lab code	Feature	Context	Sample	Depth (m OD)	Material dated	Date BP	$\delta^{13}C$‰	$\delta^{15}N$‰	C:N	Calibrated date (95.4%, 2σ range)	Reliability of date
6	SUERC-35319	Feature 352	351	Bulk 72		Charcoal: *Corylus avellana*	2200±30	-28.5	-	-	380–180 cal BC	1
7	GU-22480	-	167	Bulk 49 + 50		Plant material: 3 x *Linum usitatissimum* capsule + seed	Failed	-	-	-	-	-
7	SUERC-25621	-	169	Mono. 43 M4	0.94	Wood/stem: indet. roundwood	1605±40	-29.3	-	-	cal AD 350–560	2
7	SUERC-25622	-	169	Mono. 43 M4	1.05	Wood/stem: indet. stem	1500±40	-29.2	-	-	cal AD 430–650	2
7	SUERC-25623	-	165	Mono. 43 M2	1.87	Sediment (acid wash)	1505±40	-28	-	-	cal AD 430–650	2
7	SUERC-31558	-	167	Bulk 49 + 50	0.52 to 0.94	Seeds: 8 x *Oenanthe* sp.	1415±30	-29.1	-	-	cal AD 580–670	1
9	Beta-254059	-	80	Mono. 21	2.2	Sediment (acid wash)	2380±40	-25.6	-	-	750–380 cal BC	2
9	Beta-254060	-	74	Mono. 21	2.5	Sediment (acid wash)	1710±40	-26.1	-	-	cal AD 240–420	2
9	Beta-254061	-	1704	Mono. 578	1.3	Sediment (acid wash)	2250±40	-26.4	-	-	400–200 cal BC	1
9	Beta-254062	-	1703	Mono. 578	1.8	Sediment (acid wash)	2200±40	-25.7	-	-	390–170 cal BC	1
9	Beta-254063	-	307	Mono. 65	1.29	Sediment (acid wash)	3430±40	-28.4	-	-	1880–1630 cal BC	2
9	Beta-254064	-	1724	Mono. 584	1.7	Sediment (acid wash)	2200±40	-25.6	-	-	390–170 cal BC	1
9	Beta-254065	-	1723	Mono. 584	1.97	Sediment (acid wash)	2570±40	-26.4	-	-	820–540 cal BC	3
9	Beta-254066	-	206	Mono. 65	2.09	Sediment (acid wash)	2000±40	-27.2	-	-	160 cal BC–cal AD 90	2
9	Beta-254067	-	2221	Mono. 668	1.29	Sediment (acid –alkali-acid wash)	2180±40	-26.6	-	-	380–110 cal BC	1
9	Beta-254068	-	2181	Mono. 668	1.9	Sediment (acid wash)	2350±40	-26	-	-	730–260 cal BC	1
9	GU-23537	Ditch 1920 (cut 1738)	1737	-	-	Bone: *Bos* pelvis (6g)	Failed	-	-	-	-	-
9	GU-23547	Inhumation 1158	1156	-	-	Human bone: L. femur (1.7g)	Failed	-	-	-	-	-
9	GU-23548	Inhumation 1041	1057	-	-	Human bone: R. femur (2.0g)	Failed	-	-	-	-	-
9	GU-23549	Inhumation 1662	1663	-	-	Human bone: L. femur (1.8g)	Failed	-	-	-	-	-
9	GU-24229	Inhumation 1041	1057	-	-	Human bone: long bone 7.3	Failed	-	-	-	-	-
9	GU-24230	Inhumation 1158	1156	-	-	Human bone: long-bone 4.3g	Failed	-	-	-	-	-
9	GU-24231	Inhumation 1662	1663	-	-	Human bone: long-bone 6.9g	Failed	-	-	-	-	-
9	SUERC-33659	Pit 1790	1933	-	-	Bone: *Cervus elaphus* antler (6 g)	2200±30	-28	7.1	16.1	380–180 cal BC	#
9	SUERC-33660	Pit 1256	1255	-	-	Bone: *Ovis/capra* scapula/tibia (6g)	1785±30	-26.3	7.4	8.9	cal AD 130–340	#
9	SUERC-33661	Post-hole 2055	2014	-	-	Bone: *Capra* (kid) skeleton (5g)	2240±30	-24.4	2.2	5.3	390–200 cal BC	#
9	SUERC-33662	Pit 1005	1004	-	-	Bone: *Ovis/capra* scapula/tibia (6g)	2675±30	-22.8	11.1	3.9	900–790 cal BC	#
9	SUERC-33666	Ditch 1922 (cut 1477)	1476	-	-	Bone: *Bos* skull (7g)	3030±30	-22.2	7.1	3.6	1400–1130 cal BC	#
9	SUERC-33667	Ditch 1920 (cut 1738)	1737	Bulk 599	-	Charred cereal: 2 x *Hordeum* grains	3085±30	-25.1	-	-	1430–1270 cal BC	1

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9	SUERC-33668	Pit 1019	1018	Bulk 501	-	Charred cereal: 4 x *Triticum* cf. *dicoccum* grains	2780±30	-20.8	-	-	1010–840 cal BC	1
9	SUERC-33669	Pit 1322	1321	Bulk 528	-	Charred cereal: 2 x *Triticum dicoccum /spelta* grains	2780±30	-22	-	-	1010–840 cal BC	1
9	SUERC-33670	Pit 2115	2114	Bulk 655	-	Charred cereal: 2 x cf. *Triticum dicoccum /spelta* grains	2815±30	-22.2	-	-	1060–890 cal BC	1
9	SUERC-33671	Pit 1645	1644	Bulk 564	-	Charred cereal: 2 x cf. *Hordeum* grains	2785±30	-23.3	-	-	1010–840 cal BC	1
9	SUERC-33672	Curved gully 1260	1259	Bulk 523	-	Charred cereal: 2 x *Triticum dicoccum /spelta* grains	2195±30	-24.4	-	-	370–180 cal BC	1
9	SUERC-33676	Pit 1219	1218	Bulk 524	-	Charred cereal: 2 x cf. *Triticum spelta* grains	2785±30	-21.3	-	-	1010–840 cal BC	1
9	SUERC-33677	Pit 1730	1729	Bulk 586	-	Charred cereal: *Hordeum*, cf. *Triticum spelta* grains	2820±30	-25.3	-	-	1070–890 cal BC	1
9	SUERC-33678	Inhumation 1852	1810	-	-	Human bone: right femur (3g)	2020±30	-20.2	12.5	3.3	110 cal BC–cal AD 60	1
9	SUERC-33679	Ditch 1213	1926	Bulk 643	-	Plant material: *Prunus spinosa* stone	2190±30	-30	-	-	370–170 cal BC	1
9	SUERC-34930	Cremation 1972	1971	Bulk 633	-	Cremated indet. bone (3.7g)	2845±35	-23.1	-	-	1130–910 cal BC	1
9	SUERC-34932	Cremation 2052	2051	Bulk 638	-	Cremated indet. bone (1.8g)	2835±35	-23.4	-	-	1120–900 cal BC	1
9	SUERC-34942	Gully 1106	1196	Bulk 519	-	Charred cereal: *Hordeum*, cf. *Triticum dicoccum* grains	2215±35	-22.3	-	-	390–190 cal BC	1
9	SUERC-35323	Cremation 1972	1971	Bulk 633	-	Charcoal: *Quercus* cf. sapwood	3075±30	-26.4	-	-	1420–1260 cal BC	2
9	SUERC-35324	Cremation 2052	2051	Bulk 638	-	Charcoal: Maloideae	2840±30	-28.1	-	-	1120–910 cal BC	1
10	NZA-32947	-	134	Bulk 26	0.86 to 1.04	Plant material: 10 x *Alnus glutinosa* cones	2484±35	-28.1	-	-	780–410 cal BC	1
21	Beta-213550*	-	11	Mono. 14	1.77	Sediment (acid wash)	1300±50	-29.4	-	-	cal AD 640–870	2
21	Beta-213551*	-	14	Mono. 13	1.61	Sediment (acid wash)	1110±60	-28.7	-	-	cal AD 770–1030	3
21	GU-19373	-	11	Bulk 17	-	Seeds: 10 x *Schoenoplectus*	Failed	-	-	-	-	-
21	GU-20504	-	11	Bulk 17	1.73 to 1.93	Seeds: *Ranunculus* sp., *Mentha*, *Menyanthes*, *Rumex, Schoenoplectrus*	Failed	-	-	-	-	-
21	SUERC-24956	-	14	Bulk 15	1.60 to 1.79	Seeds: 4 x *Rumex* + bract, *Carex* trig, *Ranunculus arb*, *Polygonum aviculare*	580±30	-25.5	-	-	cal AD 1290–1420	1
22	Beta-210489	-	35	-	1.67	Plant material: Fine root material	550±40	-27	-	-	cal AD 1300–1440	3
22	SUERC-35333	-	29	Bulk 29	-	Seeds: 4 x *Ranunculus* sp., *Rumex*, 2 x *Carduus/Cirsium*, *Sonchus asper*, 2 x Trig. *Carex*, *Carex cf. nigra*, *Thalictrum flavum*	1200±30	-25.1	-	-	cal AD 710–940	1
24	Beta-210488	Pit 7	6	Mono. 1	2.12	Charred material indet.	2990±40	-24.7	-	-	1390–1050 cal BC	1
24	SUERC-24954	-	4	Bulk 8	2.12 to 2.31	Seeds: *Schoenoplectus*, *Ranunculus arb*	1050±30	-26.3	-	-	cal AD 890–1030	3
24	SUERC-24955	-	2	Bulk 12	2.44 to 2.58	Charred cereal: 2 x frags. *Avena* sp.	135±30	-27.5	-	-	cal AD 1670–1950	1
24	SUERC-25013	-	3	Bulk10	2.31 to 2.44	Seeds: *Carex*, *Ranunculus*, *Atriplex*, 2 x Alismataceae	310±60	Not quoted	-	-	cal AD 1440–1800	2
24	SUERC-35325	Gully 23	24	Bulk 24	-	Charcoal: *Prunus spinosa*	3075±30	-27.8	-	-	1420–1260 cal BC	1
26	Beta-204033*	-	12	Mono. 18	1.8	Concentration of fibrous organics from within sediment	2020±70	-28.3	-	-	340 cal BC–cal AD 130	2
27	Beta-220048	-	6(C13)	Mono. 1	1.54	Sediment (acid wash)	2130±40	-28.7	-	-	360–40 cal BC	3
27	Beta-220051*	-	C13	Mono. 9	2.02	Sediment (acid wash)	1630±50	-28.6	-	-	cal AD 250–550	3
27	SUERC-31390	-	15/16	Bulk 4/3	1.3	Plant material: *Linum usitatissimum* capsule fragments	1335±30	-29	-	-	cal AD 640–770	1
29	Beta-204034*	-	37	Mono. 45	0.7	Bulk low carbon analysis on sediment	3310±60	-29.1	-	-	1740–1450 cal BC	3
29	Beta-220049	-	36	Mono. 32	1.71	Sediment (acid wash)	2720±40	-28	-	-	980–800 cal BC	3

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29	GU-24454	-	-	Mono. 30	1.19 to 1.20	Plant material: *Sparganium erectum*, *Solanum,* 2 x bud scales, twig + bud, *Juncus*, *Montia fontanum*	Failed	-	-	-	-	-
29	SUERC-26953	-	37	Bulk 44	0.80 to 0.95	Seeds: 16 x *Ranunculus cf. repens*, 2 x *Rubus* sp.	1855±30	-26.1	-	-	cal AD 80–240	1
29	SUERC-26954	-	37	Bulk 40	1.55 to 1.70	Seeds: 2 x *Iris pseudacorus*	1720±30	-26.7	-	-	cal AD 240–400	1
30	Beta-204035*	-	54	Mono. 48	1.9	Bulk low carbon analysis on sediment	3210±50	-28.6	-	-	1620–1400 cal BC	2
33	Beta-204036*	-	82	Mono. 69	1.1	Bulk low carbon analysis on sediment	3690±60	-28.7	-	-	2280–1910 cal BC	2
33	Beta-220050	-	79	Mono. 28	2.01	Sediment (acid wash)	2420±40	-28.2	-	-	760–390 cal BC	3
33	Failed	-	81	Mono. 25	1.58 to 1.60	Seeds: *Urtica dioica*, *Mentha* sp.	Failed		-	-		
33	SUERC-31388	-	83	Bulk 79	0.95 to 1.05	Plant material: 2 x *Alnus glutinosa* cones	6240±30	-26.2	-	-	5310–5070 cal BC	1
33	SUERC-31389	-	79	Mono. 25	1.66 to 1.68	Sediment	2745±30	-28.2	-	-	980–810 cal BC	3
33	SUERC-31556	-	81	Bulk 77	1.45 to 1.55	Plant material: 3 x *Alnus glutinosa* cones	2285±30	-28.5	-	-	410–210 cal BC	1
33	SUERC-35334	-	82	Bulk 26	1.35 to 1.37	Plant material: 21 x *Alnus glutinosa* seeds + catkin frag., 6 x *Persicaria hydropiper*	2270±30	-26.7	-	-	400–200 cal BC	1
34	Beta-204037*	-	90	Mono. 90	1.16 to 1.20	Bulk low carbon analysis on sediment	4160±80	-26.3	-	-	2910–2490 cal BC	2
34	Failed	-	90	Bulk 86	1.10 to 1.27	Seeds: *Alnus glutinosa*, 11 x *Chenopodium polyspermum*, *Barbarea*, 3 x *Urtica*	Failed	-	-	-	-	-
34	SUERC-31557	-	88	Bulk 84	1.44 to 1.65	Seeds: 10 x *Rubus* sp.	2325±30	-28.4	-	-	490–230 cal BC	1
35	NZA-32949	-	94	Bulk 93	1.55 to 1.70	Plant material: *Alnus glutinosa* cone, 3 x *Crataegus monogyna* stones	2462±35	-28.1	-	-	760–410 cal BC	1
35	SUERC-36296	Interface of gravel (95) and silt (94)	95	-	-	Bone: *Equus* sp. metatarsal	2425±30	-22.6	6.6	3.2	750–400 cal BC	1
43	Beta-250982	-	501	Mono. 115	1.57	Sediment (acid wash)	4190±40	-25	-	-	2900–2630 cal BC	3
43	Beta-250983	-	500	Mono. 115	1.95	Sediment (acid wash)	3200±40	-25.7	-	-	1610–1400 cal BC	3
43	Beta-250984	-	544	Mono. 115	2.47	Sediment (acid wash)	2870±40	-26.7	-	-	1200–920 cal BC	3
43	GU-24251	Ditch 603	602	Bulk 135	-	Seeds: 7x *Ranunculus* sp., 2 x *Oenanthe*	Failed	-	-	-	-	-
43	SUERC-34931	Cremation 527	526	Bulk 107	-	Cremated indet. bone (1.7g)	2830±35	-23.1	-	-	1120–900 cal BC	1
43	SUERC-34941	Pit 587	588	Bulk 131	-	Charred cereal: 2 x degraded cf. *Hordeum* grains	2710±35	-24.3	-	-	920–800 cal BC	1
43	SUERC-34958	Ditch 628	629	Bulk 147	-	Seeds: 3 x *Menyanthes,* 3 x *Sparganium*	1145±35	-27	-	-	cal AD 770–980	1
43	SUERC-35326	Cremation 527	526	Bulk 107	-	Charcoal: *Acer campestre*	2810±30	-24.4	-	-	1050–860 cal BC	1
43	SUERC-36230	Ditch 603	602	Bulk 135	-	Seeds: *Ranunculus* sp., *Carex*, *Eleocharis*, *Mentha* sp.	1360±30	-26.7	-	-	cal AD 610–770	1
43	SUERC-36231	Post-hole 513	512	Bulk 102	-	Seeds: *Menyanthes*, *Schoenoplectrus*, *Sparganium erectum*, *Carex*, *Ranunculus* sp.	1335±30	-26.2	-	-	cal AD 640–770	1
45	GU-24236	Post-hole 46	45	Bulk 23	-	Charred cereal: *Triticum dicoccum /spelta* grain	Failed	-	-	-	-	-
45	SUERC-34940	Post-hole 42	41	Bulk 21	-	Charred cereal: *Hordeum* grain	2860±35	-23	-	-	1130–910 cal BC	1
45	SUERC-35327	Post-hole 32	31	Bulk 16	-	Charcoal: *Prunus spinosa*	2915±30	-25.7	-	-	1260–1010 cal BC	1
45	SUERC-36232	Post-hole 34	35	Bulk 18	-	Charcoal: Maloideae	2860±30	-25	-	-	1130–920 cal BC	1
52	SUERC-24522	-	58	Mono. 9 M2	1.69	Sediment (humic acid)	1170±30	-29	-	-	cal AD 770–970	1
52	SUERC-24523	-	58	Mono. 9 M3	1.61	Seeds: *Menyanthes*, *Ranunculus* subg. *Batrachium*, *Carex*	1165±30	-24	-	-	cal AD 770–970	1
52	SUERC-24524	-	58	Mono. 9 M3	1.56	Sediment (humic acid)	1440±30	-29.1	-	-	cal AD 560–660	1

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52	SUERC-24525	-	61	Bulk 10	0.90 to 0.99	Seeds: 8 x *Sagittaria*, *Schoenoplectrus*, *Sambucus nigra*	1710±30	-25.4	-	-	cal AD 250–410	1
54	SUERC-31380	-	110	Bulk 32	0.54 to 0.59	Plant material: 4 x *Alnus glutinosa* cones	4070±30	-27.4	-	-	2860–2490 cal BC	1
54	SUERC-31381	-	107	Bulk 23	1.00 to 1.36	Seeds: 10 x *Carex* sp., *Oenanthe*, *Prunus*	2015±30	-28.1	-	-	100 cal BC–cal AD 70	1
54	SUERC-31382	-	72	Bulk 34	1.64 to 1.83	Seeds: 10 x *Schoenoplectus*, *Cirsium*, 3 x *Ranunculus*, *Thalictrum*, *Menyanthes*	1175±30	-25.2	-	-	cal AD 770–970	1
56	Beta-250527	Channel fill	143	Mono. 77	2.06	Sediment (acid wash)	1790±40	-28.1	-	-	cal AD 120–350	2
56	Beta-250528	-	196	Mono. 65	2.17	Sediment (acid wash)	1590±40	-27.8	-	-	cal AD 390–570	3
56	Beta-250529	-	193	Mono. 65	2.56	Sediment (acid wash)	1180±40	-27.1	-	-	cal AD 710–980	3
56	Beta-252889	Land surface 215/217	215	Mono. 77	1.72	Sediment (acid wash)	2310±40	-27.1	-	-	510–200 cal BC	2
56	SUERC-34943	Cut 239 (associated with structure 159)	199	Bulk 66	-	Charred cereal: 2 x *Triticum dicoccum* /*spelta* grains	985±35	-22.6	-	-	cal AD 980–1160	1
56	SUERC-35335	Cut 239 (associated with structure 159)	200	Bulk 67	-	14 x *Ranunculus* sp., *Bidens* tri, 10 x *Eleocharis* sp., *Carex* trig, *Carex* flat, 2 x *Sonchus asper*	905±30	-26.9	-	-	cal AD 1030–1210	1
56	SUERC-36288	Cut 239 (associated with structure 159)	199	Bulk 66	-	Charred *Triticum dicoccum* (spikelet forks)	970±30	-25.3	-	-	cal AD 1010–1160	1
58	Beta-250978	-	27	Mono. 40	1.65	Sediment (acid wash)	5350±40	-26.2	-	-	4330–4050 cal BC	2
58	Beta-250979	-	26	Mono. 41	2.08	Sediment (acid wash)	1490±40	-29.3	-	-	cal AD 430–650	2
58	Beta-250980	-	33	Mono. 43	3.5	Sediment (acid wash)	3270±40	-26	-	-	1640–1440 cal BC	3
58	Beta-250981	-	23	Mono. 42	2.9	Sediment (acid wash)	2600±40	-26.3	-	-	840–560 cal BC	3
58	SUERC-36580	Structure 100	-	Timber 234	-	Worked wood: *Salix*/*Populus* sp.	315±35	-27.3	-	-	cal AD 1470–1650	1
58	SUERC-36581	Structure 42	-	Timber 280	-	Worked wood: *Betula* sp.	1795±35	-27.1	-	-	cal AD 120–340	1
59	Beta-251398	-	311	Mono. 225	1.87	Sediment (acid wash)	1120±40	-29.2	-	-	cal AD 780–1020	2
59	Beta-251399	-	311	Mono. 225	1.95	Sediment (acid wash)	660±40	-28.5	-	-	cal AD 1270–1400	2
59	Beta-251400	-	315	Mono. 226	1.21	Sediment (acid wash)	2100±40	-27.8	-	-	350–1 cal BC	3
59	Beta-251401	-	312	Mono. 226	1.82	Sediment (acid wash)	1540±40	-27.3	-	-	cal AD 420–610	2
65	SUERC-24531	-	2a	Mono. 1	2.18	Sediment (humic acid)	7130±35	-25.4	-	-	6070–5920 cal BC	2
65	SUERC-24532	-	2b	Mono. 6	2.4	Sediment (humic acid)	1545±30	-28.3	-	-	cal AD 420–590	1
65	SUERC-25617	-	3	Bulk 3	<2.00	Seeds: 23 x *Schoenoplectrus*	1795±40	-26.3	-	-	cal AD 90–350	1
67	SUERC-26951	-	-	Mono. M3	3.2	Sediment (humic acid)	1645±30	-28.3	-	-	cal AD 260–540	1
67	SUERC-26952	-	-	Mono. M4	2.02	Sediment (humic acid)	1725±30	-28.3	-	-	cal AD 240–400	1
71	SUERC-24526	-	17/18	Mono. 1 M3	2.07	Sediment (humic acid)	2245±30	-28.6	-	-	400–200 cal BC	2
71	SUERC-24530	-	20	Mono. 14 M1	1.21 to 1.23	Waterlogged plant material: 6 x indet. buds	9050±35	-27	-	-	8300–8230 cal BC	1
71	SUERC-24868	-	20	Mono. 14 M2	0.93	Seeds: 30 x *Carex*	9365±110	-	-	-	9130–8300 cal BC	1
71	SUERC-35328	-	22	Mono. 14 M1	1.46 to 1.49	Charcoal: cf. *Quercus* sp.	385±30	-25.1	-	-	cal AD 1440–1640	3
71	SUERC-35336	-	21	Mono. 14 M2	0.83 to 0.84	Seeds: 2 x cf. *Potamogeton natans*, 2 x *Schoenoplectus lacustris*, 2 x *Carex* sp. flat, *Carex*/*Viola* trig. 13 x *Ranunculus* subg. *Batrachium*	10285±35	-22.1	-	-	10430–9880 cal BC	1
71	SUERC-35337	-	20	Mono. 14 M2	1.06 to 1.08	Waterlogged plant material: cf. *Populus tremula* bud scale	8715±35	-25	-	-	7940–7590 cal BC	2
71	SUERC-35338	-	20	Mono. 14 M1	1.36 to 1.38	Waterlogged plant material: indet. organics x 2, could be roots or twigs.	5740±30	-25	-	-	4690–4500 cal BC	2
72	SUERC-23167	-	105	Mono. M1	1.62 to 1.64	Sediment (humic acid)	4465±30	-27.3	-	-	3340–3020 cal BC	2

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72	SUERC-23168	-	103	Mono. M3	2.44 to 2.46	Sediment (humic acid)	2000±30	-28.2	-	-	90 cal BC–cal AD 80	2
72	SUERC-31368	-	105	Bulk 4	1.69 to 1.74	Seeds: 6 x *Sambucus*	4795±30	-27.5	-	-	3650–3520 cal BC	1
72	SUERC-31369	-	103	Bulk 10	2.34 to 2.39	Seeds: 24 x *Schoenoplectus* sp.	1755±30	-26.4	-	-	cal AD 170–390	1
72	SUERC-31370	-	102	Bulk 14	2.54 to 2.59	Seeds: 2x *Ranunculus*; 4x *Schoenoplectus*, 2x *Carex*, 1x *Persicaria minor*	1900±30	-25.9	-	-	cal AD 20–220	1
72	SUERC-35329	-	104	Mono. M2	2.04 to 2.05	Charcoal: 1 x indet. roundwood	4100±30	-26.7	-	-	2870–2500 cal BC	2
72	SUERC-35339	-	109	Mono. M2	2.20 to 2.21	Seeds: *Sambucus* sp., *Carex* flat, *Lycopus europaeus*, *Schoenoplectus* sp., 2 x *Carex* trig, *Juncus* sp.	1870±30	-25	-	-	cal AD 70–230	1
72	SUERC-35343	-	-	Mono. M1	1.80 to 1.81	Seeds and waterlogged plant material: 4 x *Rubus* sp., *Sambucus nigra*, *Potamogeton coloratus*, largish Root/twig fragment	3395±30	-26.3	-	-	1760–1610 cal BC	1
75	Beta-257993	-	939	Auger	1.41	Sediment (acid wash)	3880±40	-27.3	-	-	2480–2200 cal BC	3
75	Beta-257994	-	837	Mono. 30	1.6	Sediment (acid wash)	3840±40	-27.5	-	-	2470–2150 cal BC	3
75	Beta-257995	-	837	Mono. 30	1.9	Sediment (acid wash)	3850±40	-27.8	-	-	2470–2200 cal BC	3
75	Beta-257996	-	822	Mono. 30	2.32	Sediment (acid wash)	910±40	-27.8	-	-	cal AD 1030–1220	2
75	Beta-257997	-	838	Mono. 26	1.95	Sediment (acid wash)	1330±40	-27.1	-	-	cal AD 640–780	3
75	Beta-257998	-	833/839	Mono. 26	2.45	Sediment (acid wash)	1400±40	-26.9	-	-	cal AD 570–680	3
75	Beta-257999	-	830	Mono. 28	2	Sediment (acid wash)	11080±60	-25.7	-	-	11180–10780 cal BC	2
75	Beta-258000	-	827	Mono. 28	2.21	Sediment (acid wash)	2540±40	-27.7	-	-	810–530 cal BC	3
75	Beta-258001	-	845	Mono. 28	2.49	Sediment (acid wash)	1710±40	-27.2	-	-	cal AD 240–420	3
75	Beta-258002	-	281	Mono. 2	3.53	Sediment (acid wash)	2030±40	-25.5	-	-	170 cal BC–cal AD 60	3
75	Beta-258003	-	270	Mono. 3	3.04	Sediment (acid wash)	1240±40	-26.7	-	-	cal AD 680–890	3
75	SUERC-36284	-	845	Bulk 36	-	Plant material: *Prunus domestica* stone	420±30	-25.2	-	-	cal AD 1420–1620	1
75	SUERC-36285	-	833	Bulk 37	-	Seeds: 7x *Salix* buds, 5x *Ranunculus* sp, 1x *Solanum*, 2x *Cirsium,* 1x *Oenanthe, Rumex aquatilis* +4 *Rumex* sp.+ 2x *Carex* sp.	425±30	-27.3	-	-	cal AD 1420–1620	1
75	SUERC-36286	-	842	Bulk 27	-	Plant material: 4x *Alnus glutinosa* cones/female catkins	3360±35	-27.6	-	-	1750–1530 cal BC	1
93	GU-24463	-	814	Mono. M3	1.42 to 1.43	Plant material: *Oenanthe* sp., *Sambucus nigra*, 4 x *Ranunculus repens*, 3 x *Schoenoplectus lacustris*, *Carex* trig, 2 x *Carex* flat, Twig (cf. Abscission plate), *Sphagnum* leaf/*Typha/*small Poaceae	Failed	-	-	-	-	-
93	SUERC-23172	-	807	Mono. M2	2.13 to 2.15	Sediment (acid wash)	1890±30	-28.1	-	-	cal AD 50–220	1
93	SUERC-23173	-	813	Mono. M4	0.87 to 0.89	Sediment (acid wash)	3970±30	-28.4	-	-	2580–2350 cal BC	2
93	SUERC-31371	-	807	Bulk 3	1.79 to 1.84	Plant material: 2 x *Alnus glutinosa* cones	3495±30	-28.7	-	-	1900–1740 cal BC	2
93	SUERC-31372	-	803/807	Bulk 11	2.19 to 2.24	Seeds: 2 x *Nuphar lutea*	1945±30	-25.5	-	-	30 cal BC–cal AD 130	1
93	SUERC-31376	-	813	Mono. M4	0.87 to 0.92	Plant material: 12 x *Alnus glutinosa* seeds + 6 x catkins	3510±30	-27.2	-	-	1920–1740 cal BC	1
93	SUERC-35344	-	807	Mono. M2	1.85	Seeds: *Cirsium*/*Carduus*, 2 x *Rumex* sp., *Schoenoplectus*, *Ranunculus* sp., *Alisma plantago-aquatica*, *Betula* sp., *Rorippa nasturtium aquaticum*, *Carex cf. nigra*, 3 x frags cf. Cyperaceae/*Rumex* sp.	1990±30	-25	-	-	50 cal BC–cal AD 80	1

Trench	Lab code	Feature	Context	Sample	Depth (m OD)	Material dated	Date BP	$\delta^{13}C$‰	$\delta^{15}N$‰	C:N	Calibrated date (95.4%, 2σ range)	Reliability of date
94	GU-24464	-	910	Mono. M1	0.54 to 0.56	Plant material: root (maybe twig) heavily impregnated with iron (Fe) mineralisation, so probably associated with periods of drying? 1 x *Salix* budscale	Failed	-	-	-	-	-
94	SUERC-31377	-	904	Mono. M2	1.11 to 1.13	Seeds: 6 x *Ranunculus arb*, 23 x *Ranunculus* subg. *Batrachium*, 3 x *Lycopus europaeus*, 4 x *Carex*	9735±35	-27	-	-	9290–9150 cal BC	1
94	SUERC-31378	-	904	Mono. M2	1.36 to 1.38	Sediment	6935±30	-28.2	-	-	5890–5730 cal BC	2
94	SUERC-31379	-	906	Bulk 18	1.13 to 1.18	Seeds: 9 x *Ranunculus* sp., 5 x *Schoenoplectus, 7 x Lycopus, 4 x Carex*	9945±35	-26.4	-	-	9660–9290 cal BC	1
94	SUERC-36294	-	905	Skeleton 911	-	Bone: *Equus* sp. tibia (left)	1875±30	-22.4	5.9	3.2	cal AD 60–230	1
94	SUERC-36295	-	905	Skeleton 911	-	Bone: *Equus* sp. tibia (left)	1880±30	-22.4	9.8	3.2	cal AD 60–230	1
105	SUERC-36585	Cut 287	-	Timber 286	-	Worked Wood: *Alnus glutinosa*	895±35	-25.5	-	-	cal AD 1030–1220	1
109	SUERC-31386	-	37	Mono. 1	1.00 to 1.02	Seeds: 5 x *Eleocharis palustris*, *Carex*, 3 x *Ranunculus* subg. *Batrachium*, *Rubus* sp., *Mentha*	1885±30	-25	-	-	cal AD 60–220	1
109	SUERC-31387	-	37	Mono. 1	0.58 to 0.60	Seeds: 5x *Eleocharis* sp, 3x *Ranunculus* sp. 3x *Mentha*, 4x *Carex* sp.,	2125±30	-25	-	-	350–50 cal BC	1
111	SUERC-25618	-	79	Mono. 18	0.67 to 0.68	Plant material: *Phragmites* stem	1295±40	-27.5	-	-	cal AD 650–860	1
111	SUERC-25619	-	78	Mono. 18	0.95 to 0.96	Seeds: 10 x *Menyanthes trifoliata*	1245±40	-26.1	-	-	cal AD 670–880	1
111	SUERC-25620	-	67	Mono. 18	1.75	Bulk sediment with *Phragmites* stems	1315±40	-29.4	-	-	cal AD 640–780	1
118	Beta-250594	-	223	Mono. 1 M1	-0.82	Sediment (acid/alkali/acid)	5110±40	-28.3	-	-	3990–3790 cal BC	3
118	Beta-250595	-	177N	Mono. 1 M3	0.19	Sediment (acid/alkali/acid)	4120±40	-28.3	-	-	2880–2570 cal BC	2
118	Beta-250596	-	172 (lower)	Mono. 1 M4	0.67	Sediment (acid wash)	2630±40	-28.2	-	-	900–670 cal BC	3
118	Beta-250597	-	172 (upper)	Mono. 1 M5	1.07	Sediment (acid/alkali/acid)	990±40	-26.9	-	-	cal AD 980–1160	2
118	Beta-250598	-	183-191	Mono. 9 M11	-0.4	Sediment (acid/alkali/acid)	4250±40	-27.2	-	-	2930–2670 cal BC	2
118	Beta-250599	-	183	Mono. 9 M6	-0.44	Sediment (acid/alkali/acid)	2970±40	-24.3	-	-	1380–1050 cal BC	1
118	Beta-250600	-	210	Mono. 9 M8	0.20	Sediment (acid wash)	3080±40	-28.5	-	-	1440–1220 cal BC	3
118	Beta-250601	-	208	Mono. 9 M9	0.64	Sediment (acid wash)	1790±40	-27.9	-	-	cal AD 120–350	1
118	Beta-250602	-	207	Mono. 9 M9	1.05	Sediment (acid/alkali/acid)	550±40	-24.4	-	-	cal AD 1300–1440	1
118	GU-24246	-	174	Bulk 6	*c.* 0.68	Plant material: Carex, *Schoenoplectrus*, *Sambucus*, Twig w abscission scar, *Urtica dioica*, *Mentha*, *Hypericum* sp., 2 x male *Alnus glutinosa* catkins, *Rubus* frag.	Failed	-	-	-	-	-
118	SUERC-33680	Channel cut 602	580-compl. = 596	Bulk 126	-0.76 to -1.0	Waterlogged wood: has bark, but possibly large root.	2960±30	-29.6	-	-	1300–1050 cal BC	3
118	SUERC-33681	-	580-compl. = 574 labelled as 596	Bulk 121	-0.66 to -0.56	Seeds: 25 x *Alnus glutinosa, 2 x Ranunculus*, *Persicaria hydropiper, Schoenoplectrus, Galeopsis*	3005±30	-26.9	-	-	1380–1120 cal BC	2
118	SUERC-33682	Channel cut 602	585	Bulk 127	unknown	Plant material: twig with clearly identifiable bud scales cf. *Alnus glutinosa*	4605±30	-29	-	-	3510–3130 cal BC	3
118	SUERC-33686	-	cuts 580/574	Timber 581	-0.57 (top)	Worked wood: *Alnus glutinosa*	4735±30	-28.9	-	-	3640–3370 cal BC	1
118	SUERC-33687	-	cuts 221	Timber 69	-0.51 (top)	Worked wood: *Alnus glutinosa*	1850±30	-28.4	-	-	cal AD 80–240	1

Trench	Lab code	Feature	Context	Sample	Depth (m OD)	Material dated	Date BP	$\delta^{13}C$‰	$\delta^{15}N$‰	C:N	Calibrated date (95.4%, 2σ range)	Reliability of date
118	SUERC-34933	Channel fill	55	n/a	base is at -0.36	Bone: *Equus* sp. tibia (6g)	1700±35	-22.4	5.6	3.3	cal AD 250–420	3
118	SUERC-34934	Channel cut 602	580-compl. ?=574	n/a	-0.61 to -0.81	Bone: *Bos* tibia (6g)	2980±35	-21.8	6.7	3.3	1380–1050 cal BC	3
118	SUERC-34938	Channel 563	526	n/a	unknown	Bone: *Equus* sp. femur (7g	395±35	-23.1	3.4	3.3	cal AD 1430–1640	1
118	SUERC-34939	Channel 600	569	n/a	-0.26 to -0.41 or 0.09 to -0.15	Bone: *Bos* femur (5g)	2040±35	-22.2	6.2	3.3	170 cal BC–cal AD 50	1
118	SUERC-34944	Channel fill	182	Bulk 21	0.53 to -0.35	Charred cereal: 2 x *Hordeum* grains	1865±35	-24.5	-	-	cal AD 70–240	1
118	SUERC-34948	-	177N	Mono. 1 M3	0.26	Sediment (humic acid)	4480±35	-28.3	-	-	3350–3020 cal BC	1
118	SUERC-34949	-	580	Mono. 122 M2	-1.1	Sediment	10,325±40	-29.8	-	-	10,440–10,040 cal BC	1
118	SUERC-34950	-	574	Bulk 125	-0.85 to -0.51	Plant material: 11 x *Alnus glutinosa* seeds + cone	2935±35	-28.8	-	-	1270–1020 cal BC	1
118	SUERC-34951	-	162	Bulk 38	-0.7 to -0.4	Plant material: *Alnus glutinosa* cone	4650±35	-26.9	-	-	3520–3360 cal BC	1
118	SUERC-34952	-	177S	Bulk 27	-0.17 to 0.23	Seeds: 5 x *Schoenoplectus*, 2 x *Carex*, 2 x *Oenanthe.*	2235±35	-27	-	-	390–200 cal BC	3
118	SUERC-34953	-	182	Bulk 12	-0.10 to 0.1	Plant material: 2 x *Nuphar lutea* seeds, *Alnus glutinosa* cone	2970±35	-27.3	-	-	1320–1050 cal BC	3
118	SUERC-34954	Channel fill	210	Bulk 14	0.32 to 0.55	Seeds: 10 x *Ranunculus*, 5 x *Schoenoplectrus*	1900±35	-26.2	-	-	cal AD 20–220	1
118	SUERC-34959	-	-	Timber 565	0.09 (top)	Wood: *c.* 5cm roundwood - *Salix*/*Populus*	1835±35	-28.5	-	-	cal AD 80–260	1
118	SUERC-34960	-	?180	Timber 180	-0.85 (top)	Wood: *Alnus glutinosa* branch	1820±35	-30.4	-	-	cal AD 80–330	1
118	SUERC-35345	-	below 55?	Timber 74/504	-0.43 (top)	Wood: *Alnus glutinosa* roundwood	1855±30	-29.5	-	-	cal AD 80–240	1
118	SUERC-36220	-	cuts 168/169	Timber 188	1.43	Wood: *Quercus* sp.	315±30	-27.5	-	-	cal AD 1480–1650	1
118	SUERC-36221	-	537	Timber 554	-	Wood: *Salix*/*Populus* sp.	610±30	-29.3	-	-	cal AD 1290–1410	1
118	SUERC-36222	-	Unstrat.	Timber 560	-	Wood: *Salix*/*Populus* sp.	1555±30	-27	-	-	cal AD 420–580	1
118	SUERC-36223	-	577	Timber 577	-0.57 (top)	Wood: *Alnus glutinosa*	4785±30	-28.1	-	-	3650–3520 cal BC	1
118	SUERC-36224	-	578	Timber 578	-0.57	Wood: *Alnus glutinosa*	4740±30	-25.4	-	-	3640–3370 cal BC	1
118	SUERC-36225	-		Timber 567	0.06	Wood: *Alnus glutinosa*	1875±30	-29.8	-	-	cal AD 60–230	1
118	SUERC-36226	-	177N	Bulk 5	0.2-0.4	Plant material: *Corylus avellana* nut shell	4120±30	-29.3	-	-	2870–2570 cal BC	2
118	SUERC-36287	-	596	Bulk 126	-0.76 to -1.0	Seeds: 100 x *Carex* sp.	10,000±35	-25.3	-	-	9750–9330 cal BC	1
118	SUERC-36289	-	580-compl.	on 7	unknown	Bone: *Cervus elaphus* antler	3935±35	-23.2	6.8	3.4	2570–2290 cal BC	2
118	SUERC-36293	-	580-compl.	on 9	unknown	Bone: *Cervus elaphus* antler	3910±30	-23.1	6.5	3.3	2480–2290 cal BC	2
118	SUERC-36571	-	183	Bulk 11	-0.2 to -0.4	Seeds: 26 x *Ranunculus*, 8 x *Persicaria hydropiper*, 4 x *Potentilla*, 30 x *Rumex*	3055±35	-26.7	-	-	1420–1210 cal BC	1
118	SUERC-36575	-	183	Bulk 24s7	-0.55 to -0.65	Plant material: 2 x *Corylus avellana* fragments, 2 x *Alnus glutinosa* cones	4680±35	-29.5	-	-	3630–3360 cal BC	1
118	SUERC-36576	Channel fill	532	Bulk 101	0.1 to 0.4	Seeds: 12 x *Thalictrum flavum,* 15 x *Stachys*	1920±35	-27.6	-	-	cal AD 1–220	1
118	SUERC-36577	Channel fill	182	Bulk 24s3	-0.1 to -0.15	Seeds: 10 x *Oenanthe*, 3 x *Ranunculus*	1945±35	-27.5	-	-	40 cal BC–cal AD 130	1
118	SUERC-36578	Channel 600	572	Bulk 113	-0.4 to 0.1 (-0.44 to -0.3)	Plant material: 5 x *Alnus glutinosa* cones	2040±35	-28.5	-	-	170 cal BC–cal AD 50	1
118	SUERC-36579	-	cuts 580/574	Timber 581	-0.57 (top)	Worked wood: *Alnus glutinosa*	4780±35	-28.3	-	-	3650–3380 cal BC	1
120	NZA-32943	-	20	Bulk 4	-	Seeds: 2 x *Corylus avellana*	3960±35	-24.5	-	-	2580–2340 cal BC	1

Trench	Lab code	Feature	Context	Sample	Depth (m OD)	Material dated	Date BP	$\delta^{13}C$‰	$\delta^{15}N$‰	C:N	Calibrated date (95.4%, 2σ range)	Reliability of date
120	NZA-32944	-	23	Bulk 3	-	Plant material: *Alnus glutinosa* cone, catkin frags., 10 x *Sambucus* seeds	4628±40	-26.6	-	-	3630–3190 cal BC	1
SBX00 - Area2	NZA-32945	-	4316	Bulk 1086	0.70 to 0.95	Seeds: 4 x *Nuphar lutea*	1834±35	-30.1	-	-	cal AD 80–260	1
SBX00 - Area2	NZA-32946	-	4322	Bulk 1092	0.19 to 0.21	Plant material: 10 x *Alnus glutinosa* cones	6822±45	-26.9	-	-	5800–5630 cal BC	1
SBX00 - Area2	NZA-32948	-	4326	Bulk 1096	0.08 to 0.12	Plant material: 10 x *Alnus glutinosa* cones	7014±40	-27.3	-	-	6000–5790 cal BC	1

Radiocarbon dates derived from sediment dated within geotechnical boreholes (previous phases of work).
All dates are AMS unless indicated by * (radiometric) or + (method unknown)
Location data is given using a 12 digit OSGB36 grid reference

Lab code	***Borehole***	***Depth (m OD)***	***Easting***	***Northing***	***Material description***	***Date BP***	***$\delta^{13}C$ (‰)***	***Calibrated date (95.4%, 2σ range)***
Beta-216947*	BHCZ6A-044J	2.30 to 2.35	537494.3	185389.1	Organic mud	4430±40	-27.6	3340–2920 cal BC
Beta-216948	BHCZ6D-008C	1.05 to 1.02	537636.6	185010.1	Organic mud	6220±40	-27.8	5310–5050 cal BC
Beta-216949	BHCZ6D-008C	2.22	537636.6	185010.1	Organic mud	2020±40	-28.6	170 cal BC–cal AD 70
Beta-216950*	BHCZ6A-008A	1.73 to 1.71	537537.9	185417.8	Organic mud	3470±40	-28.4	1900–1680 cal BC
Beta-216951*	BHCZ6D-005	1.4 to 1.3	537618.6	185141.4	Organic mud	4090±70	-28.6	2880–2480 cal BC
Beta-216952*	BHCZ6A-025	2.39 to 2.44	537537.1	185287.8	Organic mud	2220±70	-28.1	410–90 cal BC
Beta-216953*	BHCZ6A-025	1.74 to 1.84	537537.1	185287.8	Organic mud	2870±40	-27.2	1200–920 cal BC
Beta-216954+	BHCZ6D-013	1.2	537635.5	184872.7	Organic mud	11130±40	-29.5	11210–10860 cal BC
Beta-216955*	BHCZ6A-017A	3.37	537723.5	185366.2	Organic mud	1940±40	-27.3	50 cal BC–cal AD 140
Beta-216956*	BHCZ6B-009	2.99 to 2.79	538010.11	185231.05	Oxidised Organics	4870±40	-24.2	3760–3530 cal BC
Beta-218157*	BHCZ7Ai-003	1.07 to 0.87	537521.84	185559.85	Organic Sediment	12080±40	-29.9	12110–11830 cal BC
Beta-218158+	BHCZ7Ai-005A	1.88 to 1.83	537484.69	185629.29	Organic mud	2940±40	-28.7	1300–1010 cal BC
Beta-218159+	BHCZ7Ai-004	2.01 to 1.91	537478.88	185653.27	Organic mud	2900±60	-29.1	1290–910 cal BC
Beta-218160	BHCZ7Ai-006	2.93 to 2.90	537455.93	185614.65	Organic mud	2410±80	-27.7	780–380 cal BC
Beta-218608+	BHCZ4-040	1.34 to 1.29	537421.22	184094.8	Organic mud	2350±40	-25.6	730–260 cal BC
Beta-218609+	BHCZ4-007	1.18	537438.55	184469.96	Organic mud	4570±40	-28.5	3500–3100 cal BC
Beta-218610+	BHCZ4-014	0.89	537397.61	184413.6	Organic mud	7450±60	-28.2	6440–6220 cal BC
Beta-218760+	BHCZ5C-014	1.89	537045.26	185003.86	Organic Sediment	3410±40	-27.4	1880–1610 cal BC
Beta-218761+	BHCZ5C-007	1.89 to 1.85	537156.56	185078.71	Organic Sediment	3640±50	-29.3	2190–1880 cal BC
Beta-218762+	BHCZ5C-025	0.02	537257.7	184813.41	Organic Sediment	10470±70	-30.2	10630–10170 cal BC
Beta-226481	WSOLY2-005	3.7	537461.6	185831.03	(Plant material): acid/alkali/acid	1170±40	-29.9	cal AD 720–980
SUERC-28031	Deep Foul Sewer P4	-0.9 to -0.91	537602.82	184701.66	Organic Sediment	12020±40	-28.7	12060–11800 cal BC
SUERC-28032	Deep Foul Sewer P11	2.00 to 2.02	537660.75	183798.04	Organic Sediment	1385±35	-29.7	cal AD 590–690

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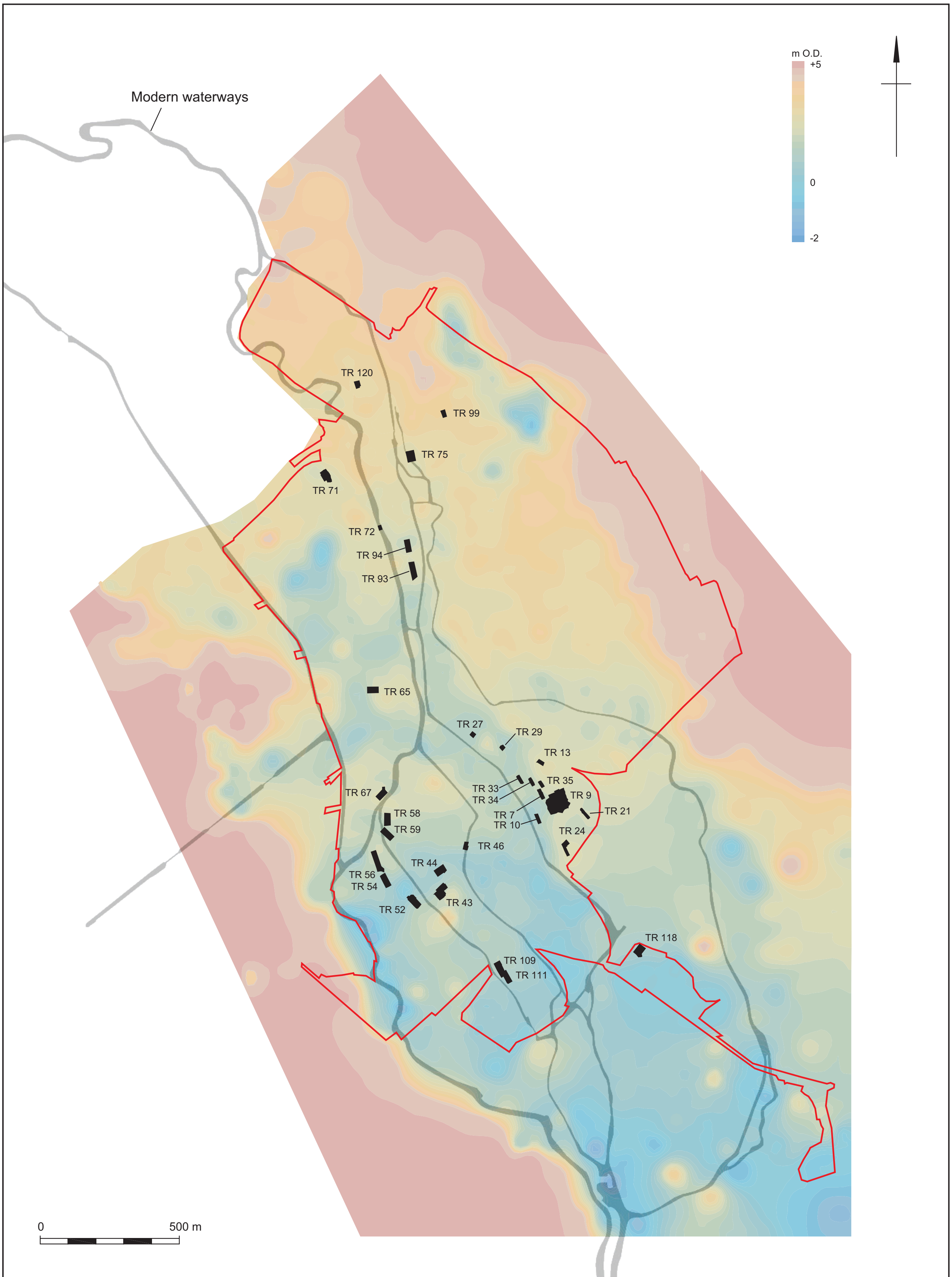

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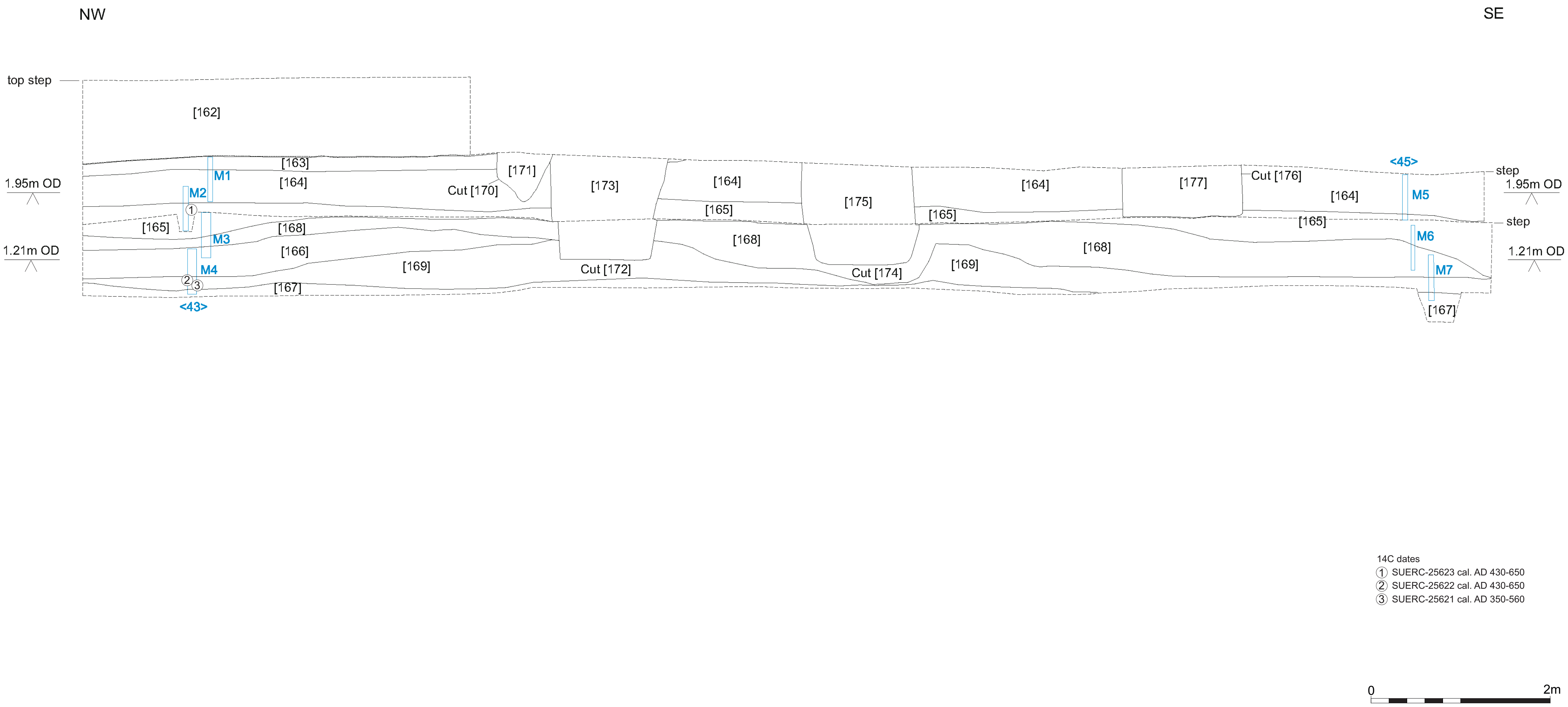
Wessex Archaeology

Trenches with analysed environmental sequences mentioned in the text, shown overlying the gravel topography derived from deposit modelling

Figure 1



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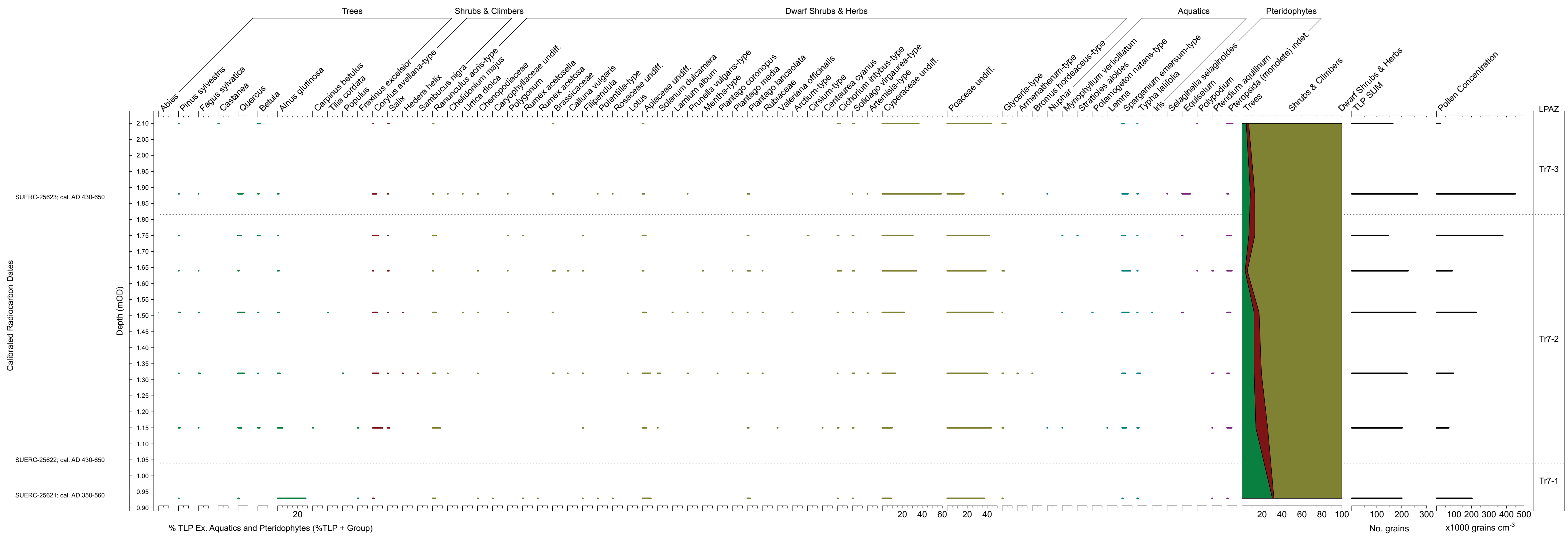
South-west facing Section 16, Trench 7 (from Bazley et al. 2008)

Figure 2



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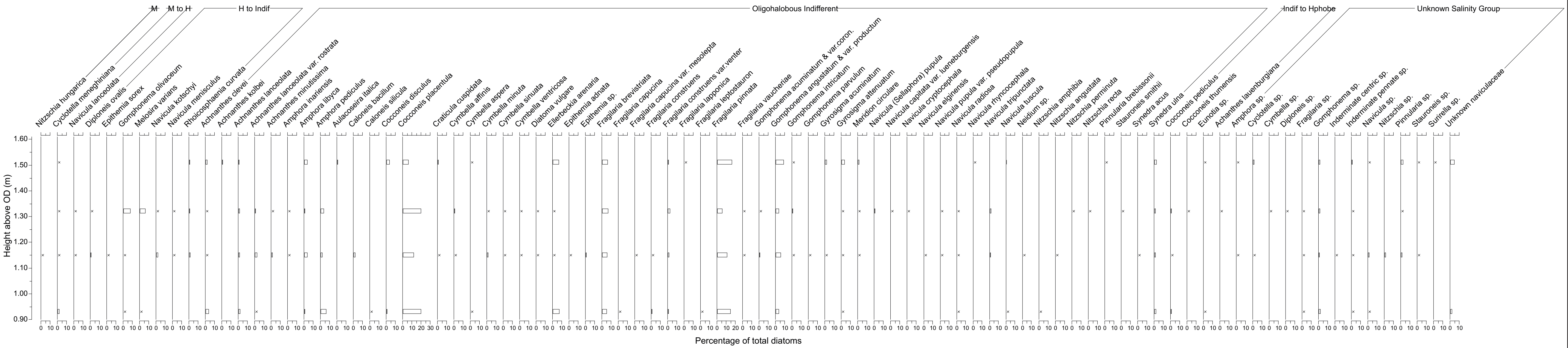
Pollen diagram from monolith <43>, Trench 7

Figure 3



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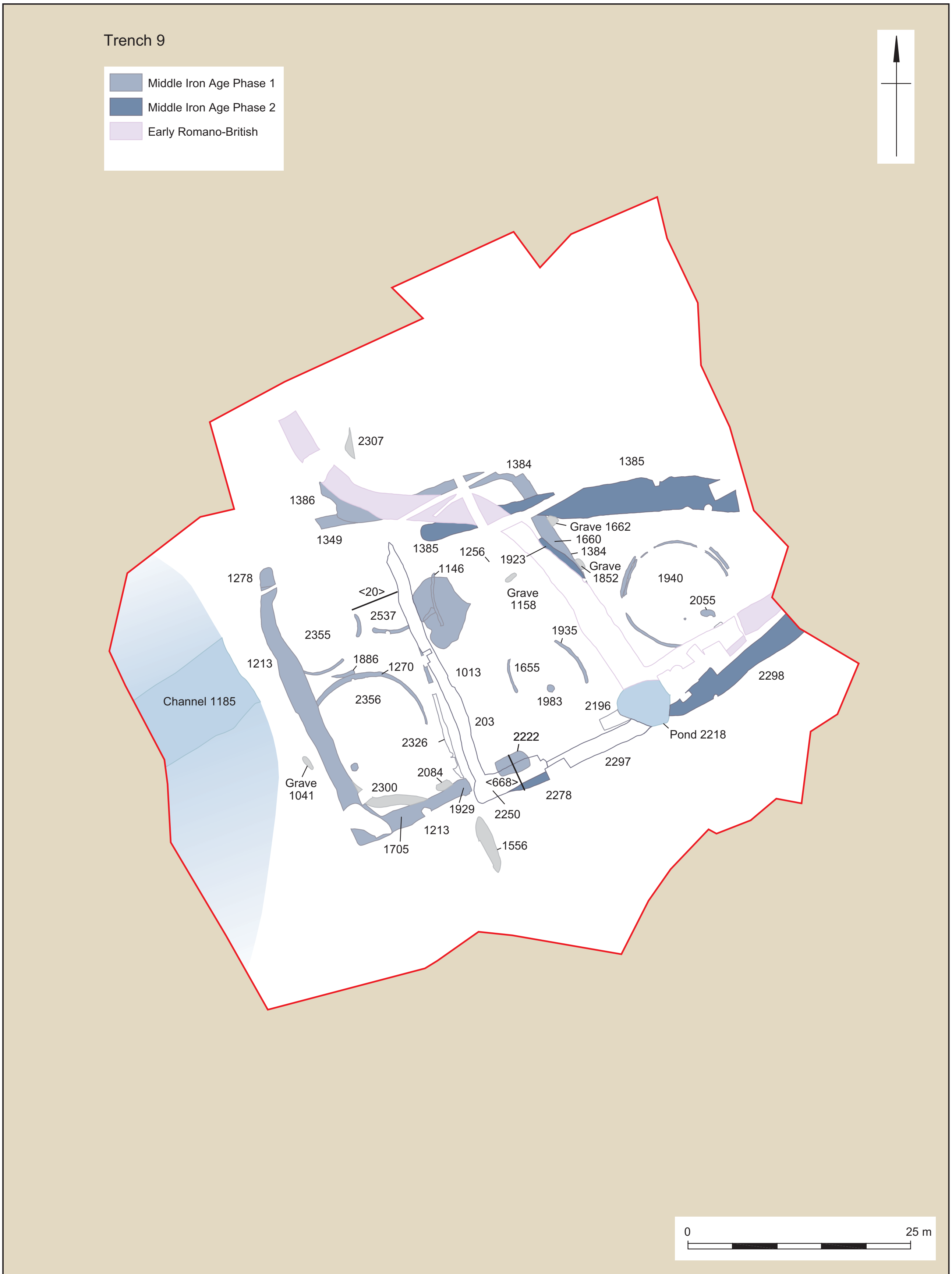
Diatom diagram from monolith <43>, Trench 7

Figure 4



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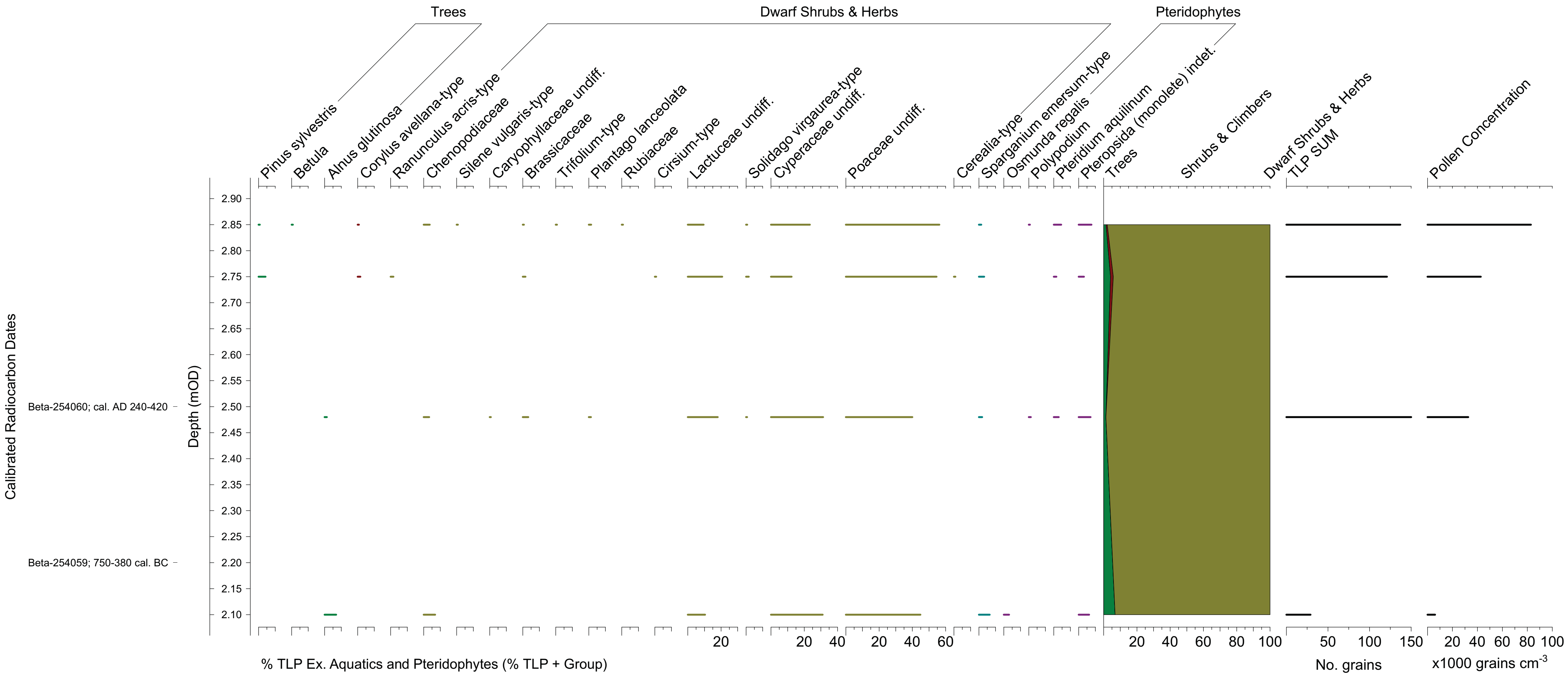
Trench 9: Middle and Late Iron Age phases, with position of Romano-British ditch

Figure 5



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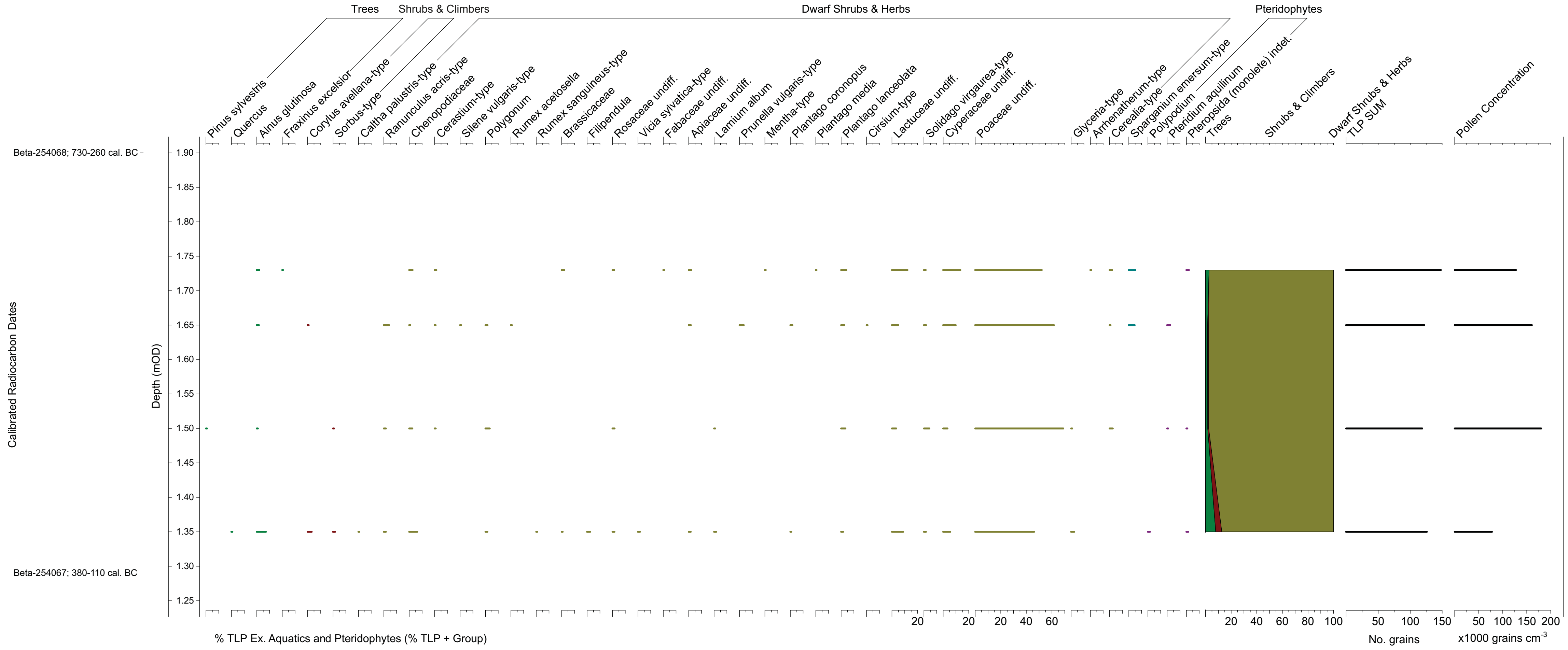
Pollen diagram from ditch segment 2222, monolith <668>, Trench 9

Figure 6



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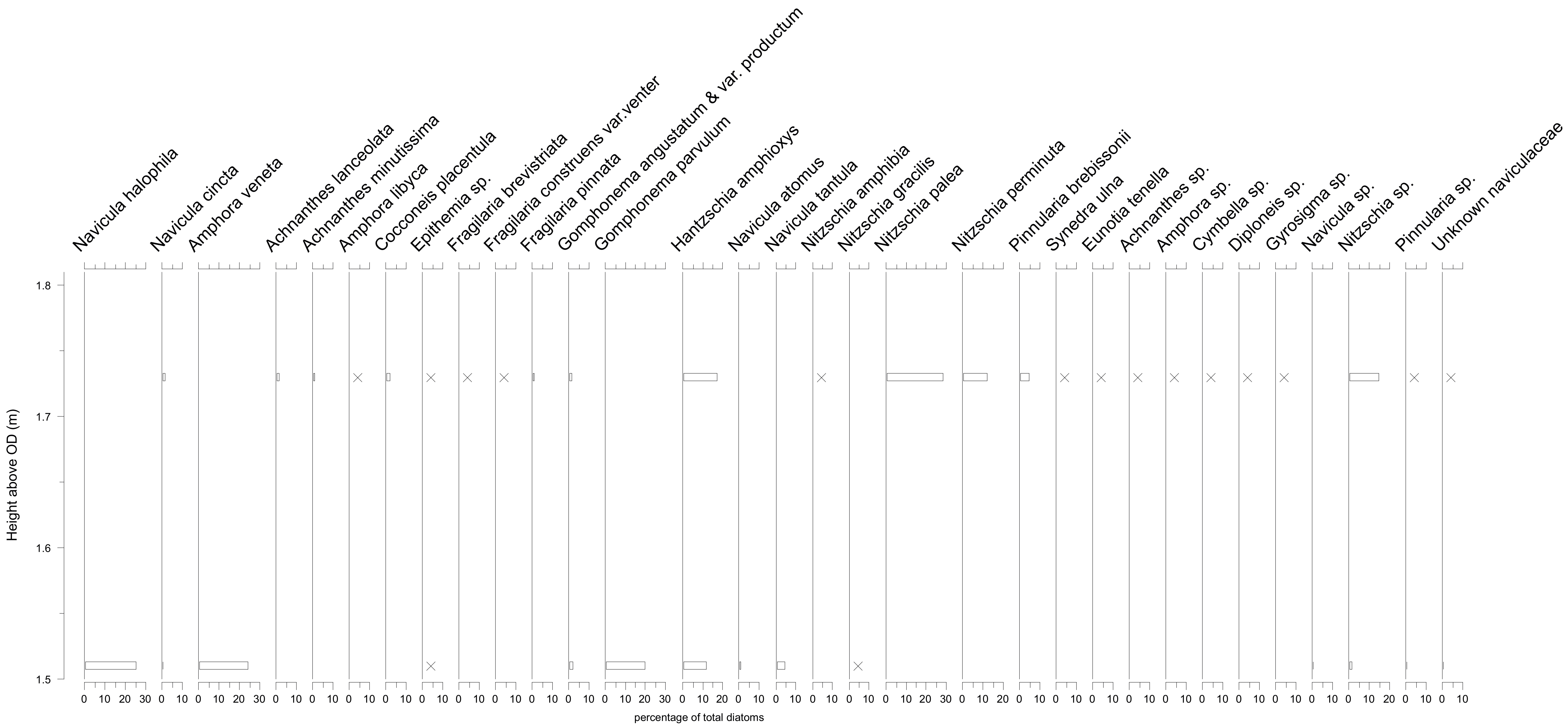
Pollen diagram from monolith <21>, Trench 9

Figure 7



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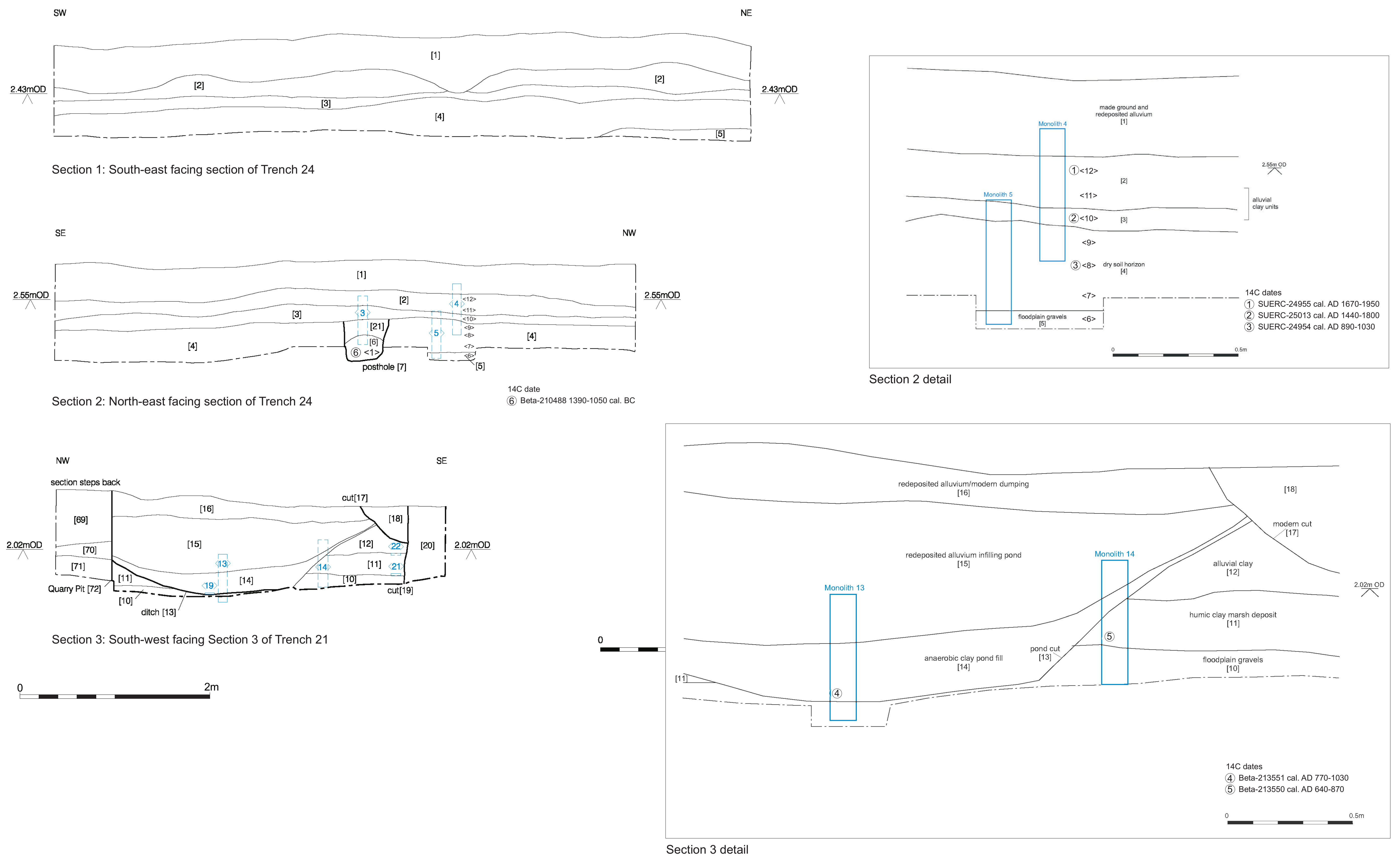
Diatom diagram from ditch segment 2222, monolith <668>

Figure 8



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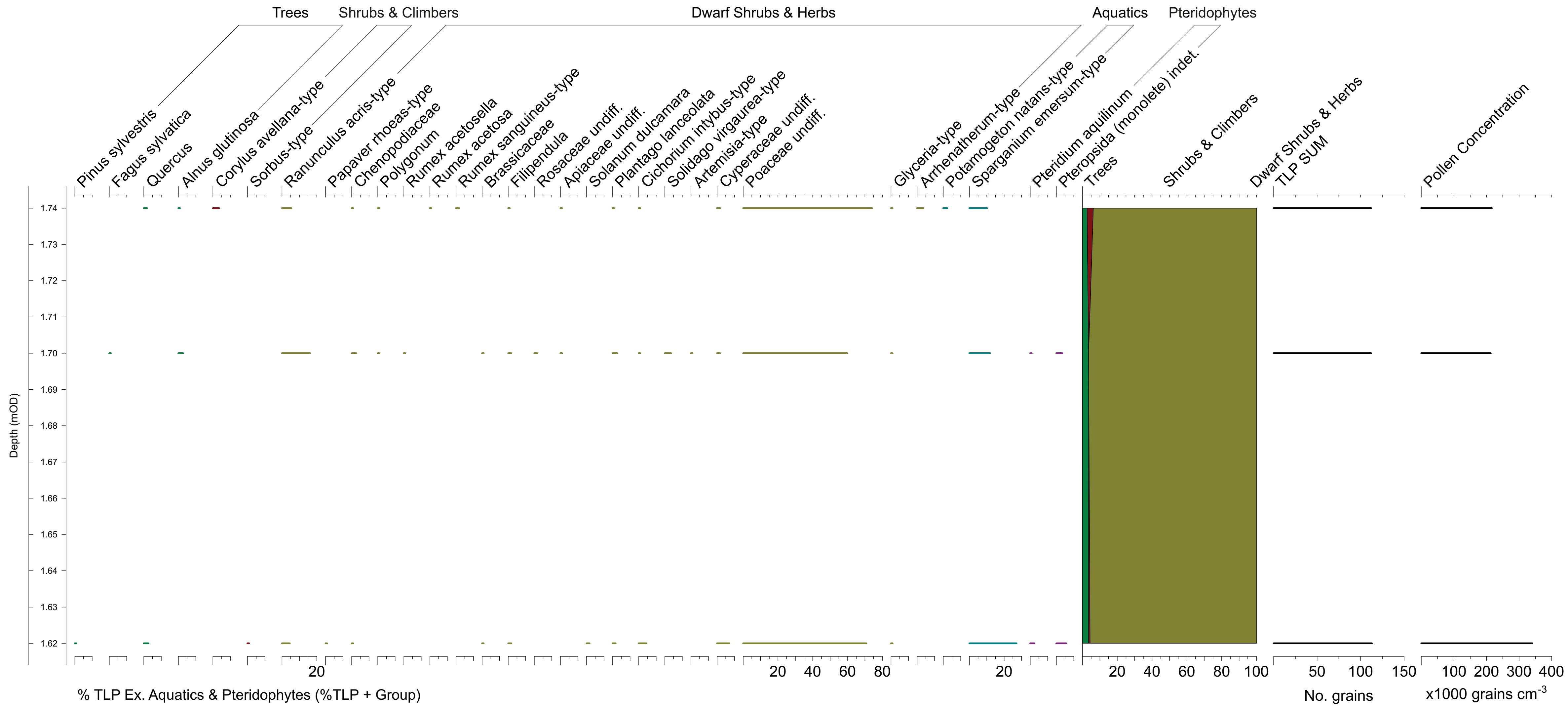
Sections from Trenches 21 and 24 (from Halsey and Hawkins 2007)

Figure 9



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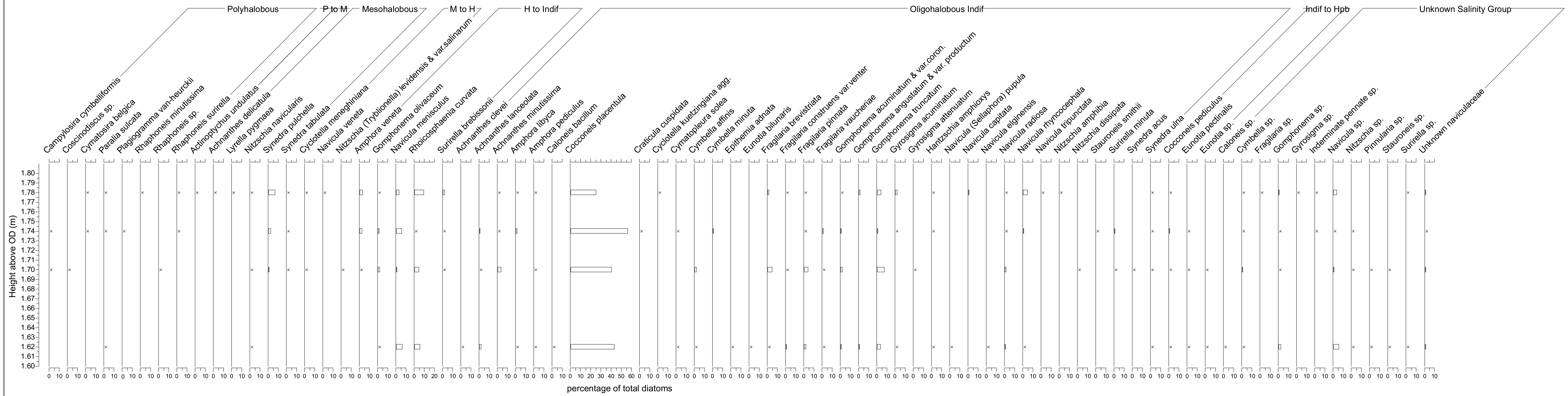
Pollen diagram from monolith <13>, Trench 21

Figure 10



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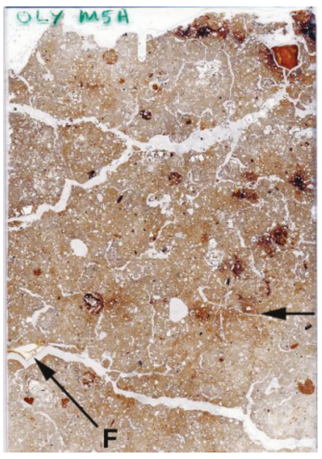
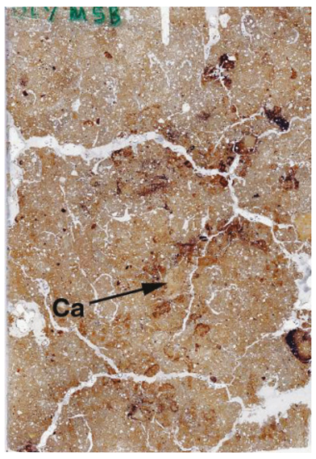
Diatom diagram from monolith <13>, Trench 21

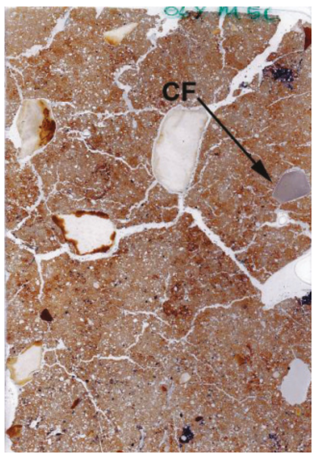
Figure 11



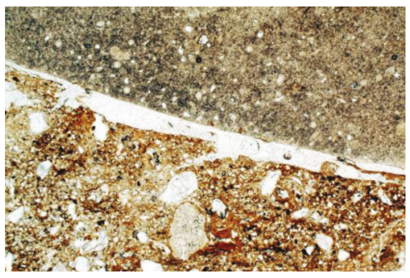
A: Scan of M5A; very diffuse junction between Contexts 3 and 4. Note darkish brown 'muddy' layer of locally (clay-enriched) slaked soil-sediment (arrow) and also associated with possible flint flake (F). Pale areas are iron and clay depleted. Frame height is ~75mm.



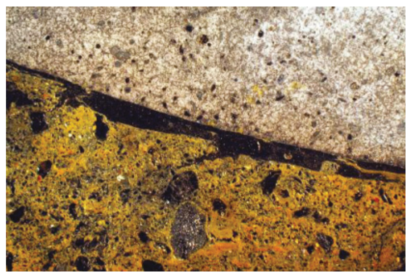
B: Scan of M5B (upper Context 4); iron-stained burrows and clay-rich slaked soil, with patches of secondary $CaCO_3$ (e.g., Ca; see Fig 11) infilling voids and as root pseudomorphs and predating most iron staining. Frame height is ~75mm.



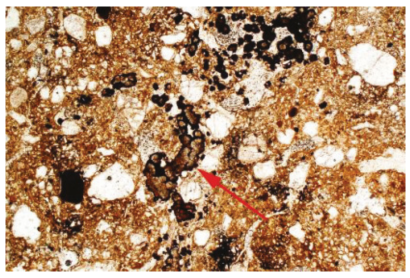
C: Scan of M5C; junction of Contexts 4 and 5; note presence of gravel, and one possible weakly calcined flint (arrow). Frame height is ~75mm.



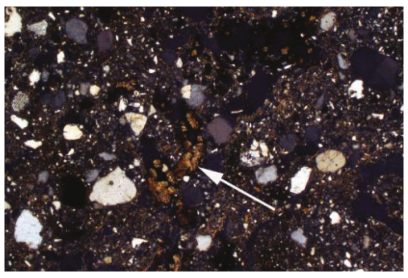
D: Photomicrograph of M5C; edge of weakly calcined/burned flint; note reddish clay void coatings and infills. Plane polarised light (PPL), frame width is ~4.62mm.



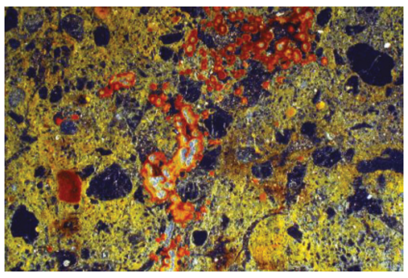
E: As D, under oblique incident light (OIL).



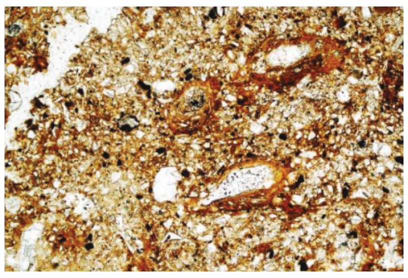
F: Photomicrograph of M5C showing calcitic root pseudomorph (arrow) and later iron mottling related to this root feature. PPL, frame width is ~4.62mm.



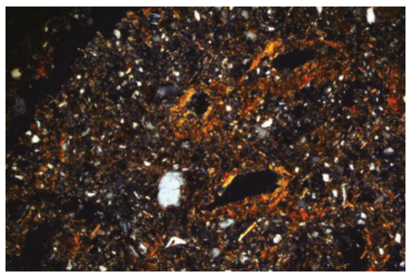
G: As F, under crossed polarised light (XPL); note relict high interference colours of the root replaced by $CaCO_3$ /calcite (arrow).



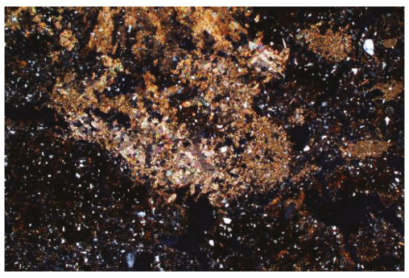
H: As Figs F-G, under OIL; note iron staining of organic remains.



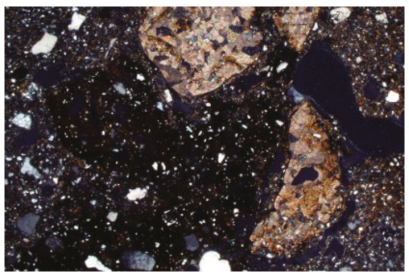
I: Photomicrograph of M5C; close up of poorly laminated reddish clay void coatings and infills and intercalations within the matrix. PPL, frame width is ~2.38mm.



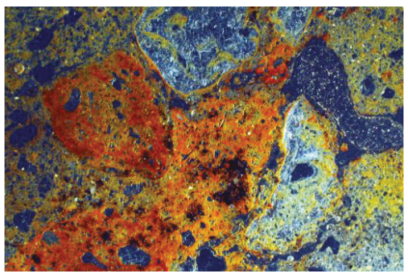
J: As I, under XPL. Note general interference colours of 'clay-enriched' fabric and coatings.



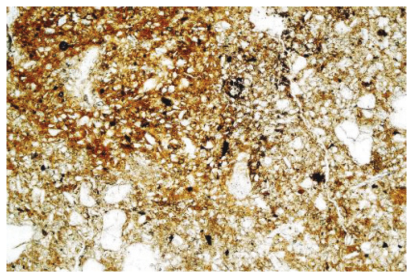
K: Photomicrograph of M5 B; partially depleted (decalcified) and iron-stained micritic and microsparitic void infill. XPL, frame width is ~4.62mm.



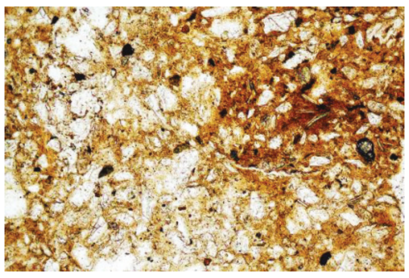
L: Photomicrograph of M5B; relict calcitic root pseudomorphs. XPL, frame width is ~4.62mm.



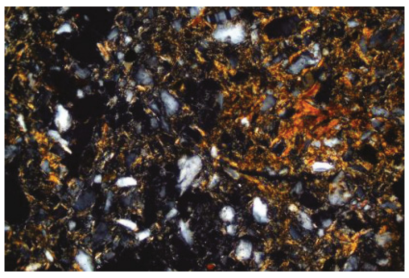
M: As L, under OIL. Note iron-stained broad burrows within this old root channel.



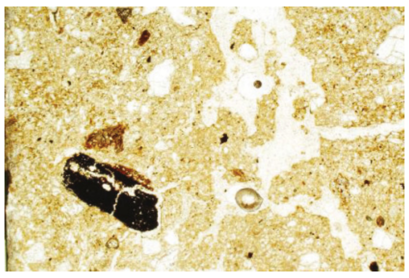
N: Photomicrograph of M5B; clay and iron-enriched burrow, with partially iron and clay depleted soil around it. PPL, frame width is ~4.62mm.



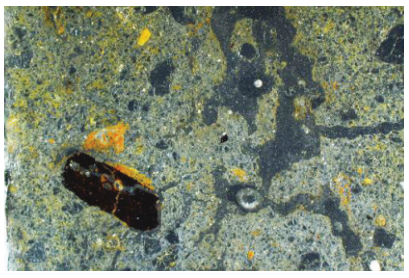
O: Detail of N, showing iron-stained intercalations within burrow soil. PPL, frame width is ~0.90mm.



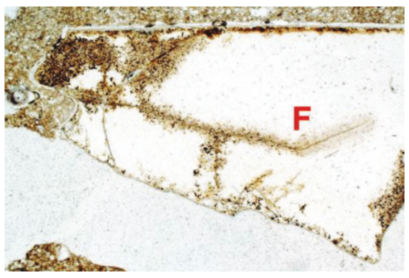
P: As O, under XPL.



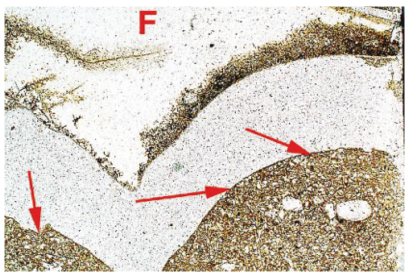
Q: Photomicrograph of M5A (Context 4); note pale depleted matrix and charcoal inclusion. PPL, frame width is ~4.62mm



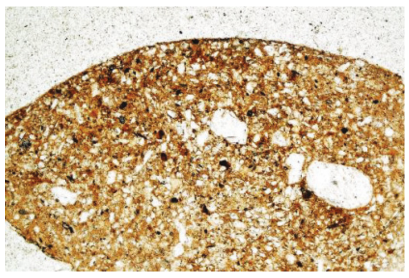
R: As Q under OIL; note pale iron and clay-depleted soil.



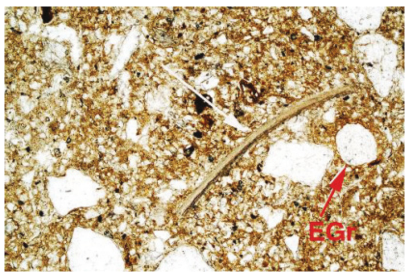
S: Photomicrograph of M5A; possible flint flake (F) along diffuse junction between Contexts 3 and 4 (see Fig 1). PPL, frame width is ~4.62mm.



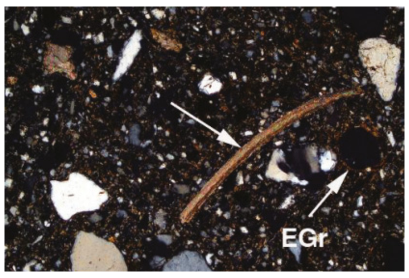
T: As S, lower edge of flint (F); note fine material concentrations (intercalations), caused by soil slaking (arrows) along base of flint (now a fissure caused by drying of specimen). PPL, frame width is ~4.62mm.



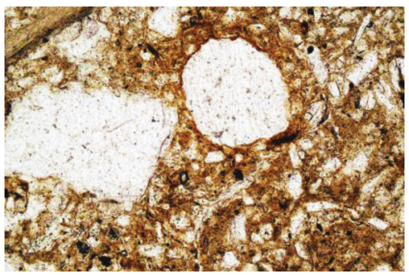
U: As T; detail of muddy fine soil concentrations. PPL, frame width is ~2.38mm.



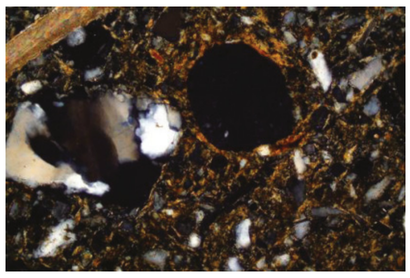
V: Photomicrograph of M5A, Context 3; close up of shell inclusion (arrow) and embedded grain (EGr) – the latter due to soil slaking. PPL, frame width is ~2.38mm.



W: As V, under XPL; note birefringence of aragonite (shell) and clay oriented around the embedded grain.



X. Detail of V; fine moderately humic soil embedded grain. PPL, frame width is ~0.90mm.



Y: As X, under XPL, showing oriented clay around embedded grain and in matrix (intercalations) – all indicating muddy conditions.

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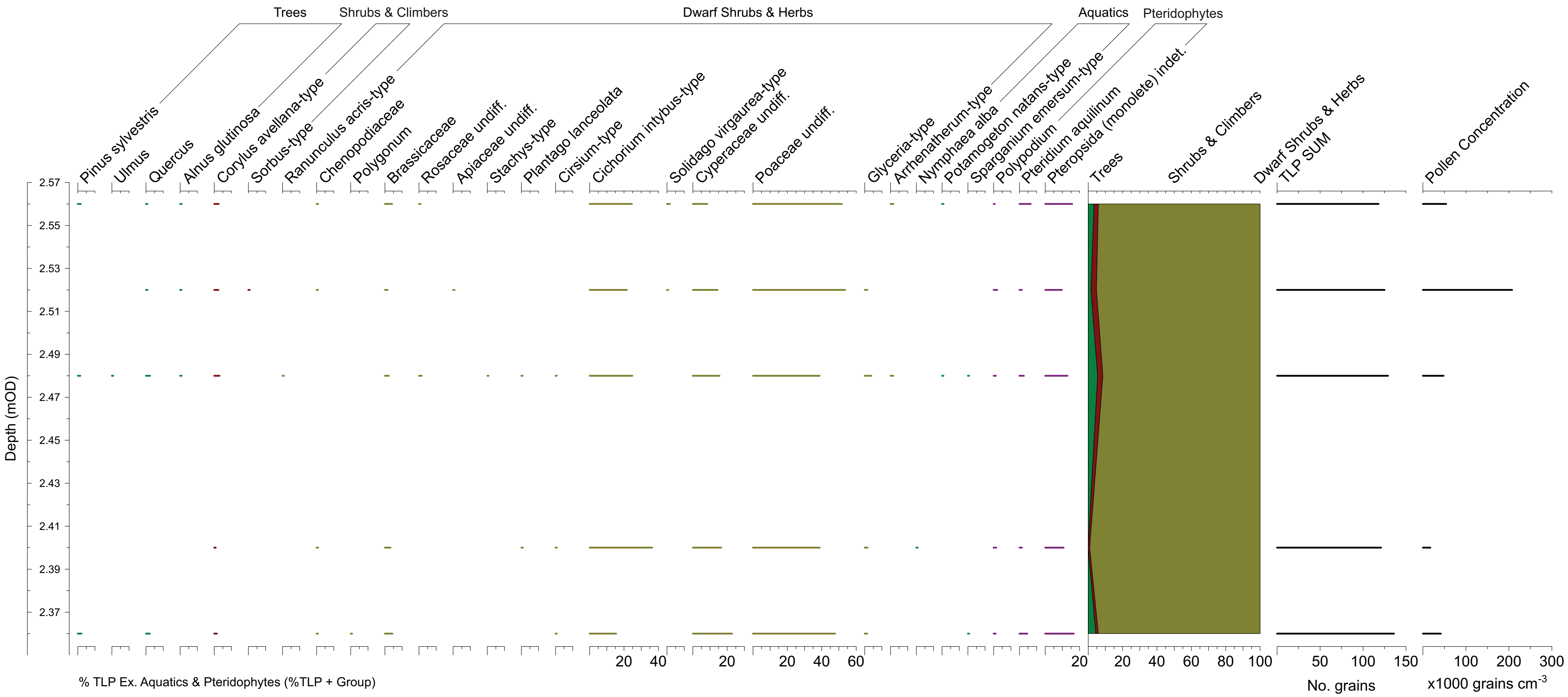
Soil Micromorphology figures from Trench 24

Figure 12



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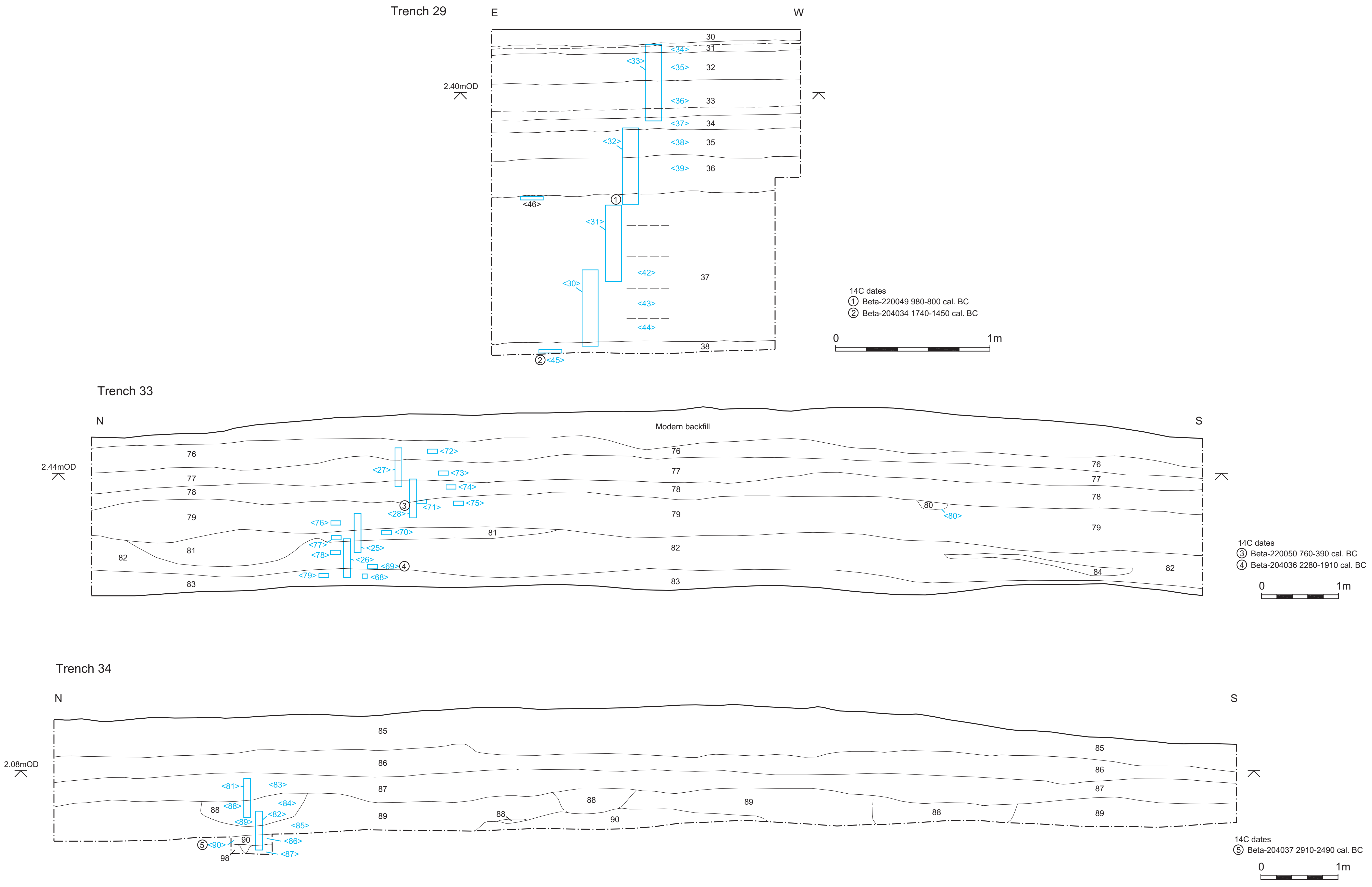
Pollen diagram from monoliths <4> and <5>, Trench 24

Figure 13



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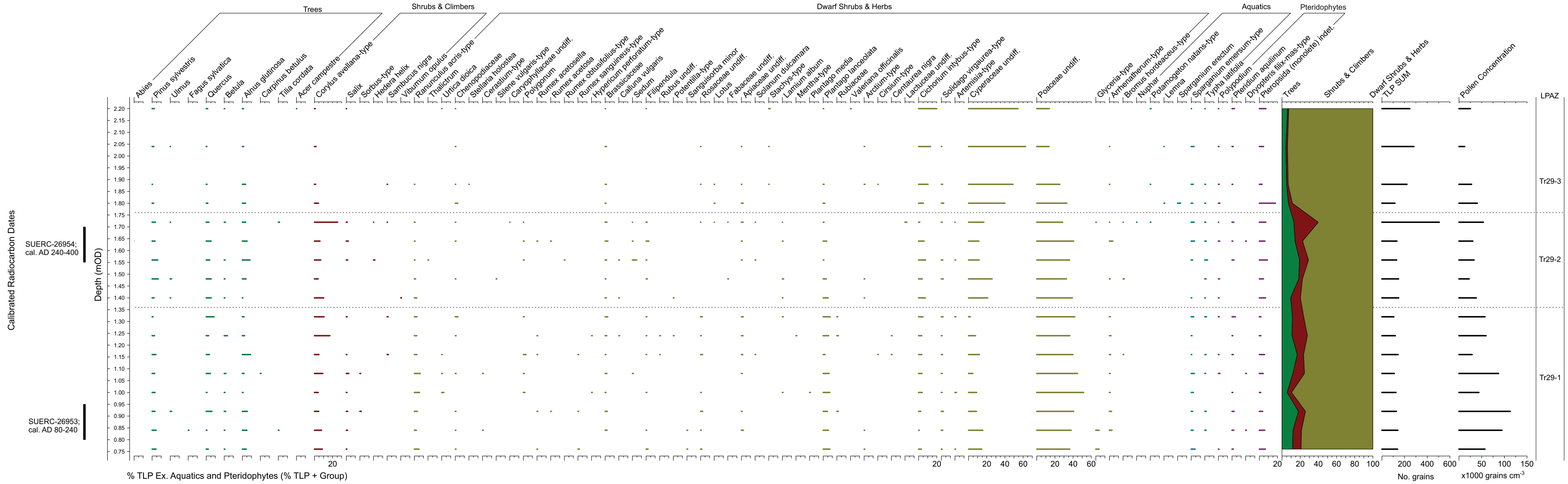
Sections from Trenches 29, 33 and 34

Figure 14



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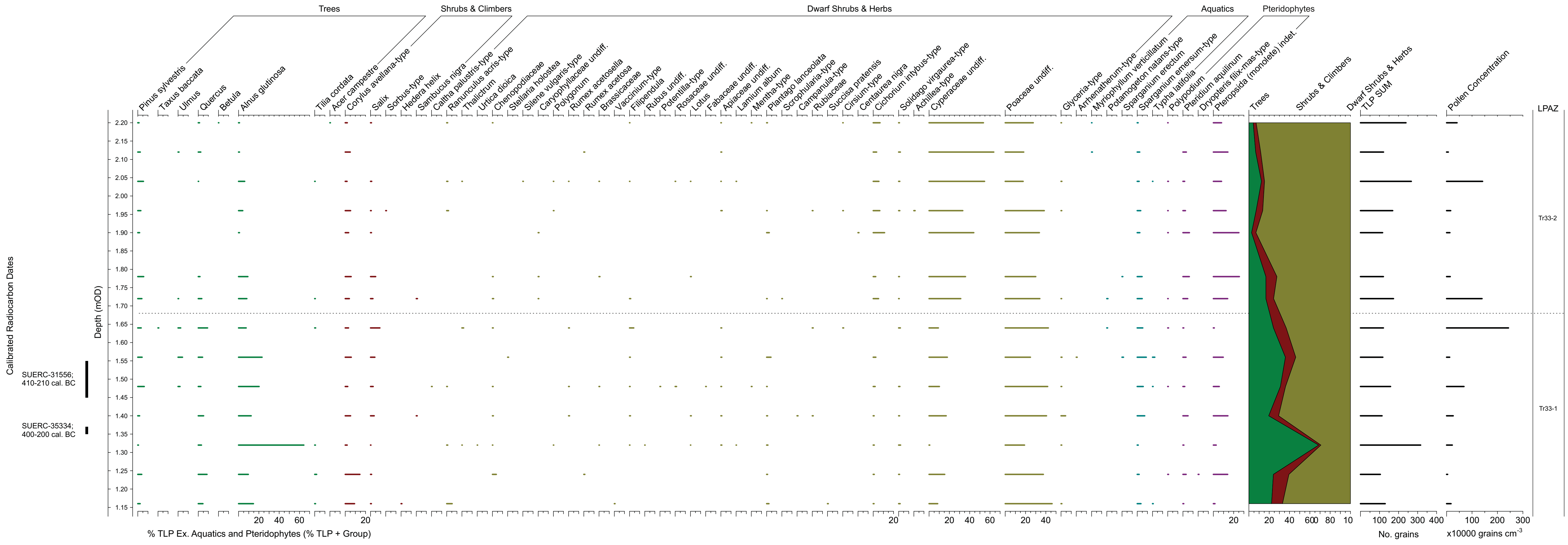
Pollen diagram from monoliths <30>, <31>, <32> and <33>, Trench 29

Figure 15



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Pollen diagram from monoliths <25>, <26>, <27> and <28>, Trench 33

Figure 16

Moving water species
Ditch species
Intermediate species (F)
Amphibious species
Marsh loving species
Shade-loving species
Intermediate species (T)
Open country species

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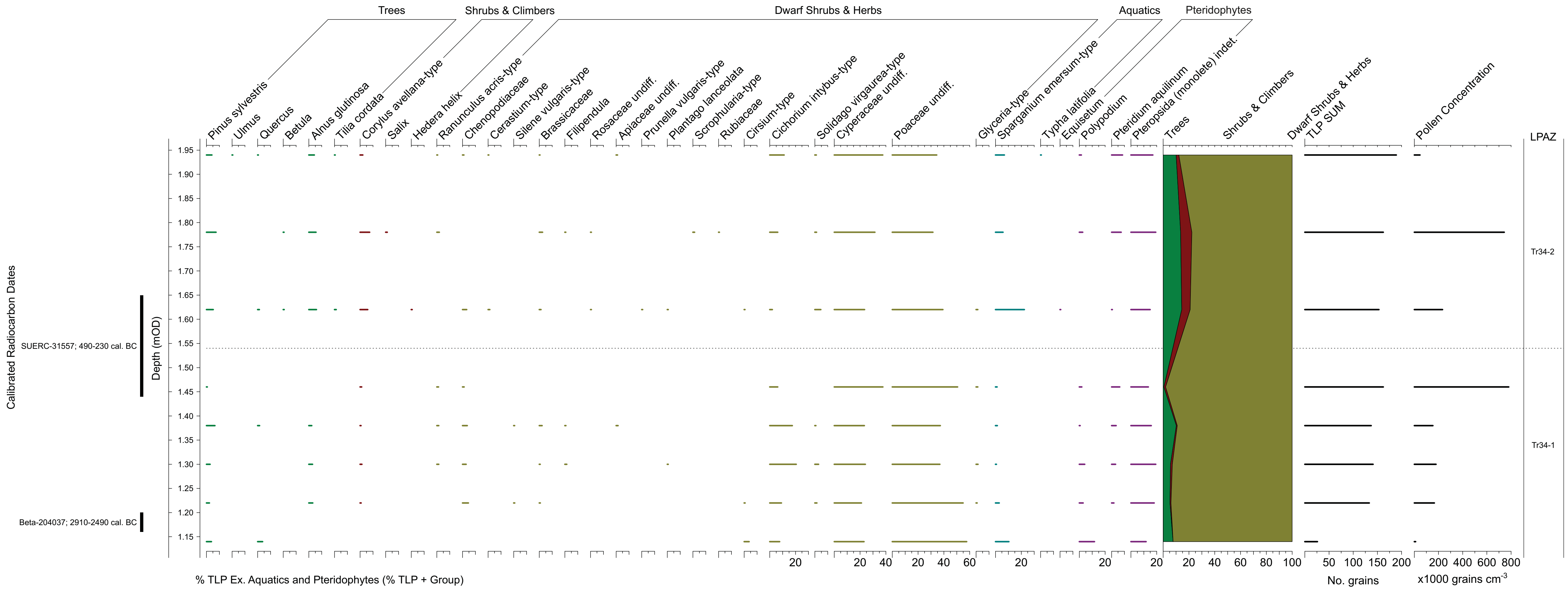
Mollusc diagram from Trench 33

Figure 17



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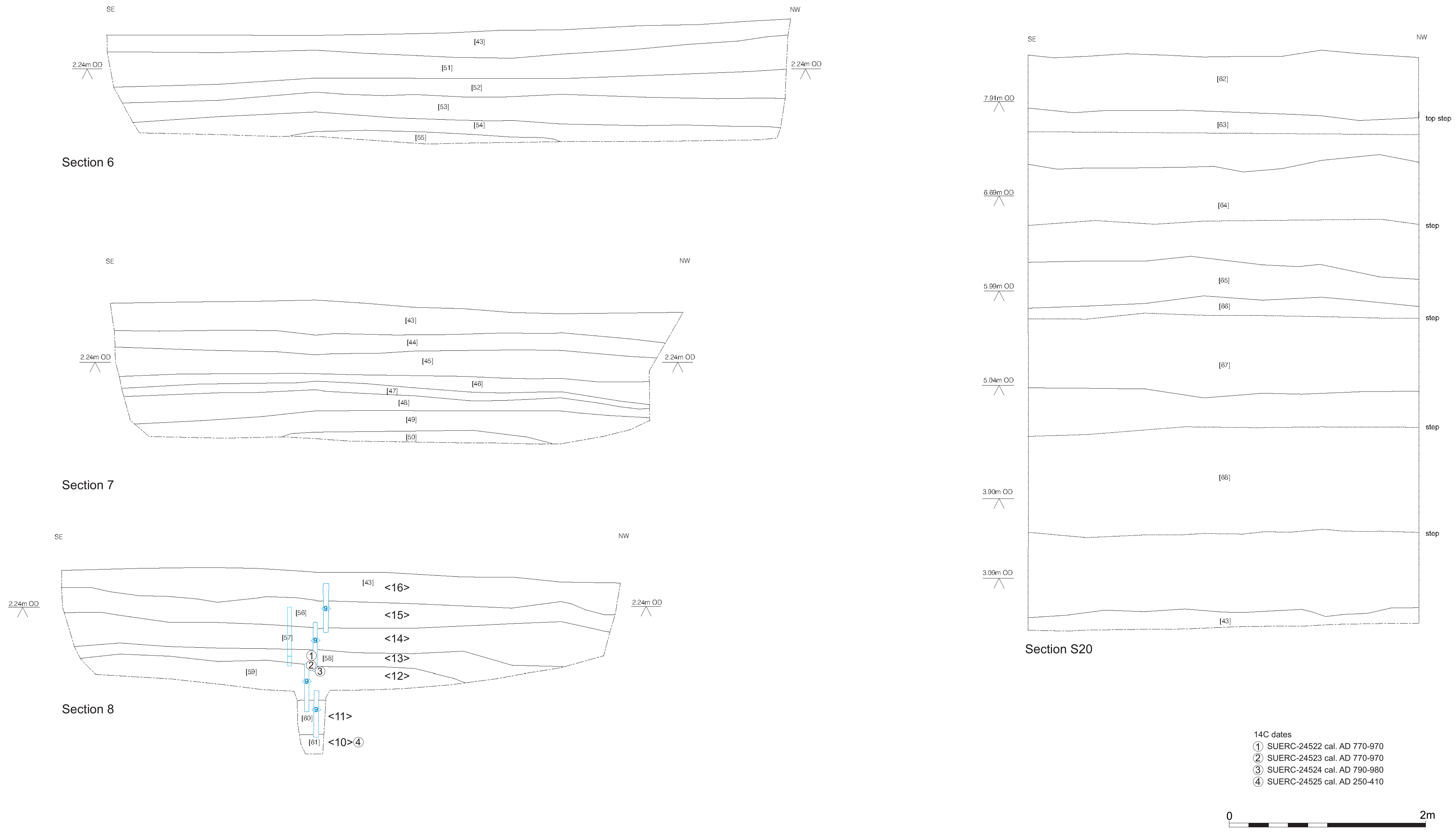
Pollen diagram from monoliths <81> and <82>, Trench 34

Figure 18



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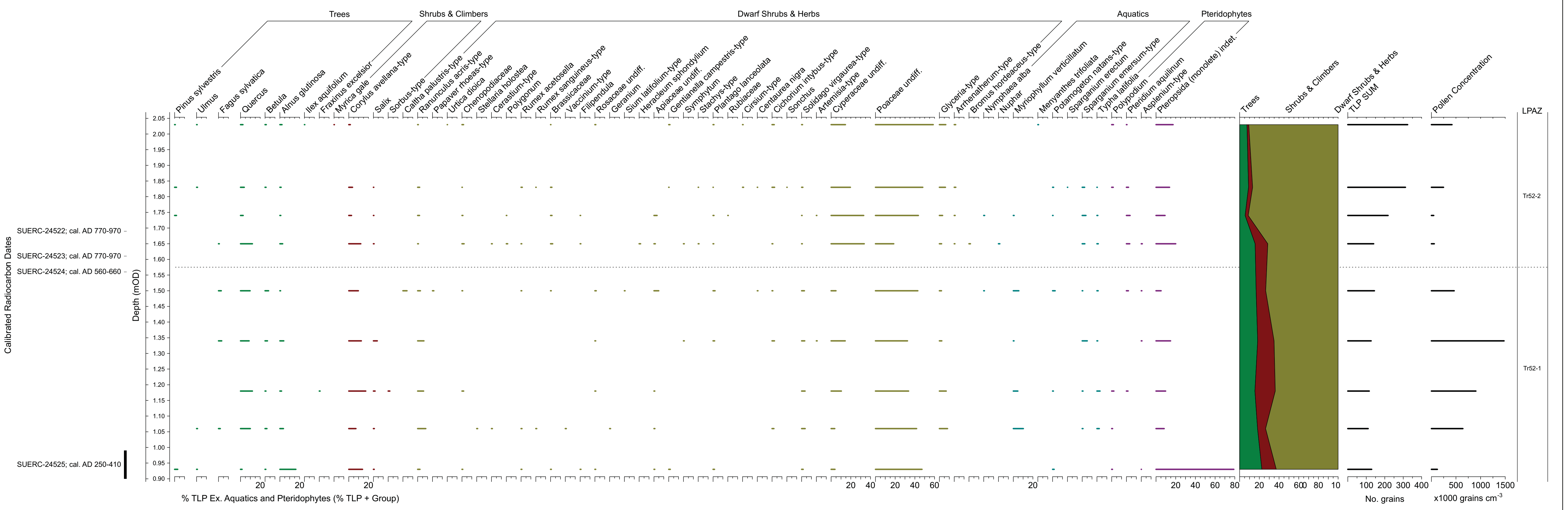
North-east facing Sections 6, 7, 8 and 20 of Trench 52 (after Payne et al. 2008)

Figure 19



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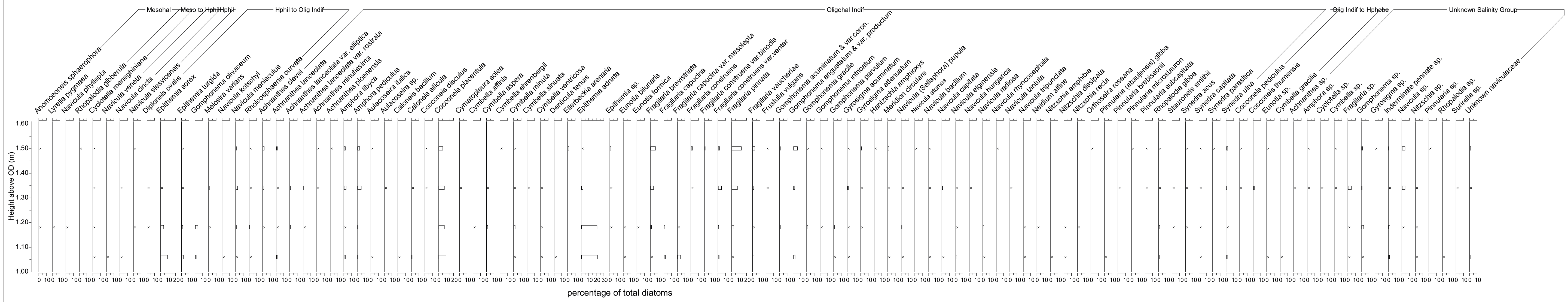
Pollen diagram from monolith <9>, Trench 52

Figure 20



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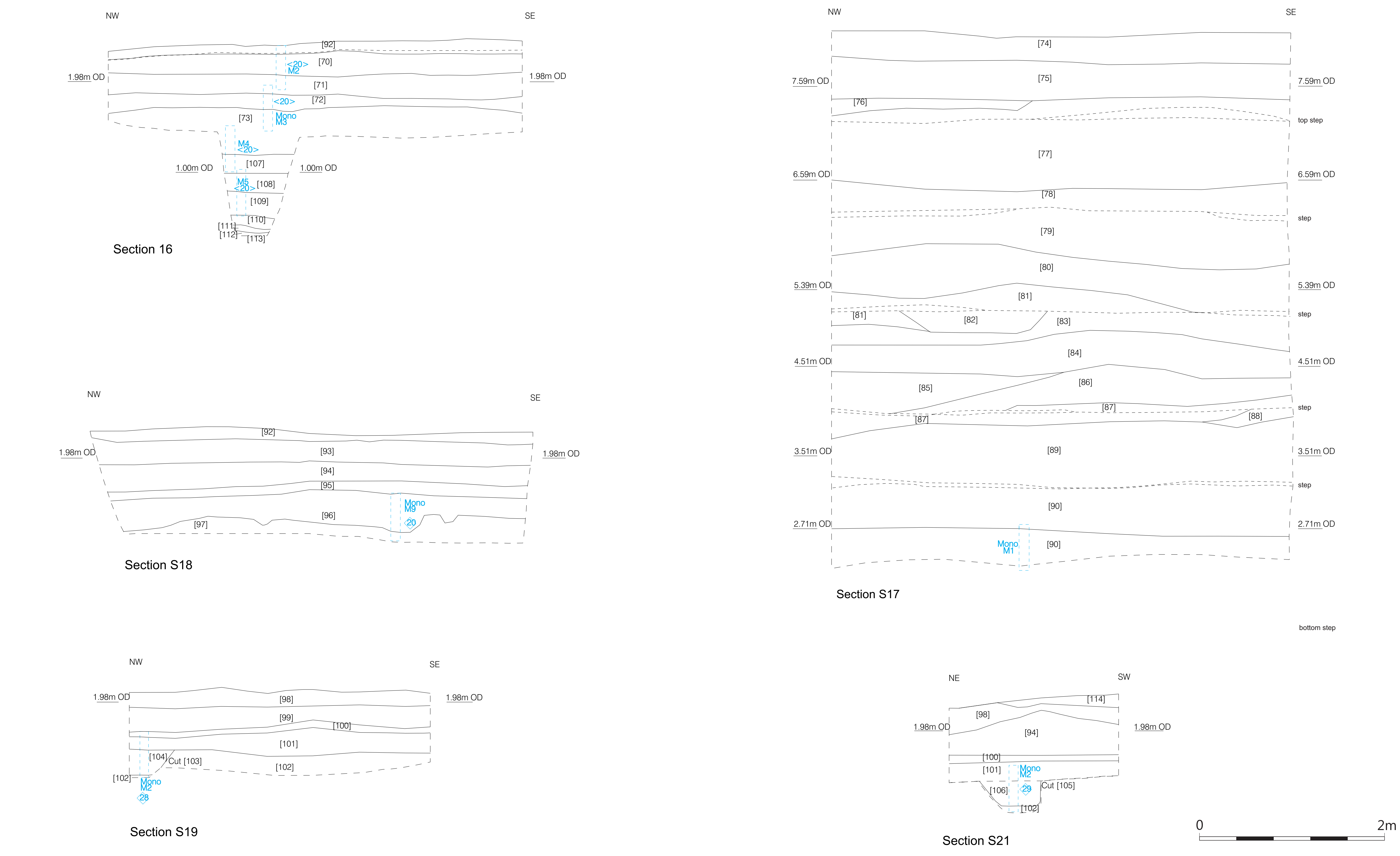
Diatom diagram from monolith <9>, Trench 52

Figure 21



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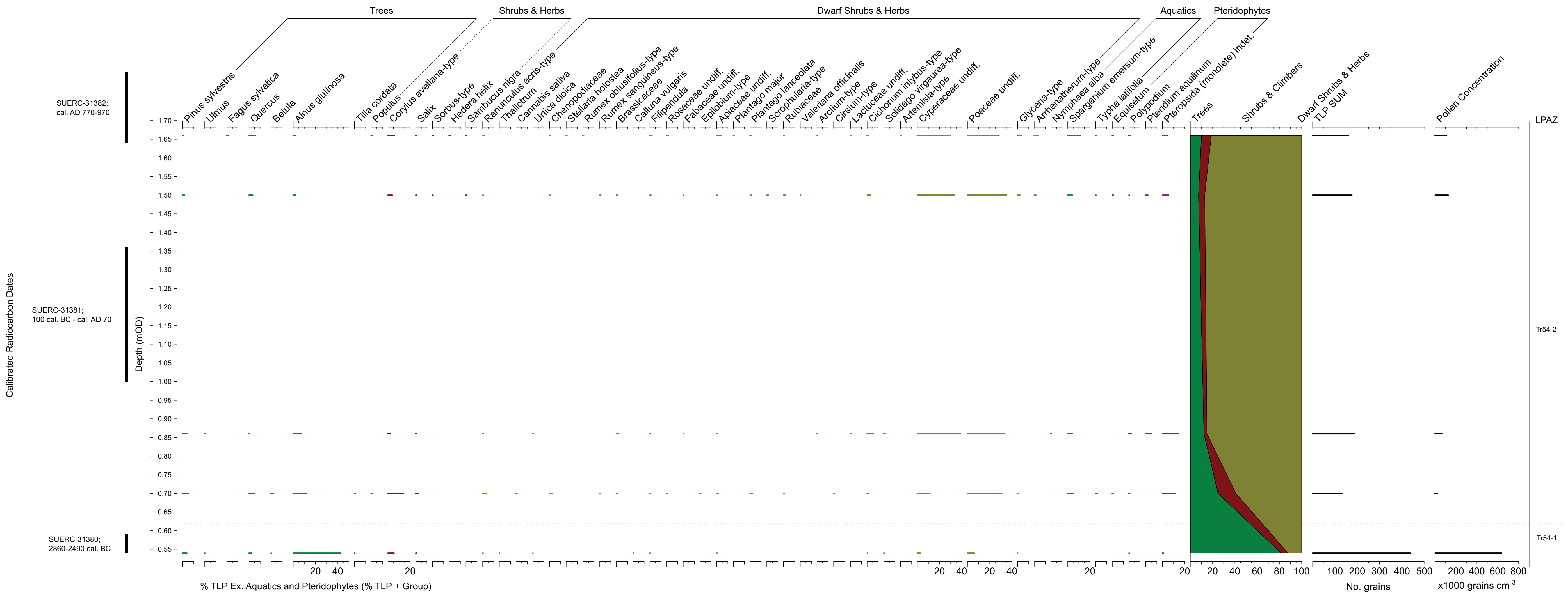
South-west facing sections 16–19, and north-west facing section 21 of Trench 54 (after Payne et al. 2008)

Figure 22



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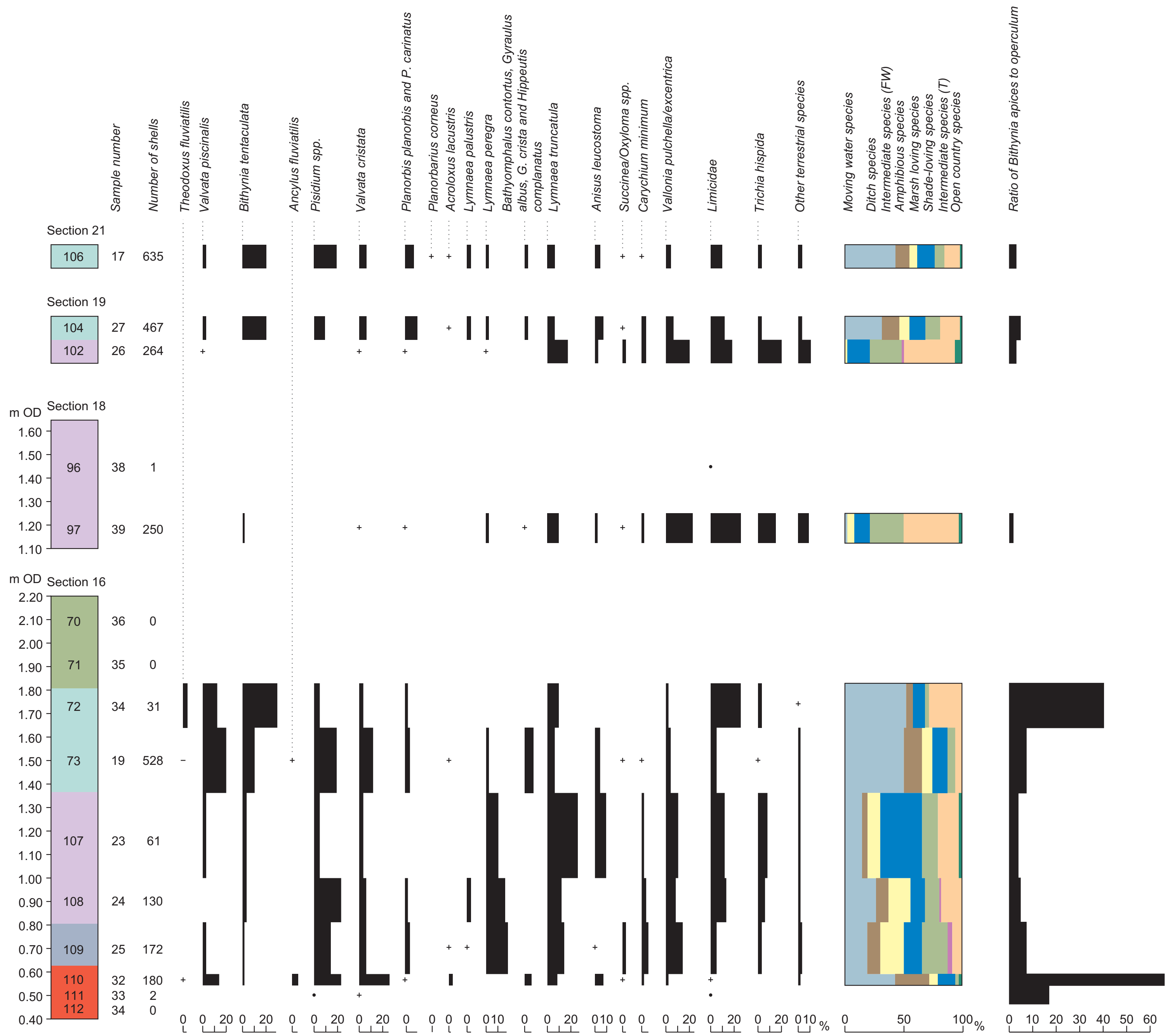
Pollen diagram from monolith <20>, Trench 54

Figure 23



19th/20th century | Saxon | Late Iron Age/Romano British | Iron Age | Neolithic

Moving water species | Ditch species | Intermediate species (FW) | Amphibious species | Marsh loving species | Shade-loving species | Intermediate species (T) | Open country species

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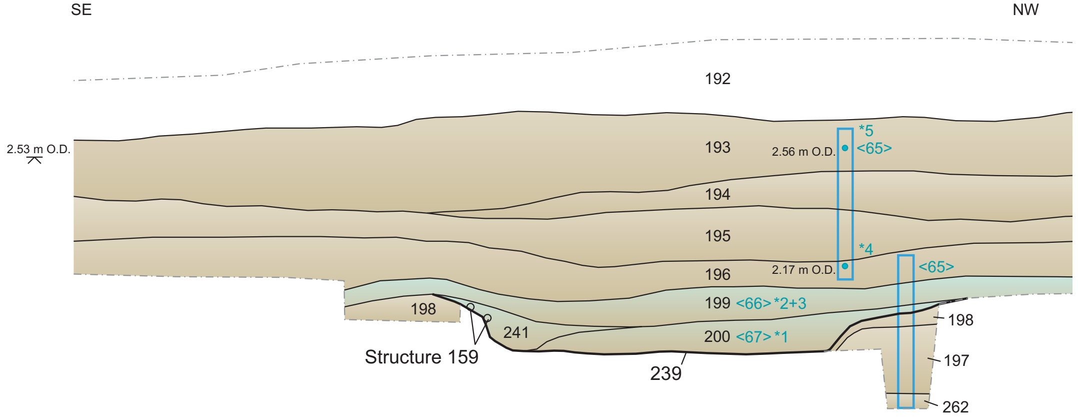
Molluscs diagram from Trench 54 showing sequences through the channel in sections 21, 19, 18 and 16

Figure 24

Trench 56 - Section



*1 Waterlogged seeds: cal AD 1030–1210 (SUERC-35335, 905±30 BP)
*2 Charred cereal grain: cal AD 980–1160 (SUERC-34943, 985±35 BP)
*3 Charred cereal spikelet forks: cal AD 1010–1160 (SUERC-36288, 970±30 BP)
*4 Sediments: cal AD 390–570 (Beta-250528, 1590±40BP)
*5 Sediments: cal AD 710–980 (Beta-250529, 1180±40 BP)

Late Saxon

0 1 m

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Section through feature 239 containing wattle structure 159, Trench 56

Figure 25

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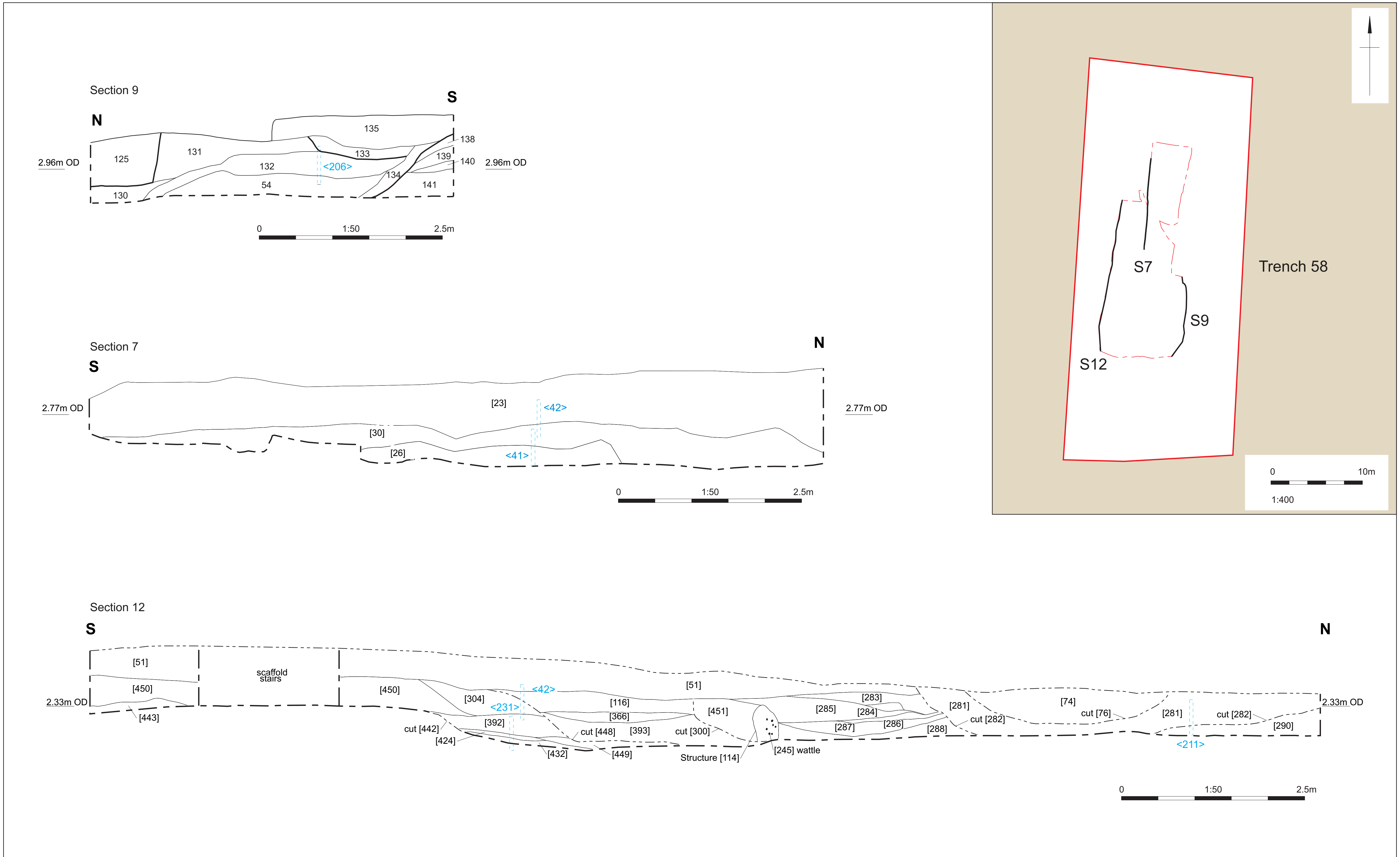
Pollen diagram from monolith <65>, Trench 56

Figure 26



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Scale:	Plan 1:400, sections 1:50 @ A3	Illustrator:	(KJF)
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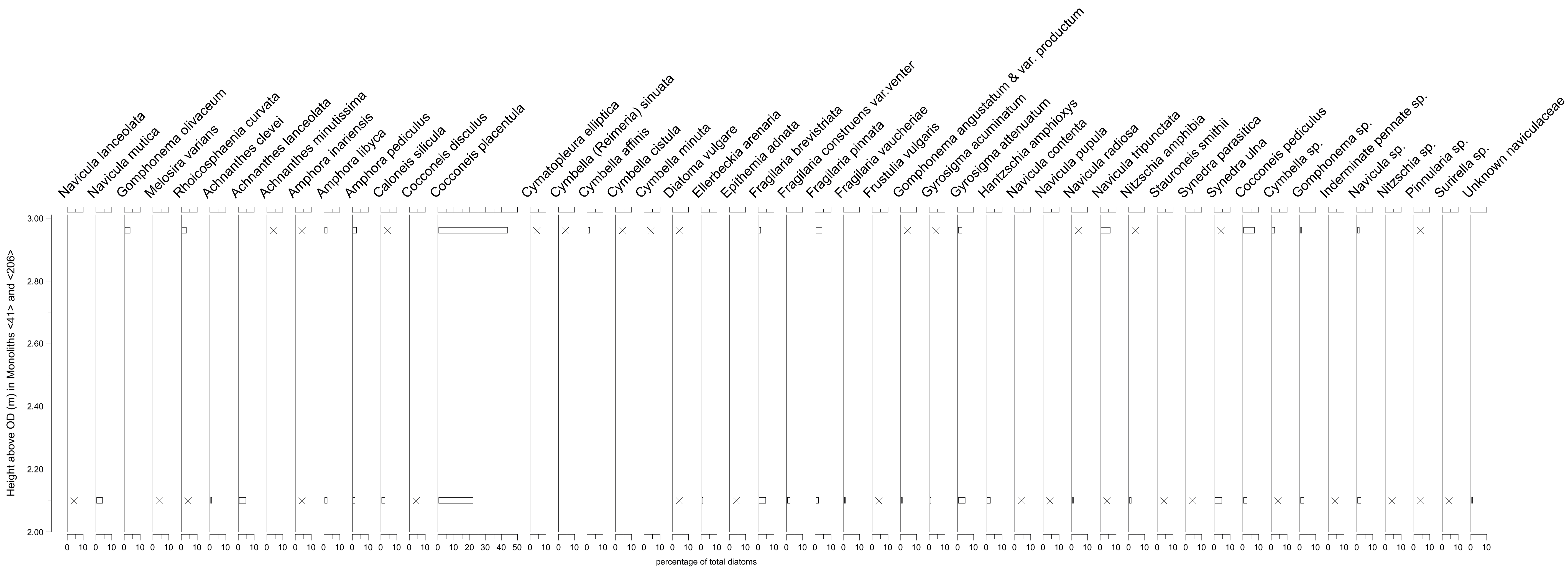
Section drawing, Trench 58

Figure 27



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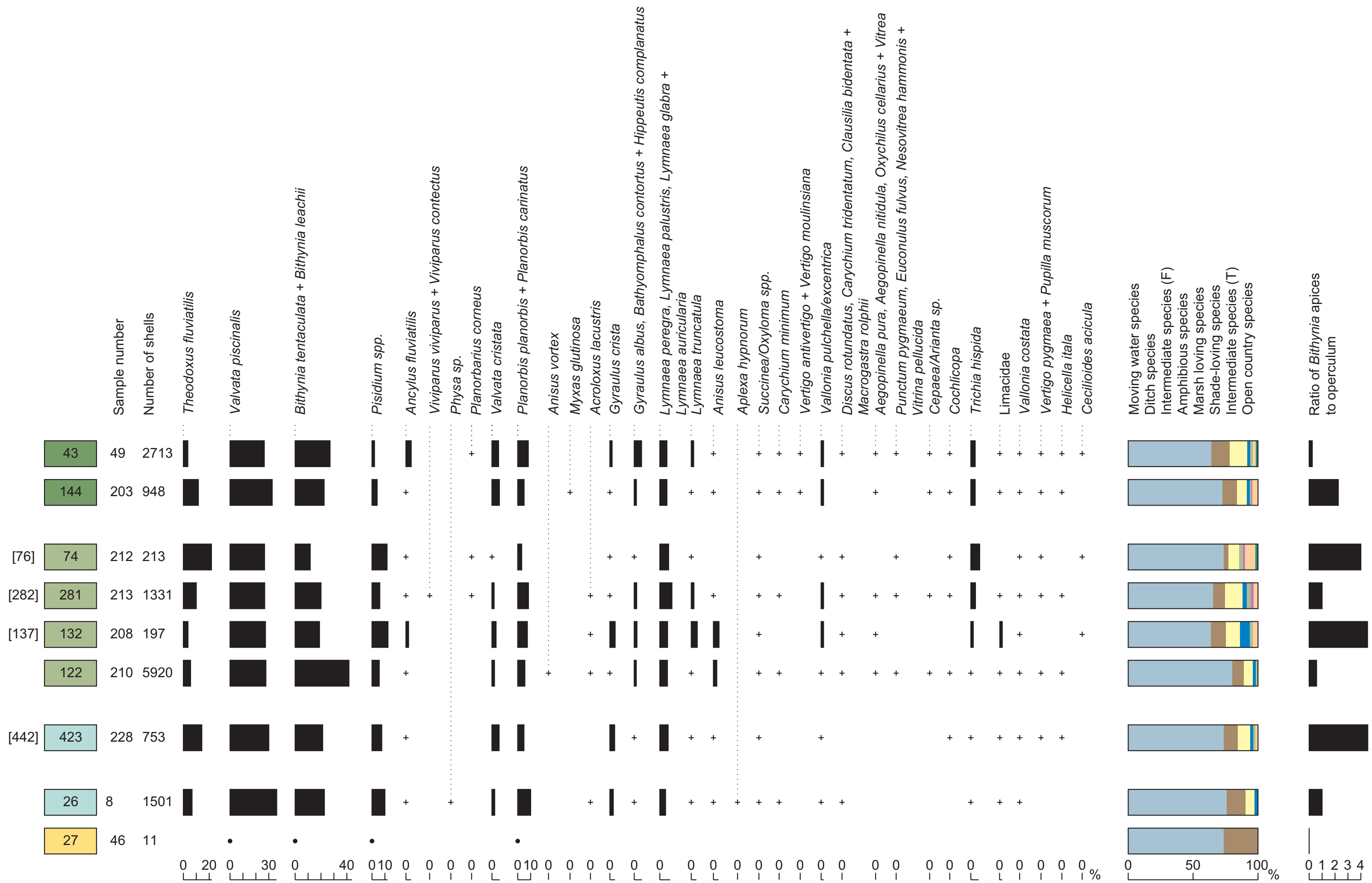
Diatom diagram from monoliths <41> and <206>, Trench 58

Figure 28



Pre-1900	Moving water species	Marsh loving species	
Post-medieval 1650–1800	Ditch species	Shade-loving species	
Saxon	Intermediate species (F)	Intermediate species (T)	
Late Mesolithic	Amphibious species	Open country species	

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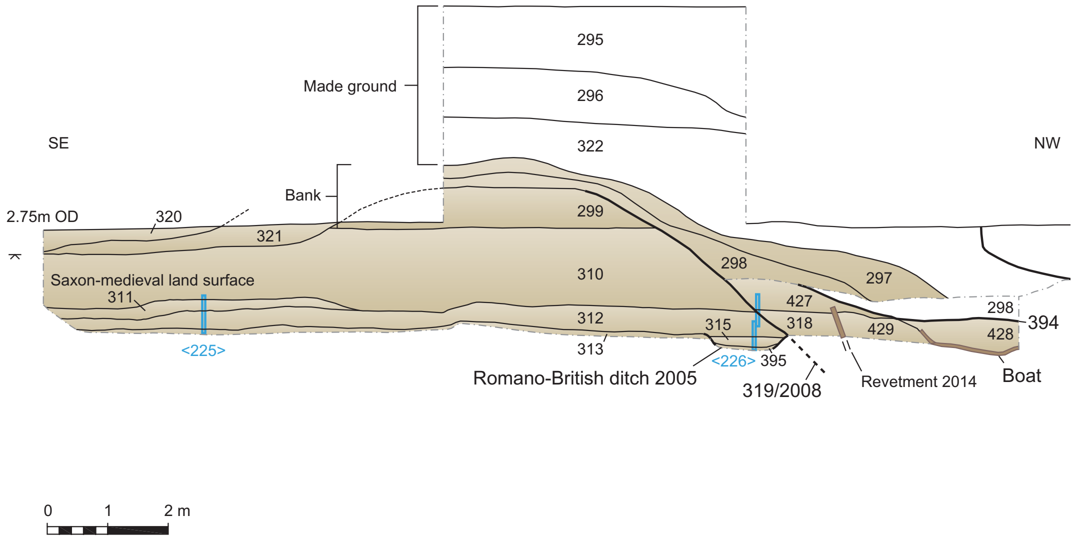
Mollusc sequence through the Late Mesolithic deposit and the Saxon, 1650-1800 and pre 1900 deposits within the channel from Trench 58

Figure 29

Trench 59 - Section



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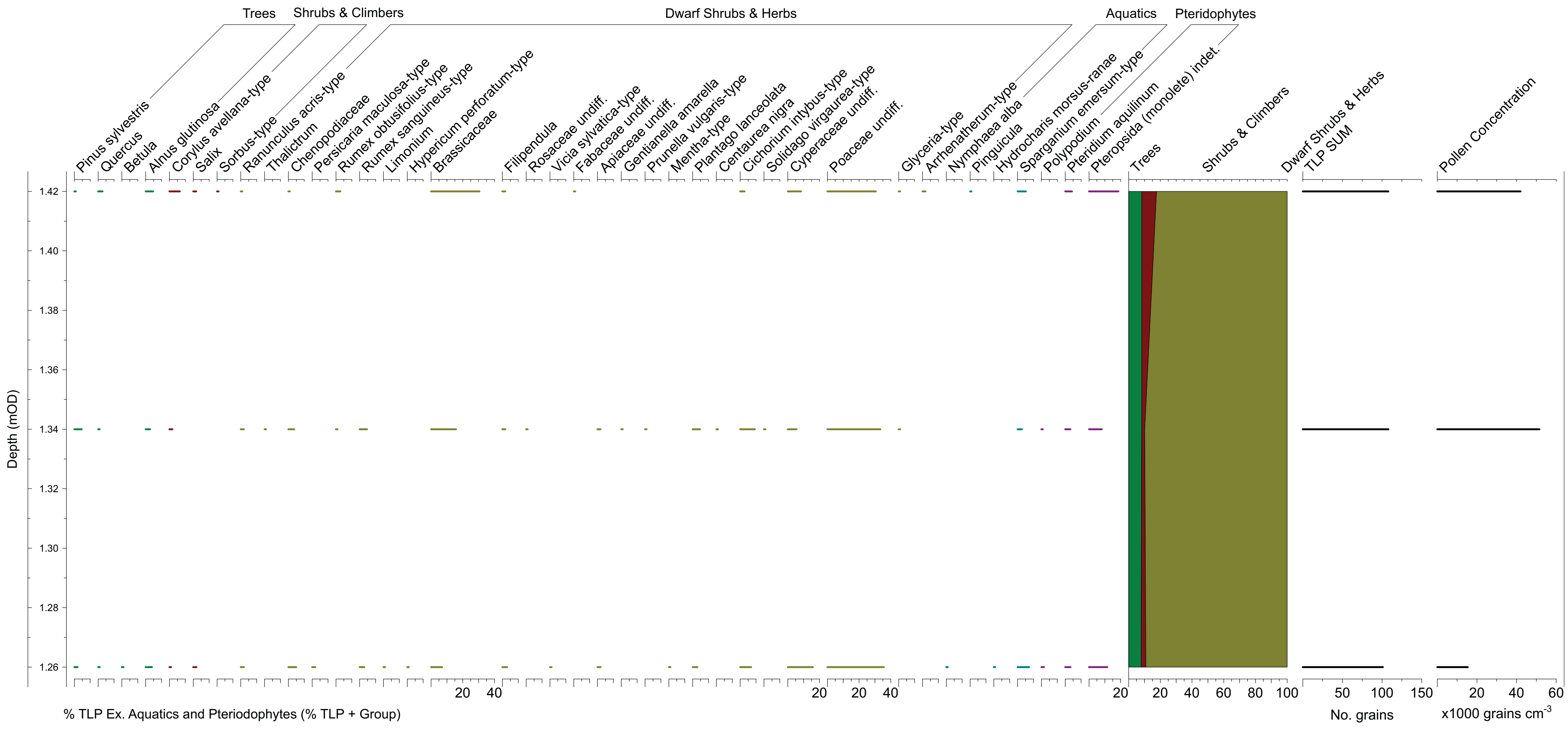
Section 15, Trench 59

Figure 30



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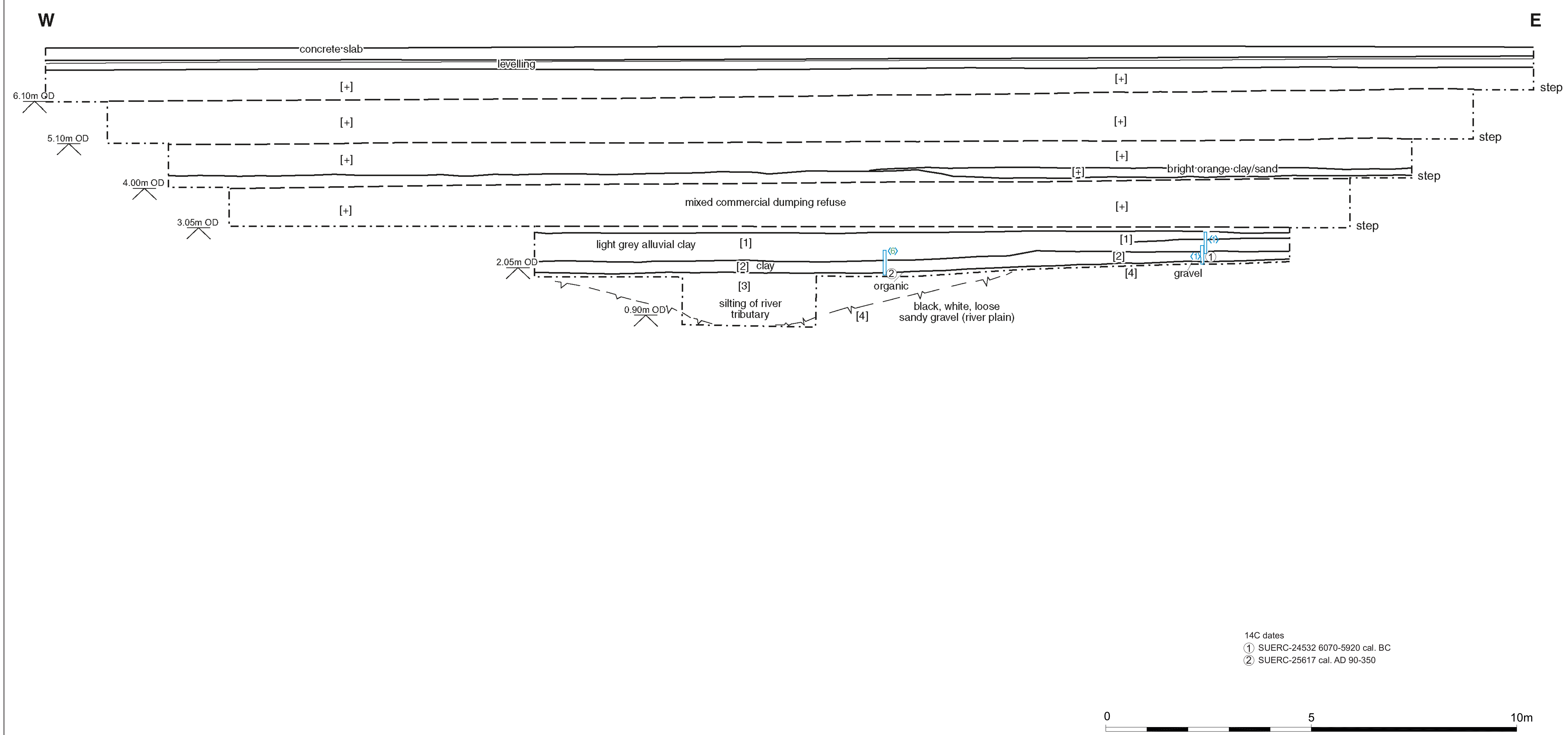
Pollen Diagram from monolith <226>, Trench 59

Figure 31



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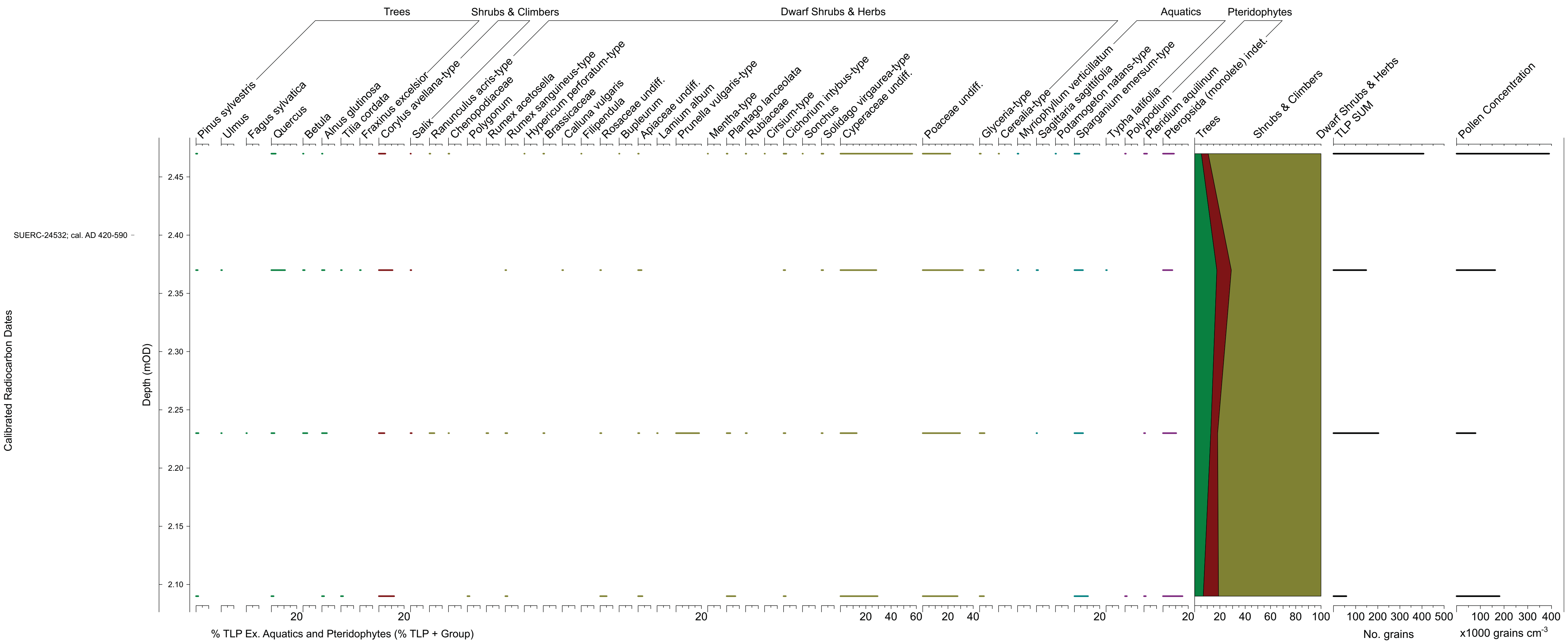
South facing section 3 of Trench 65 (after Pipe et al. 2008)

Figure 32



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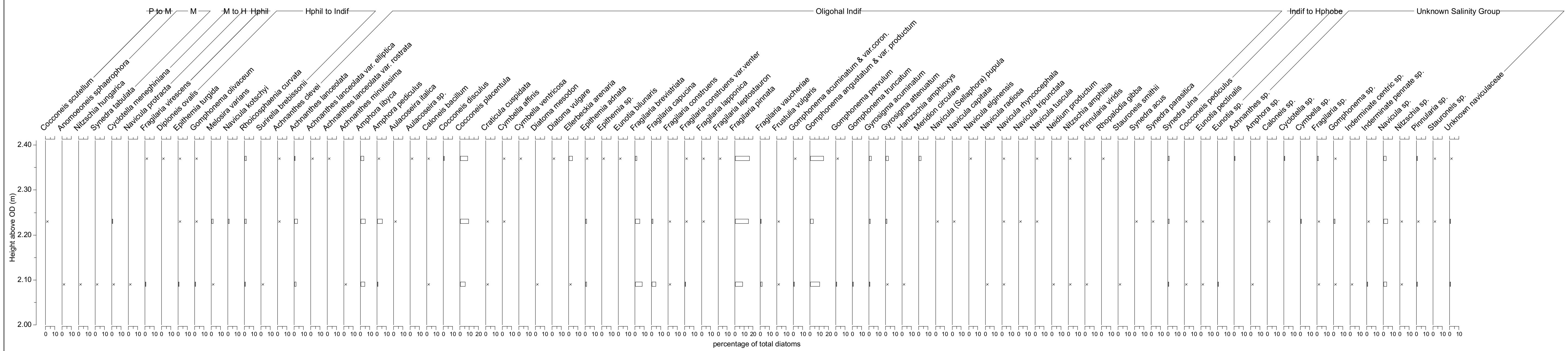
Pollen diagram from monolith <6>, Trench 65



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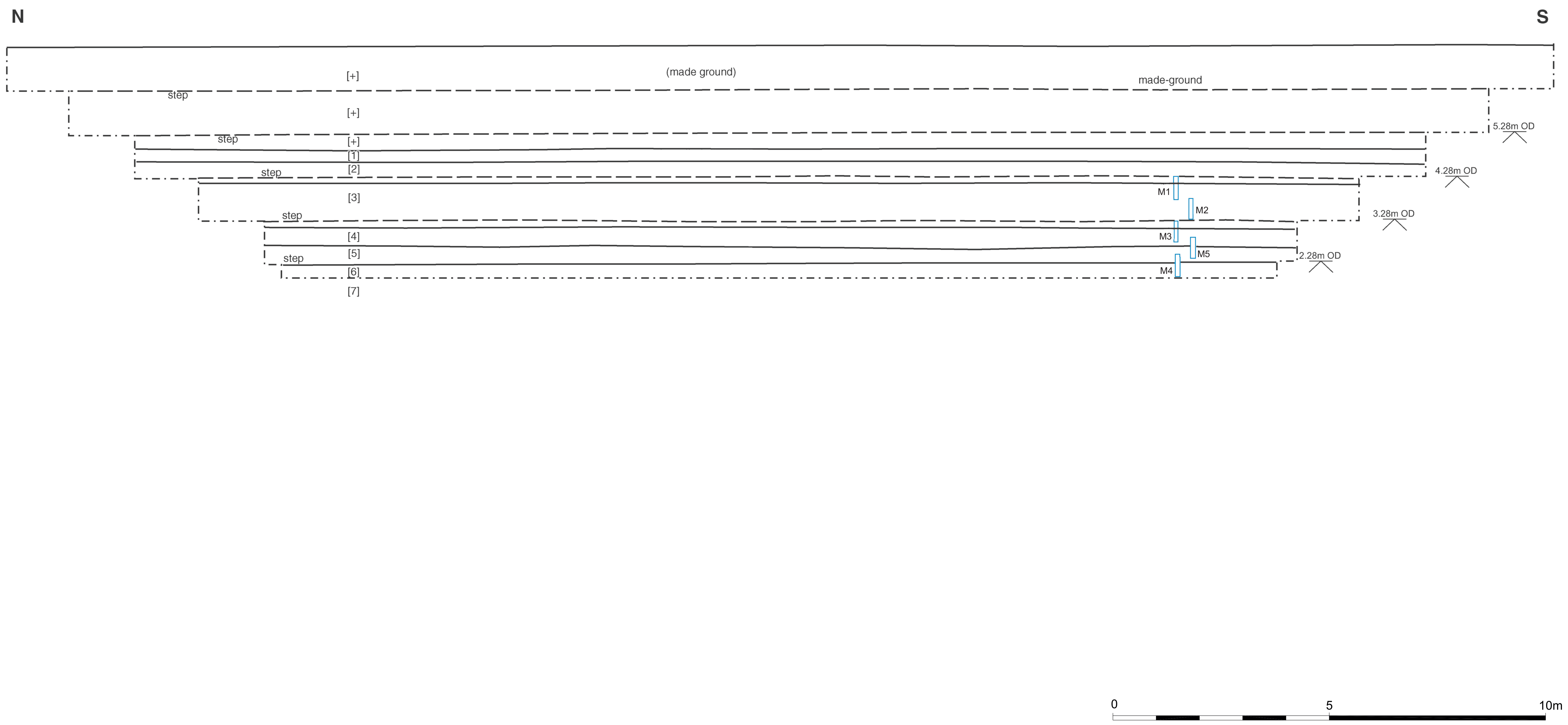
Diatom diagram from monolith <6>, Trench 65

Figure 34



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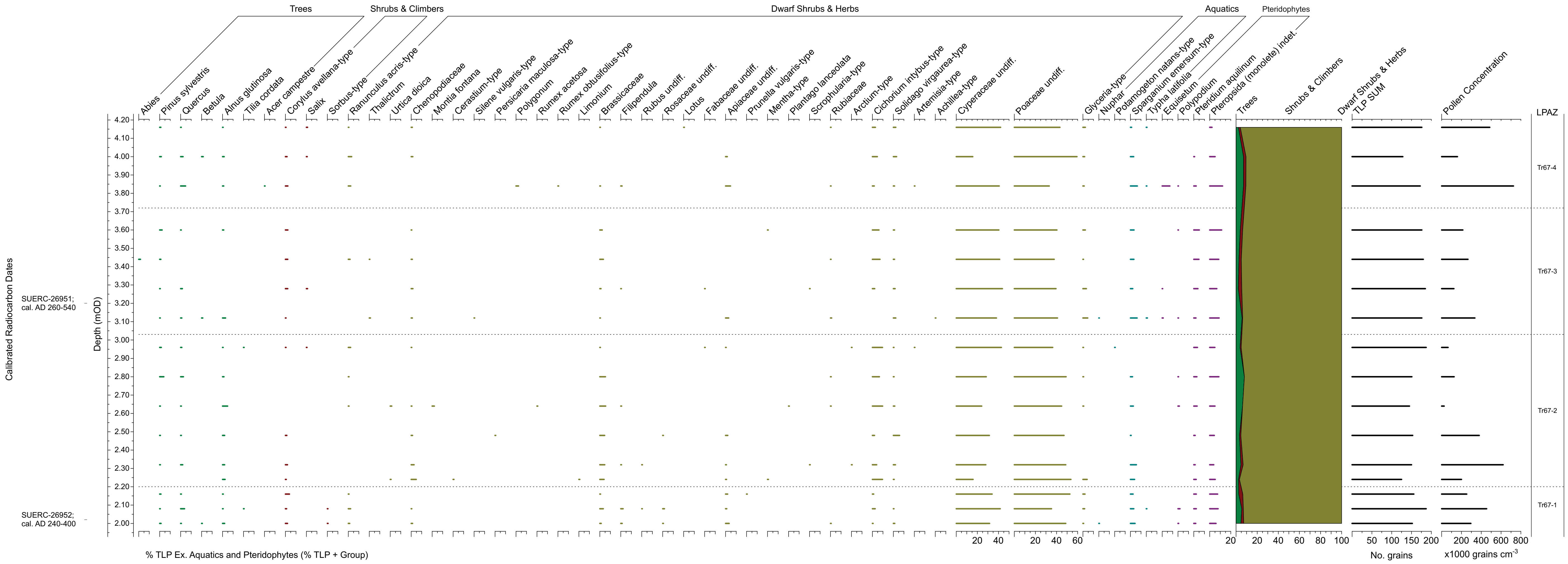
South facing section 3 of Trench 67 (after Thrale 2008)

Figure 35



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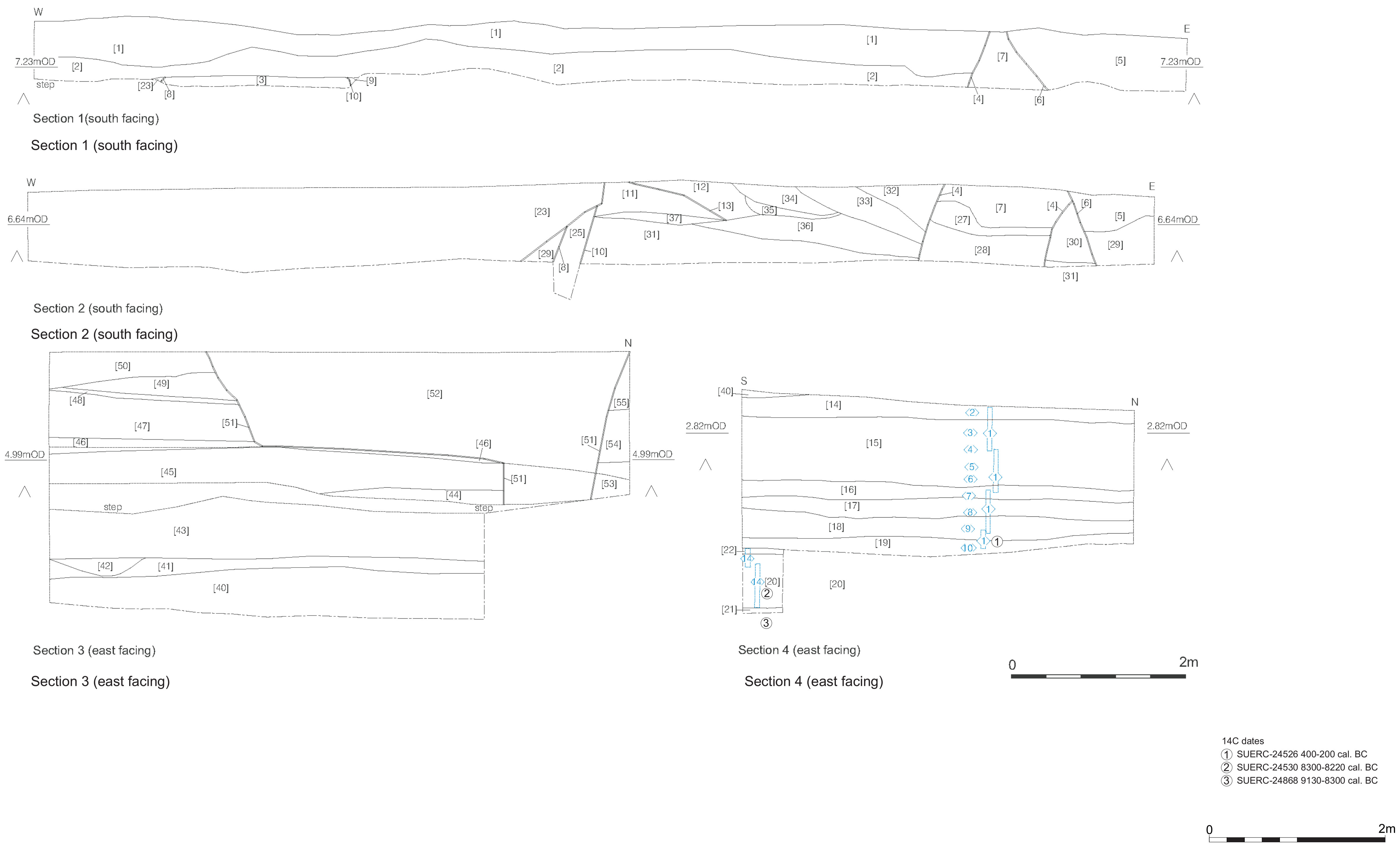
Pollen diagram from monoliths <M1>, <M2>, <M3>, <M4> and <M5>, Trench 67

Figure 36



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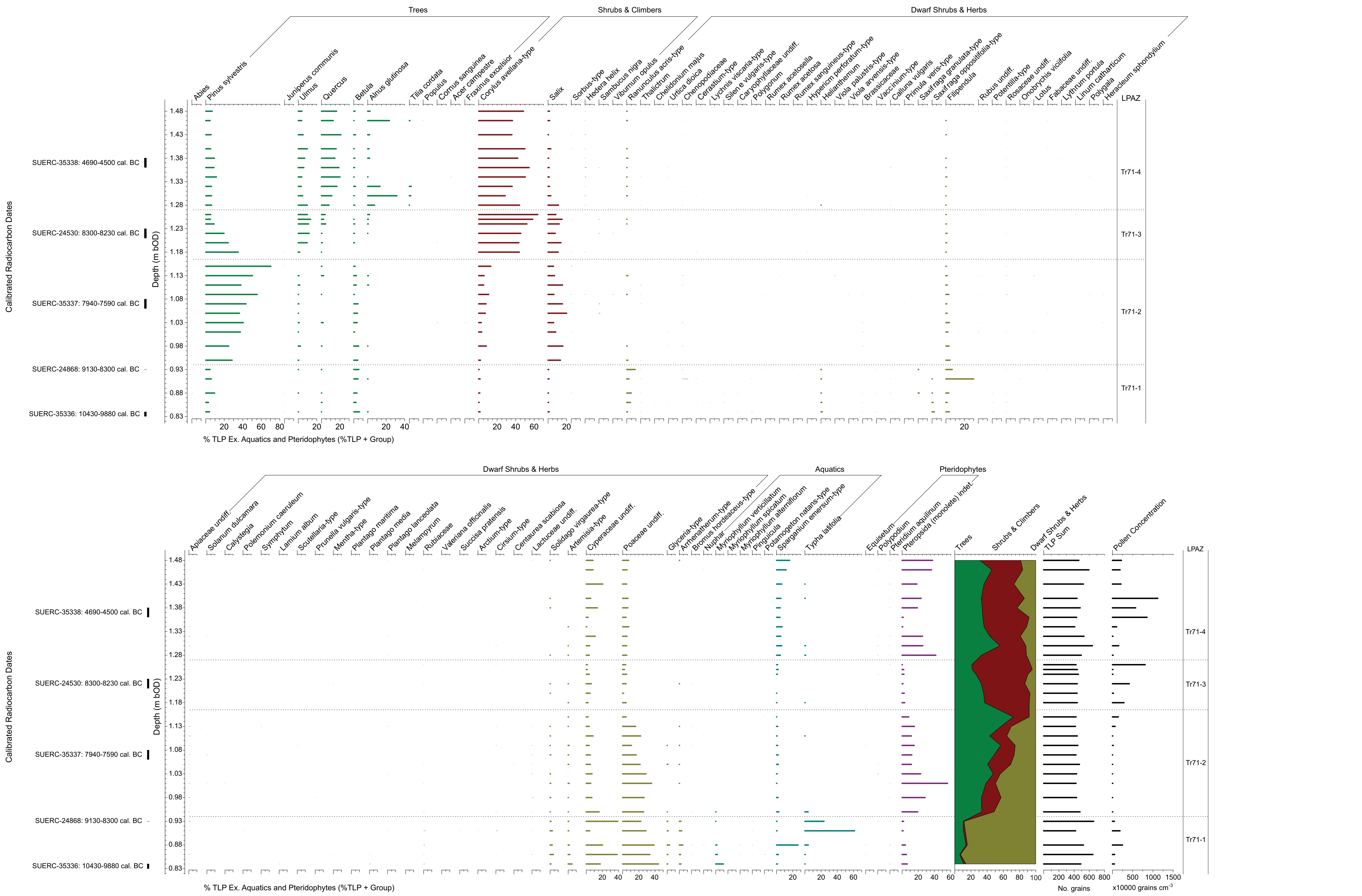
South and east facing sections of Trench 71 (after Sargent and Corcoran 2008)

Figure 37



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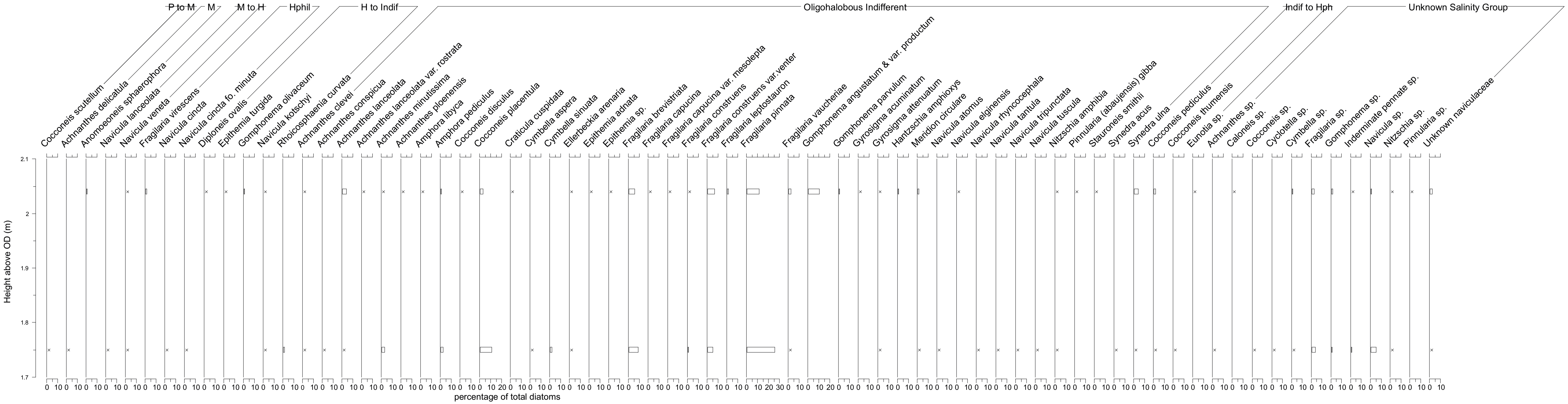
Pollen diagram from monolith 14, Trench 71

Figure 38



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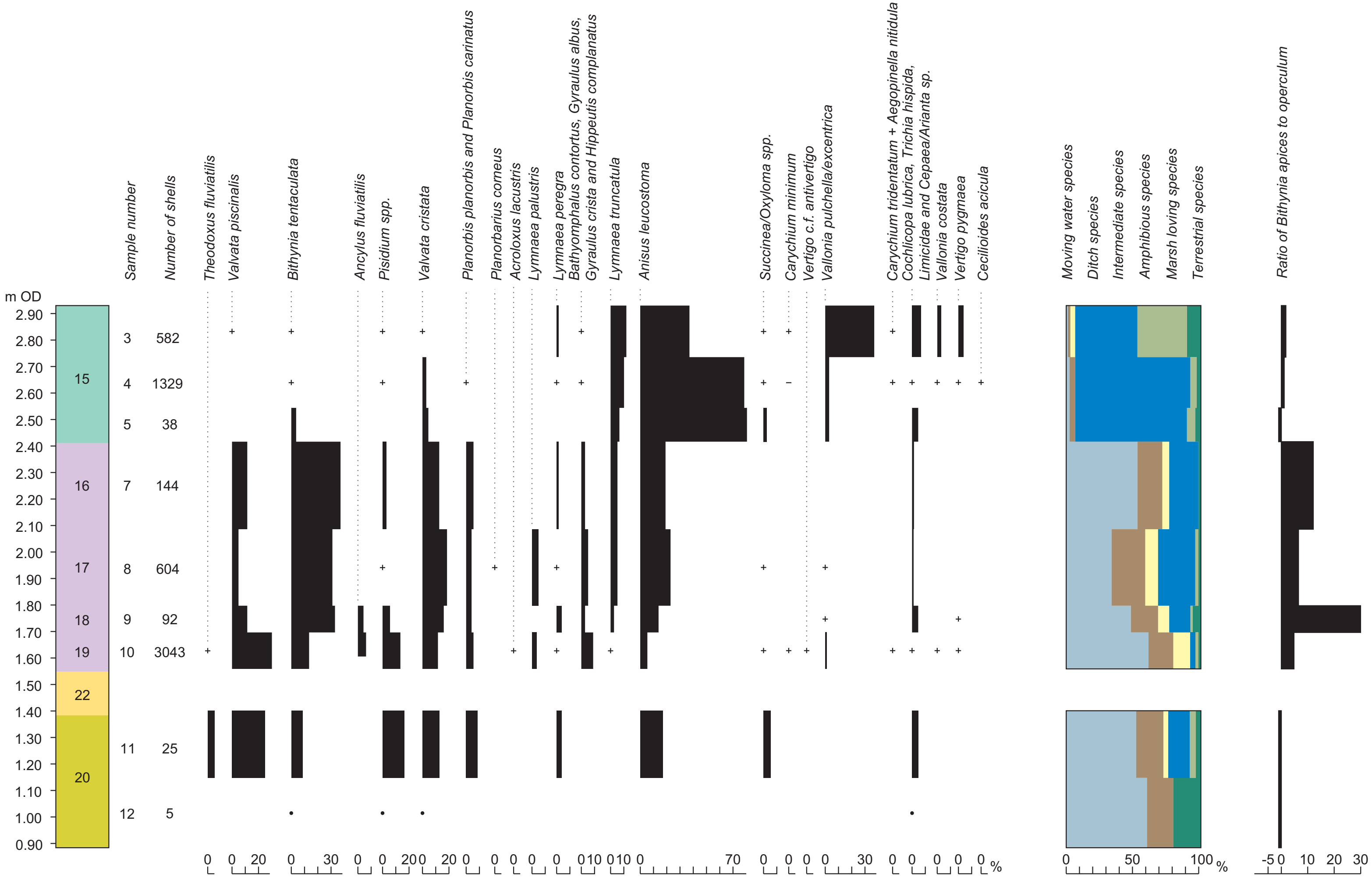
Diatom diagram from monolith <1>, Trench 71

Figure 39



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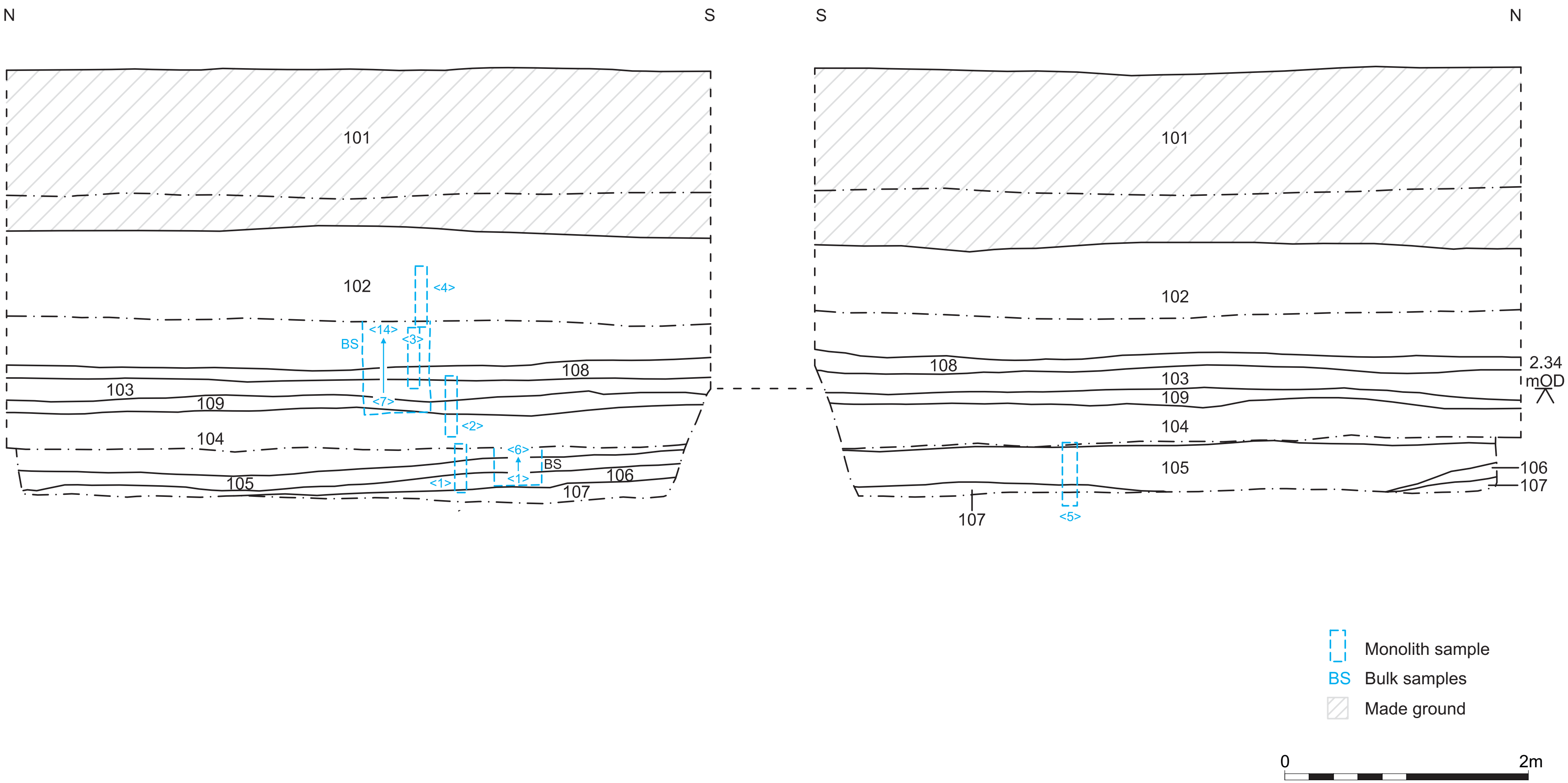
Mollusc diagram from Trench 71

Figure 40



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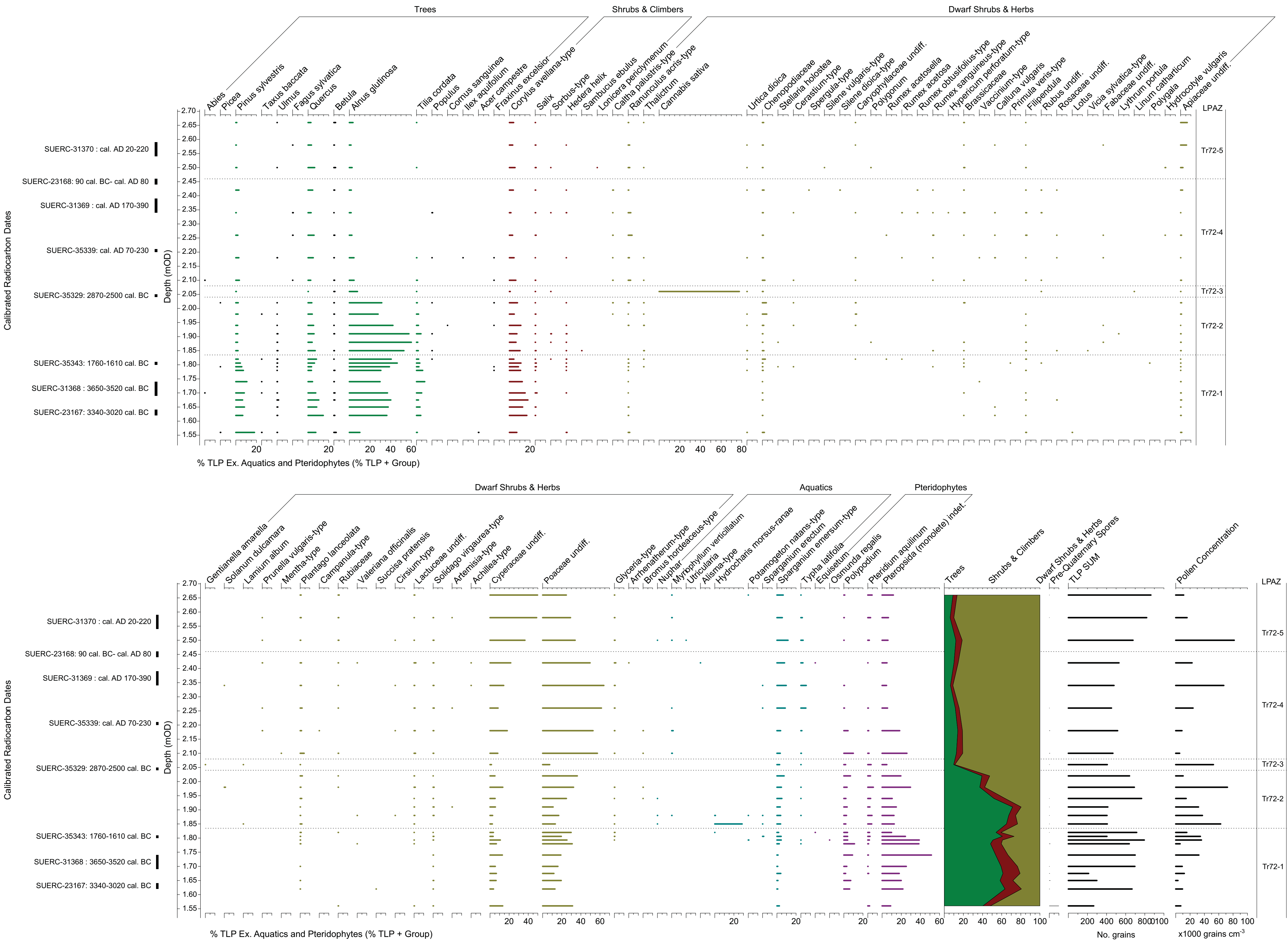
East and west facing sections of Trench 72 (after Harris and Melikia 2009)

Figure 41



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Scale:	n/a	Illustrator:	KJF
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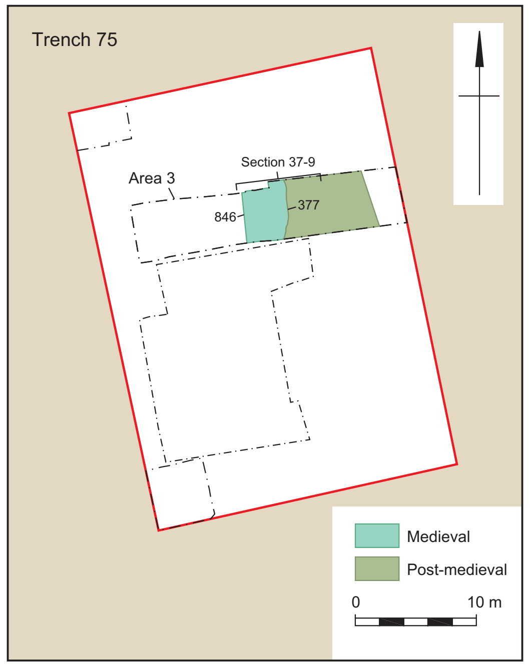
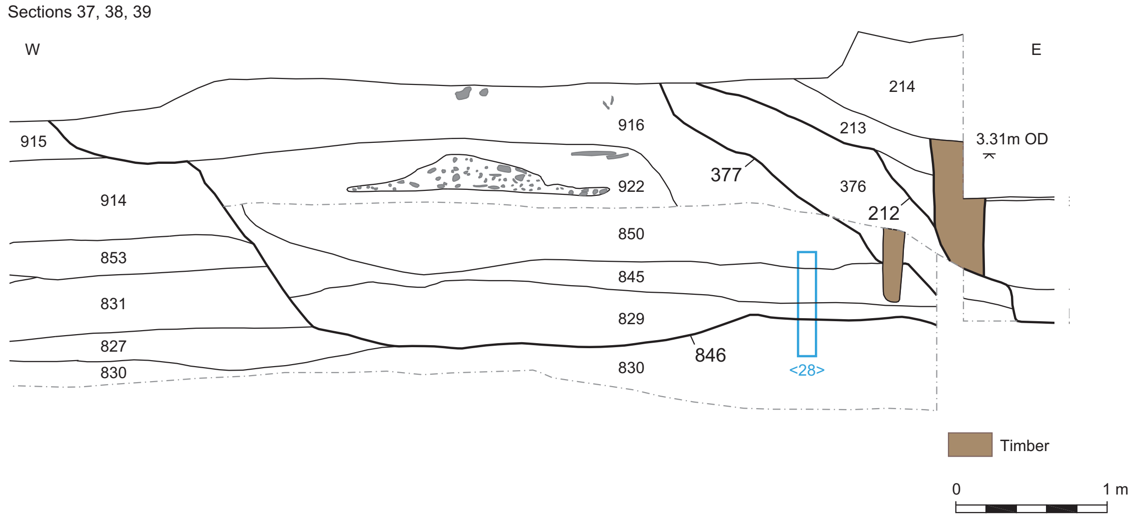
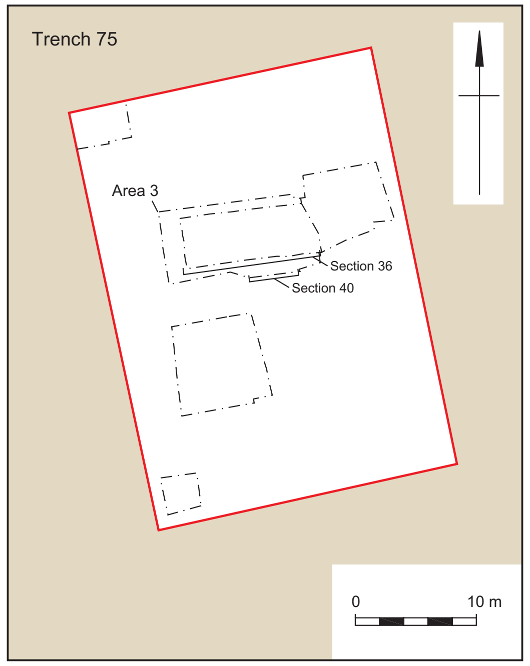
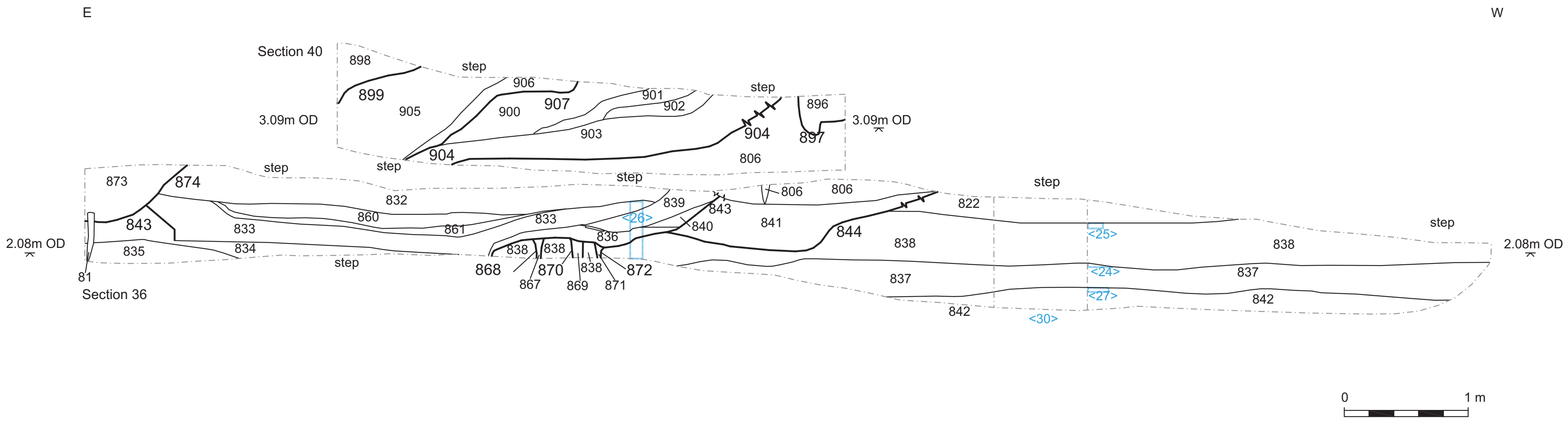
Pollen diagram from monoliths <1>, <2> and <3>, west facing section, Trench 72

Figure 42









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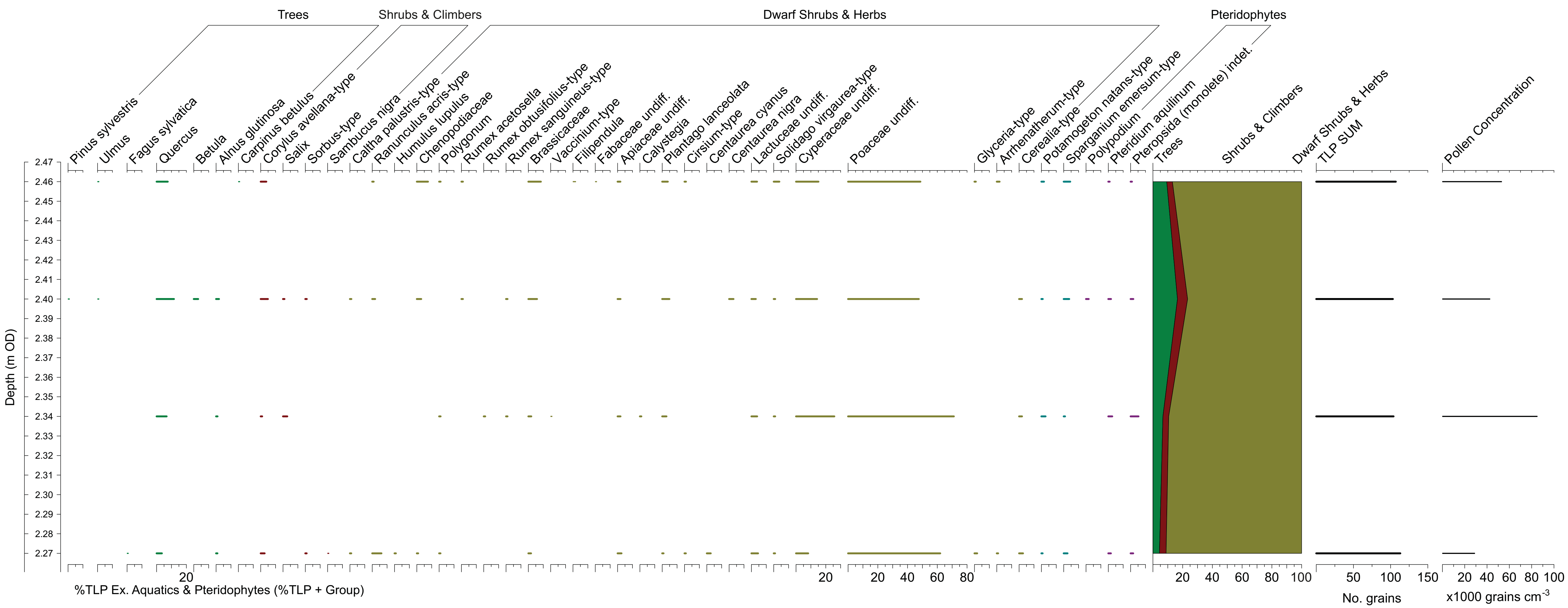
Plan and section of medieval channel 846, by Tumbling Bay stream (377), Trench 75

Figure 43



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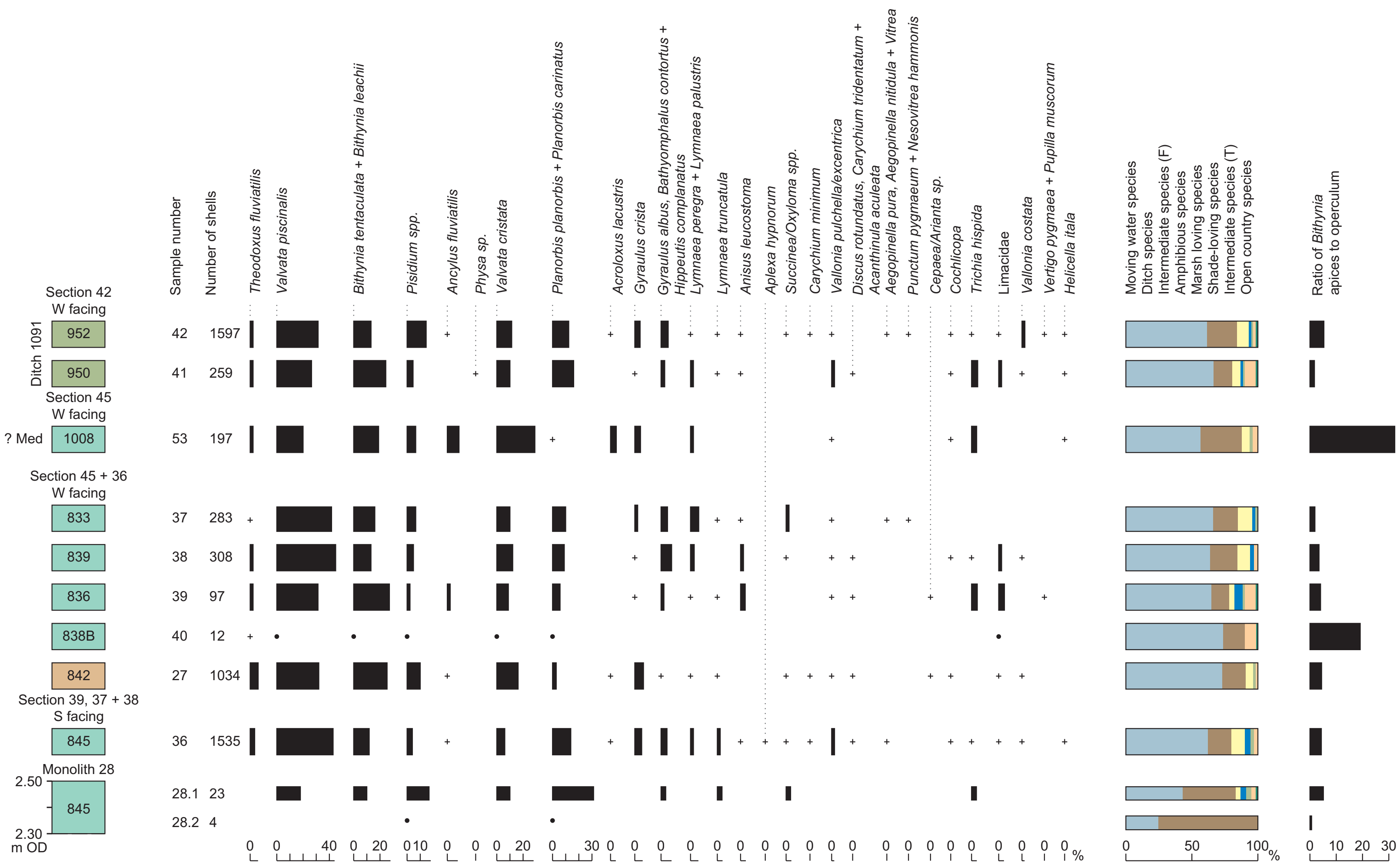
Pollen diagram from monolith <28>, Trench 75

Figure 44



Post-medieval	Moving water species	Marsh loving species	
Medieval	Ditch species	Shade-loving species	
Early/Middle Bronze Age	Intermediate species (F)	Intermediate species (T)	
	Amphibious species	Open country species	

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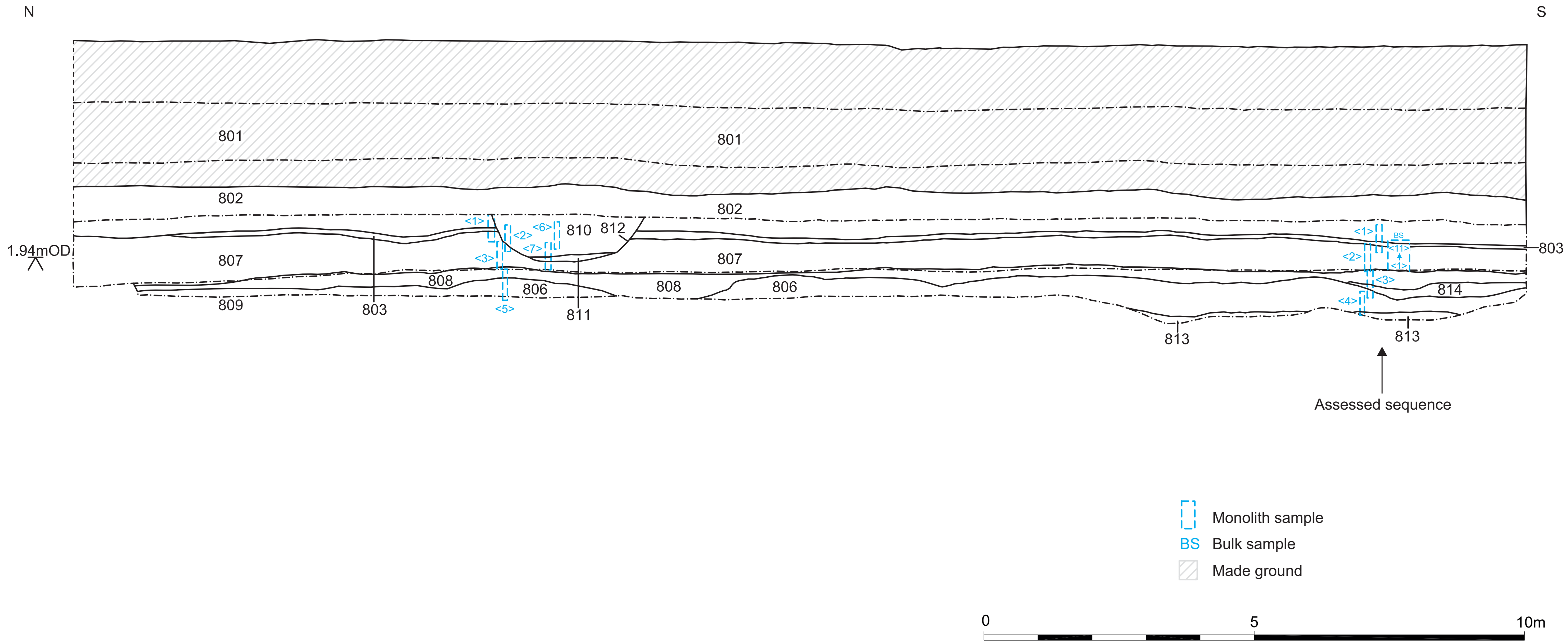
Mollusc diagram from Trench 75, showing samples from ditch 1091 and the west and south facing sections through the channel

Figure 45



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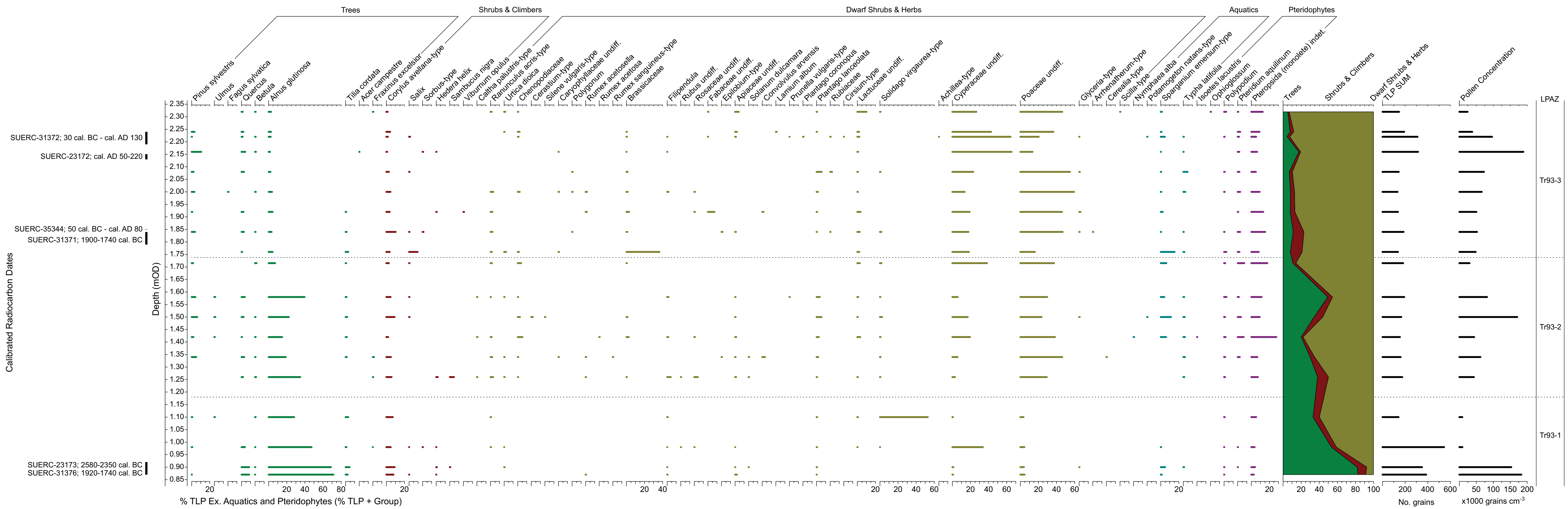
South facing section of Trench 93 (after Harris and Melikia 2009)

Figure 46



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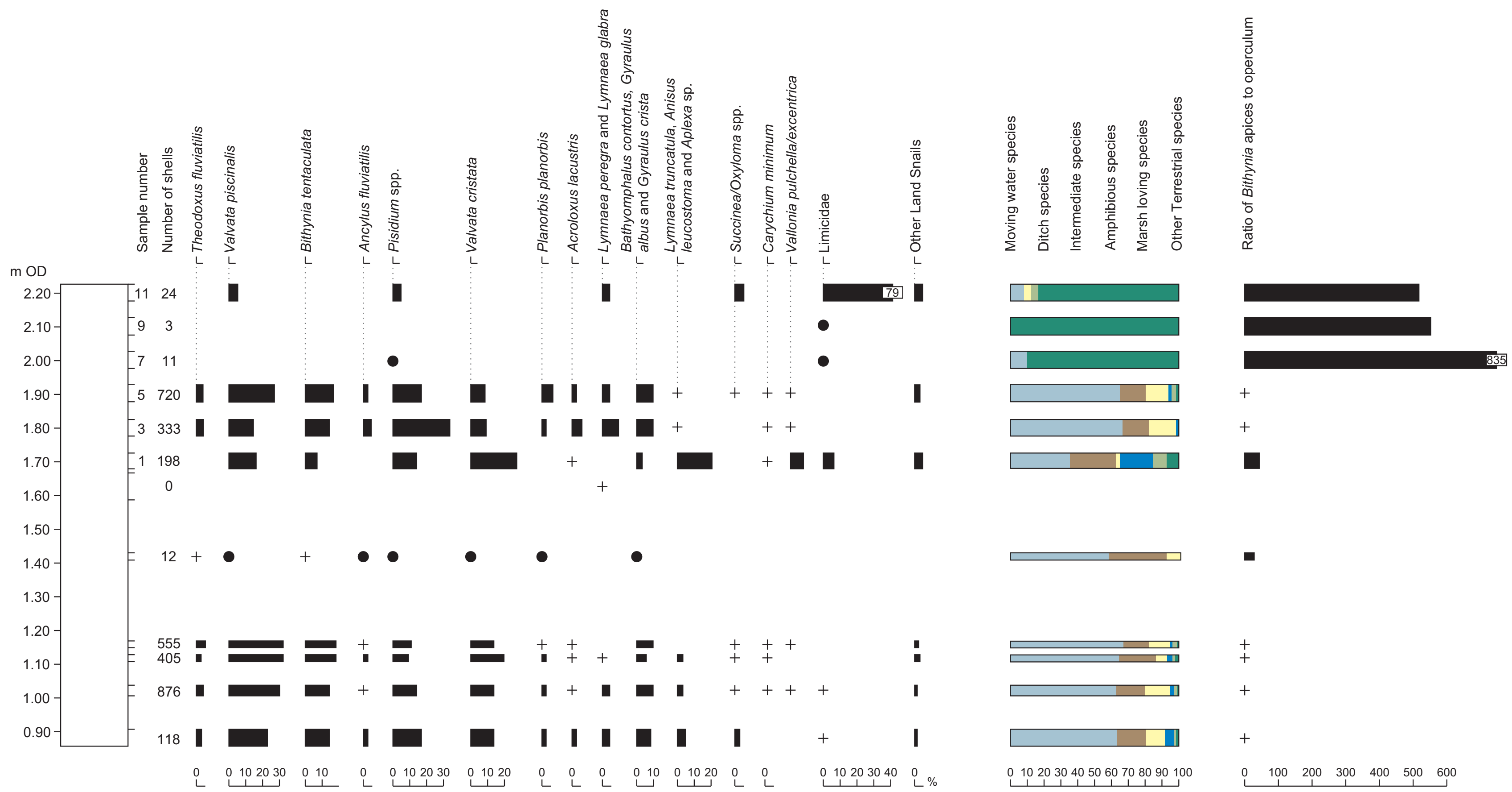
Pollen diagram from monoliths <1>, <2>, <3> and <4>, Trench 93

Figure 47



Moving water species	Marsh loving species
Ditch species	Other terrestrial species
Intermediate species (F)	
Amphibious species	

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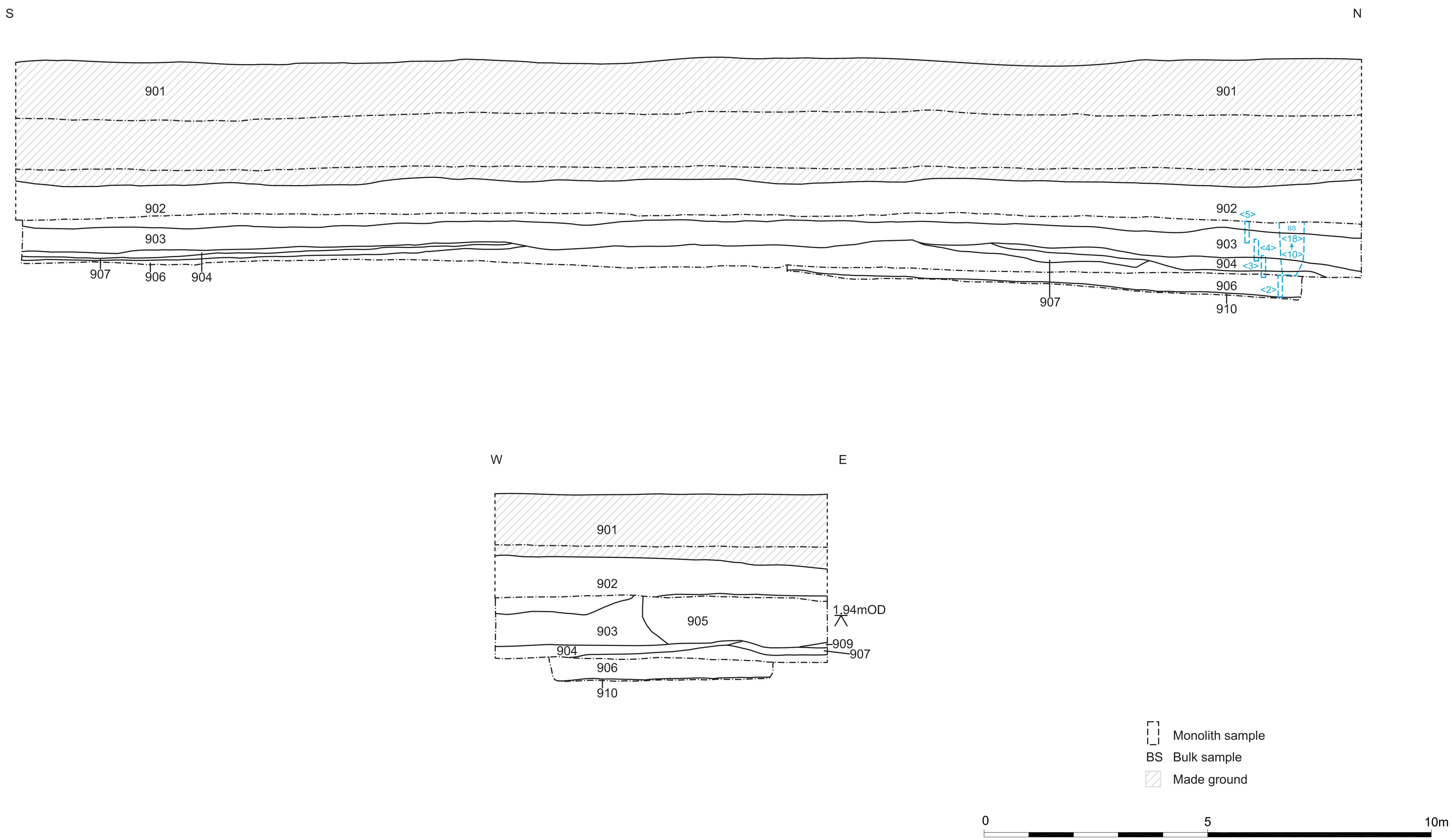
Mollusc diagram from south facing section, Trench 93

Figure 48



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East and south facing sections of Trench 94 (after Harris and Melikia 2009)

Figure 49

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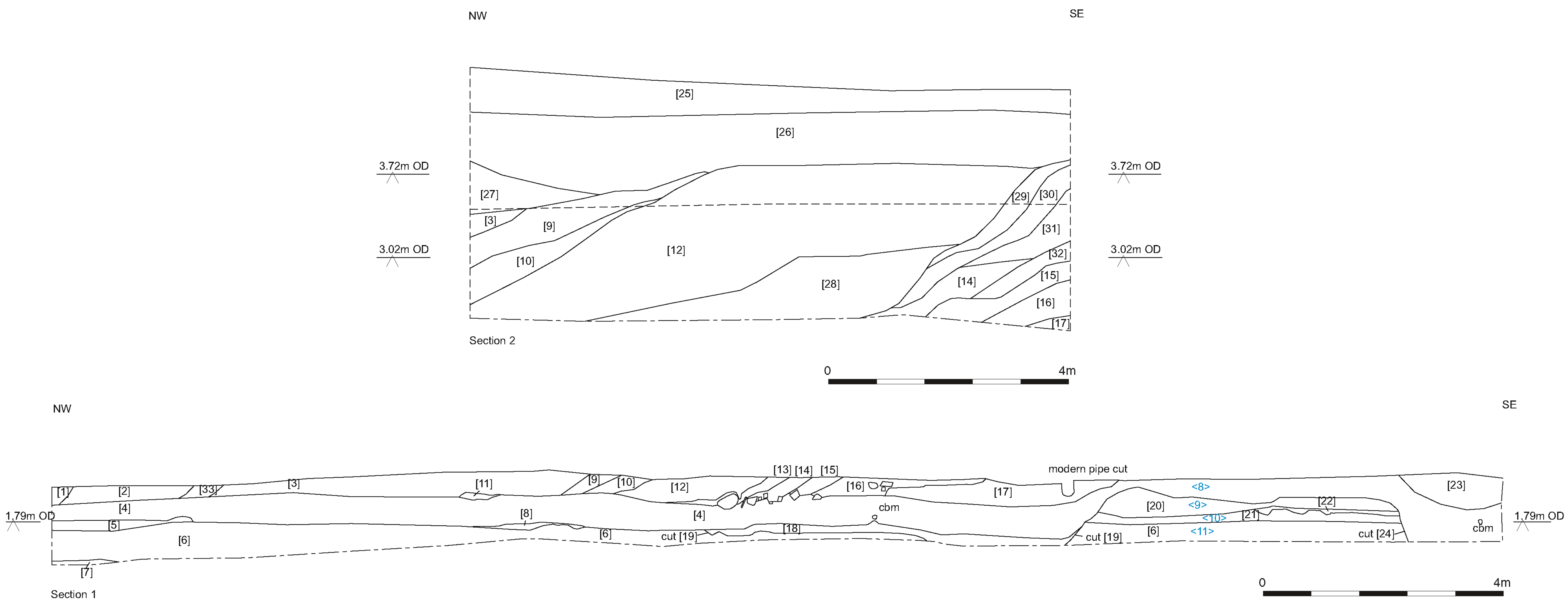
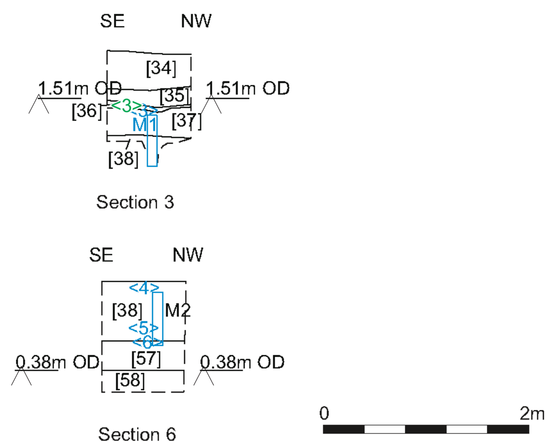
Pollen diagram from monoliths <1>, <2>, <3> and <4>, Trench 94

Figure 50



South-west facing sections 1 and 2 of Trench 109



North-east facing sections 3 and 6 of Trench 109

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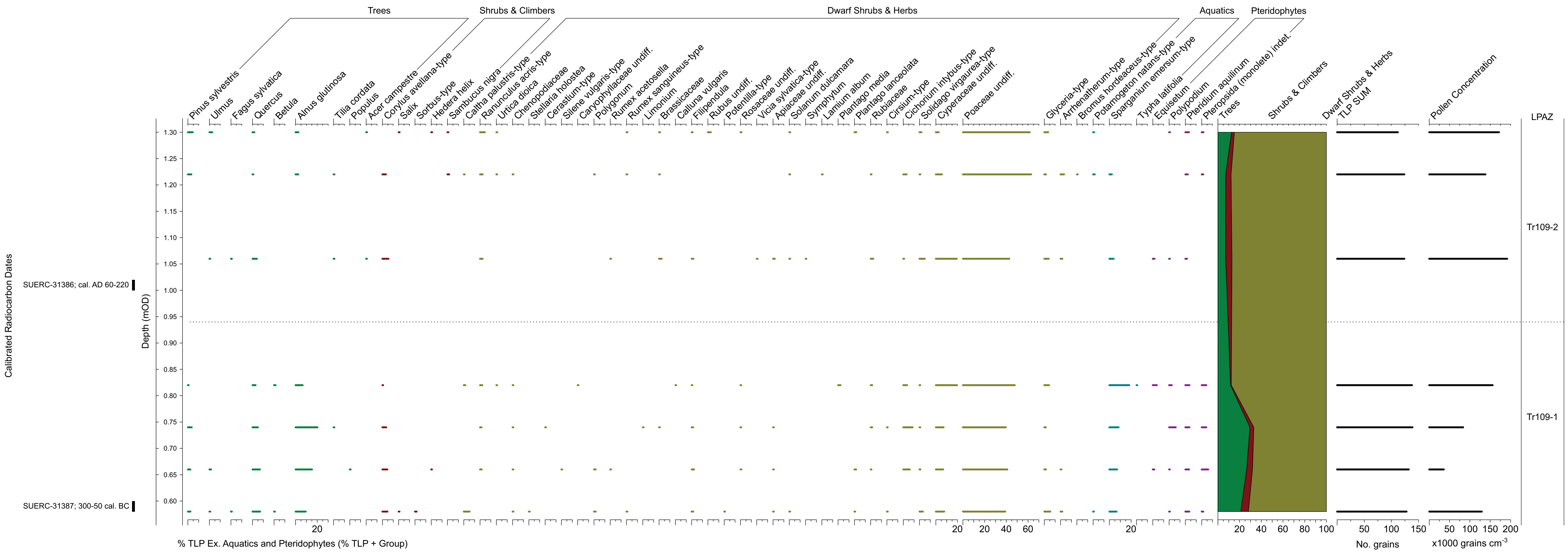
South-west facing Sections 1 and 2, and north-east facing Sections 3 and 6 of Trench 109 (after Barrowman and Yendell 2008)

Figure 51



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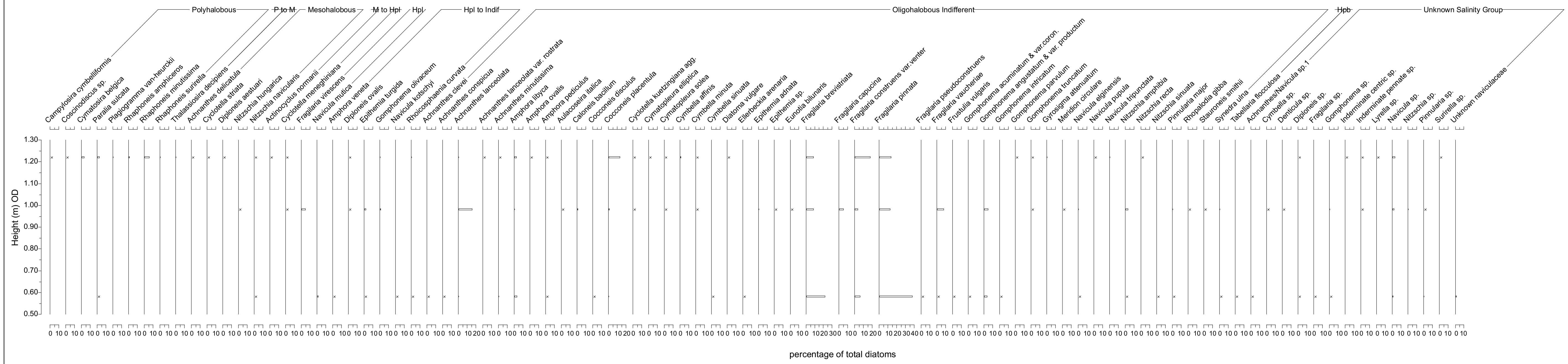
Pollen diagram from monolith <1>, Trench 109



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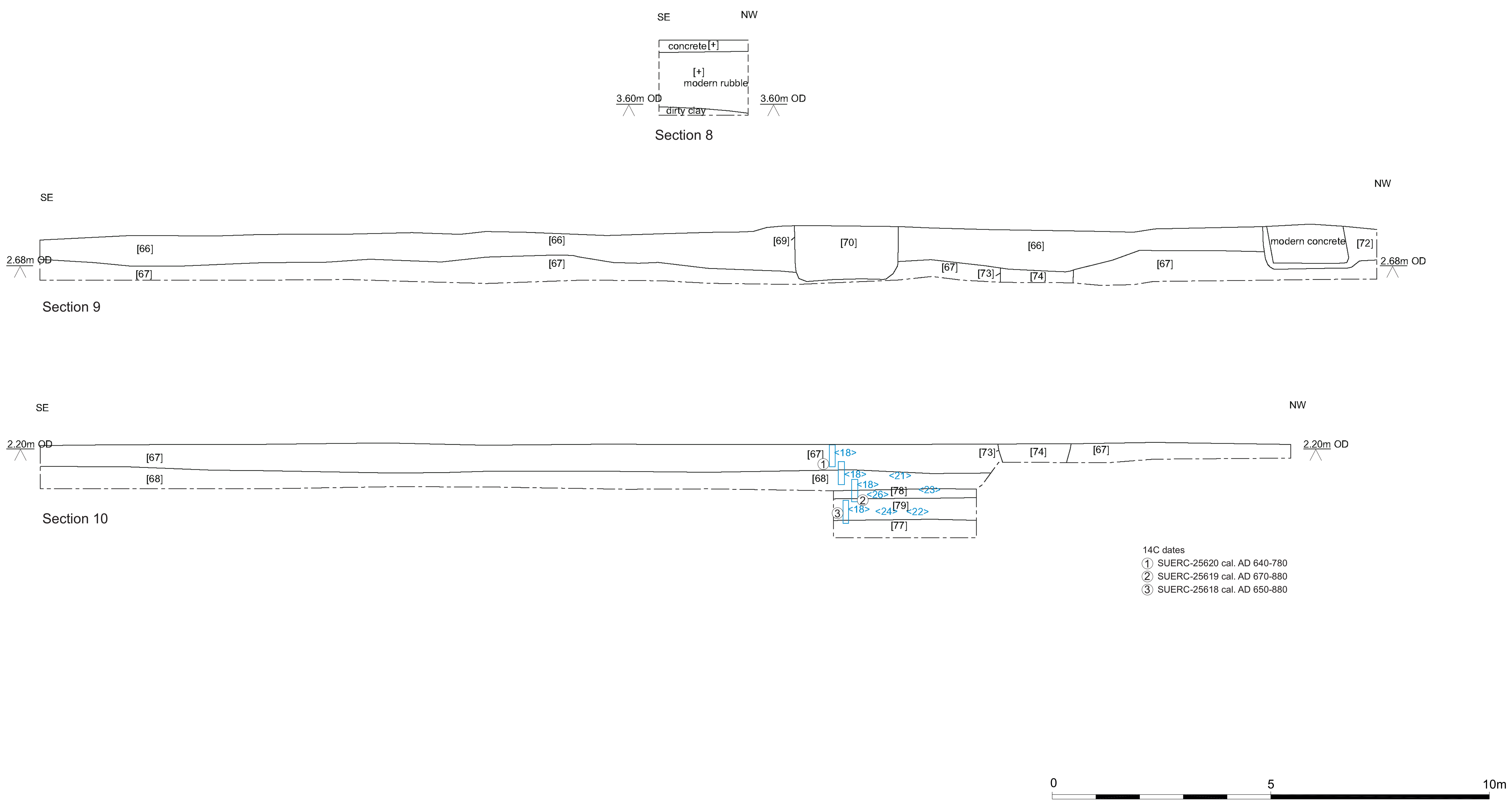
Diatom diagram from monolith <1>, Trench 109

Figure 53



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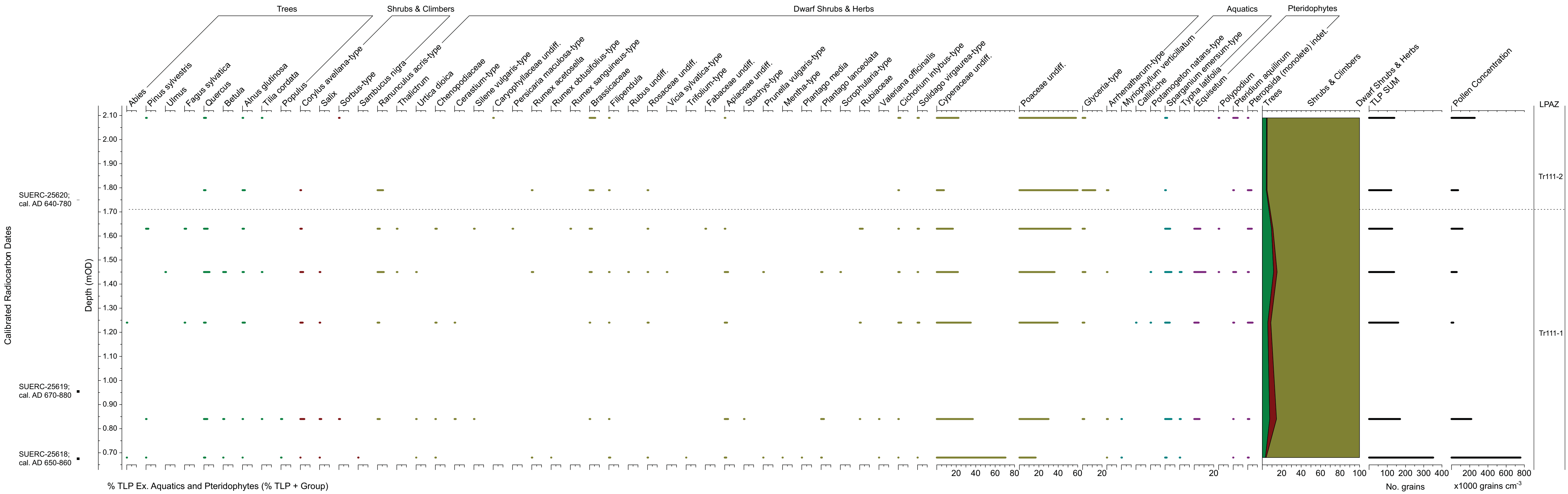
North-east facing Sections 8, 9 and 10 of Trench 111 (after Barrowman and Yendell 2008)

Figure 54



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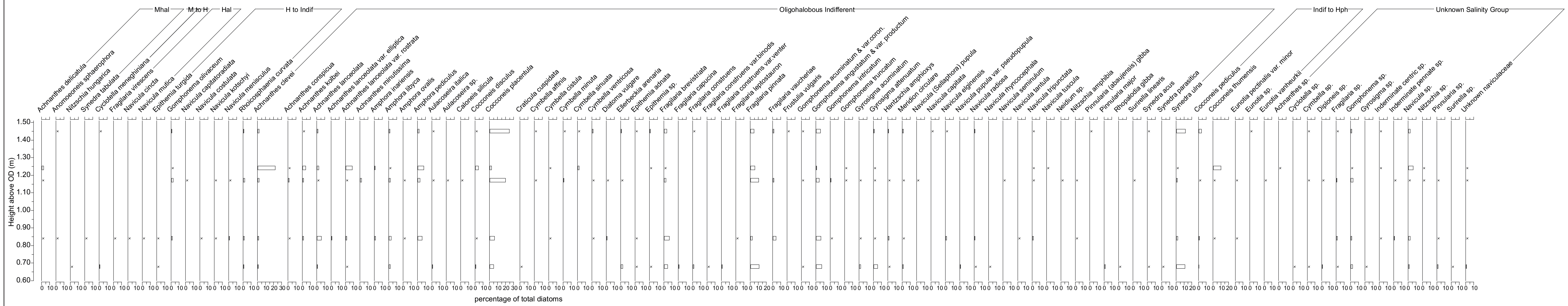
Pollen diagram from monolith <18>, Trench 111



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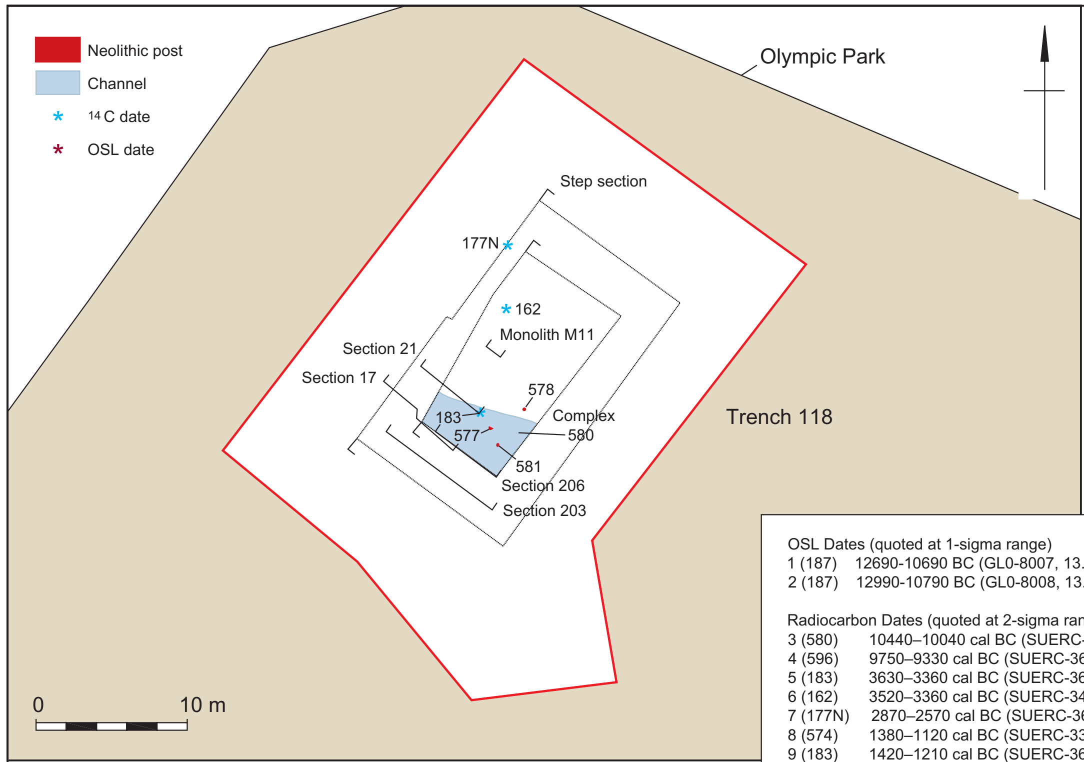
Diatom diagram from monolith <18>, Trench 111

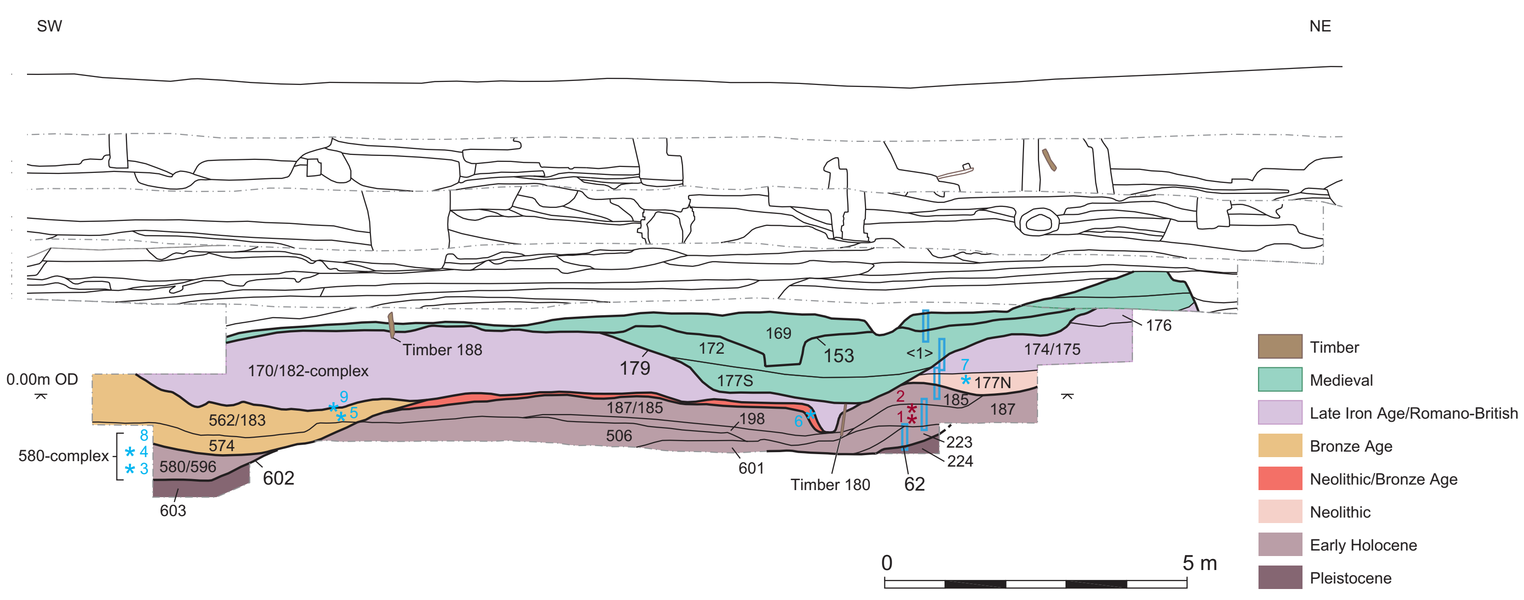
Figure 56



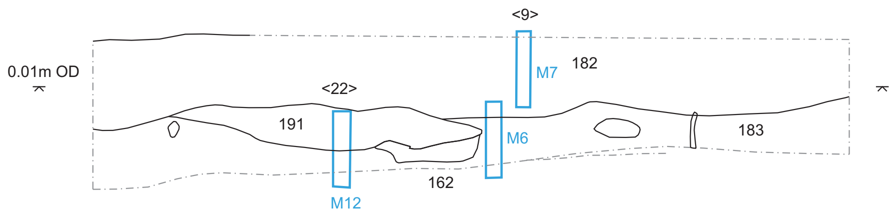
OSL Dates (quoted at 1-sigma range)
1 (187) 12690-10690 BC (GL0-8007, 13.7±1.0 ka)
2 (187) 12990-10790 BC (GL0-8008, 13.9±1.1 ka)

Radiocarbon Dates (quoted at 2-sigma range)
3 (580) 10440–10040 cal BC (SUERC-34949, 10325±40 BP)
4 (596) 9750–9330 cal BC (SUERC-36287, 10000±35 BP)
5 (183) 3630–3360 cal BC (SUERC-36575, 4680±35 BP)
6 (162) 3520–3360 cal BC (SUERC-34951, 4650±35 BP)
7 (177N) 2870–2570 cal BC (SUERC-36226, 4120±30 BP)
8 (574) 1380–1120 cal BC (SUERC-33681, 3005±30 BP)
9 (183) 1420–1210 cal BC (SUERC-36571, 2970±40 BP)

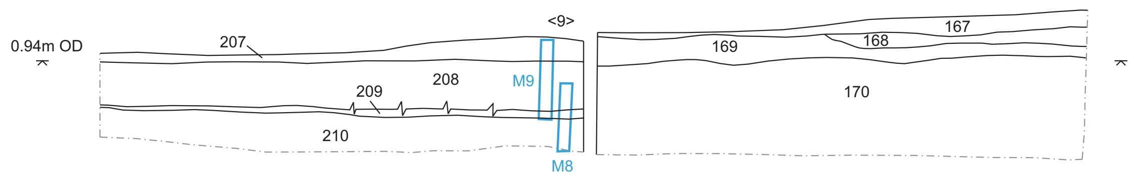
Step section



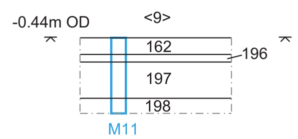
Section 21



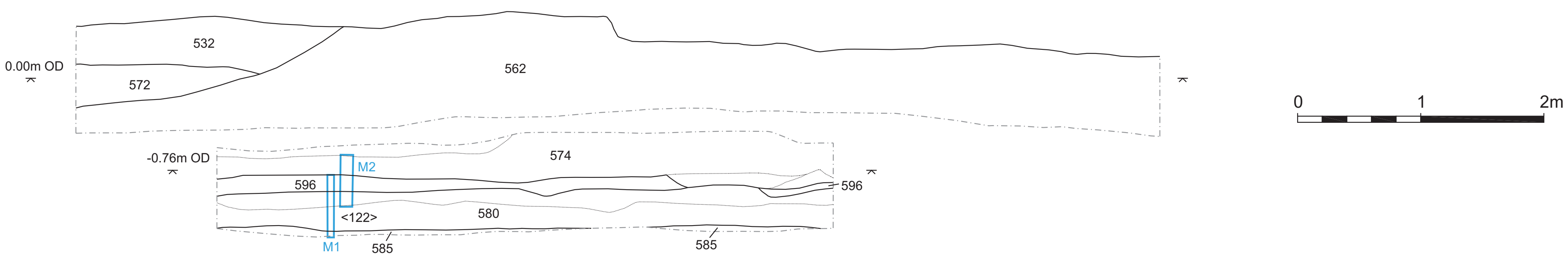
Section 17



Monolith <9> (M11)



Section 203/206



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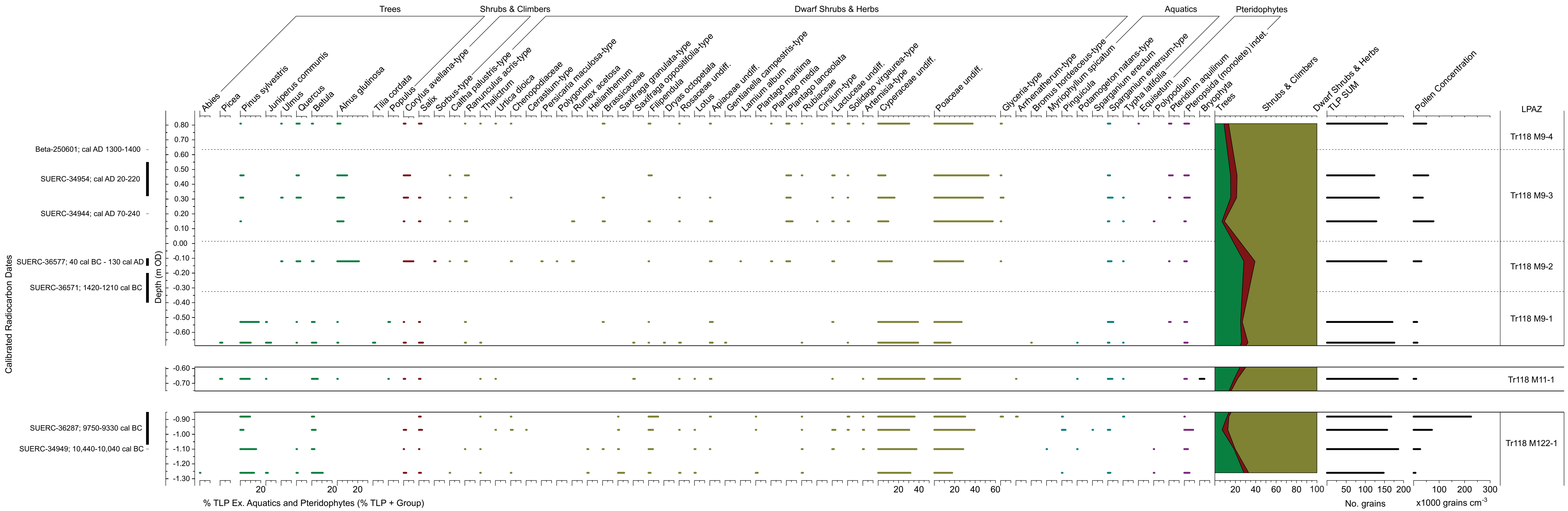
Section drawings of Trench 118

Figure 57



Pollen diagram from north-east facing sections, containing monoliths <122>, <M11> and <9> from Trench 118

Figure 58

Wessex Archaeology

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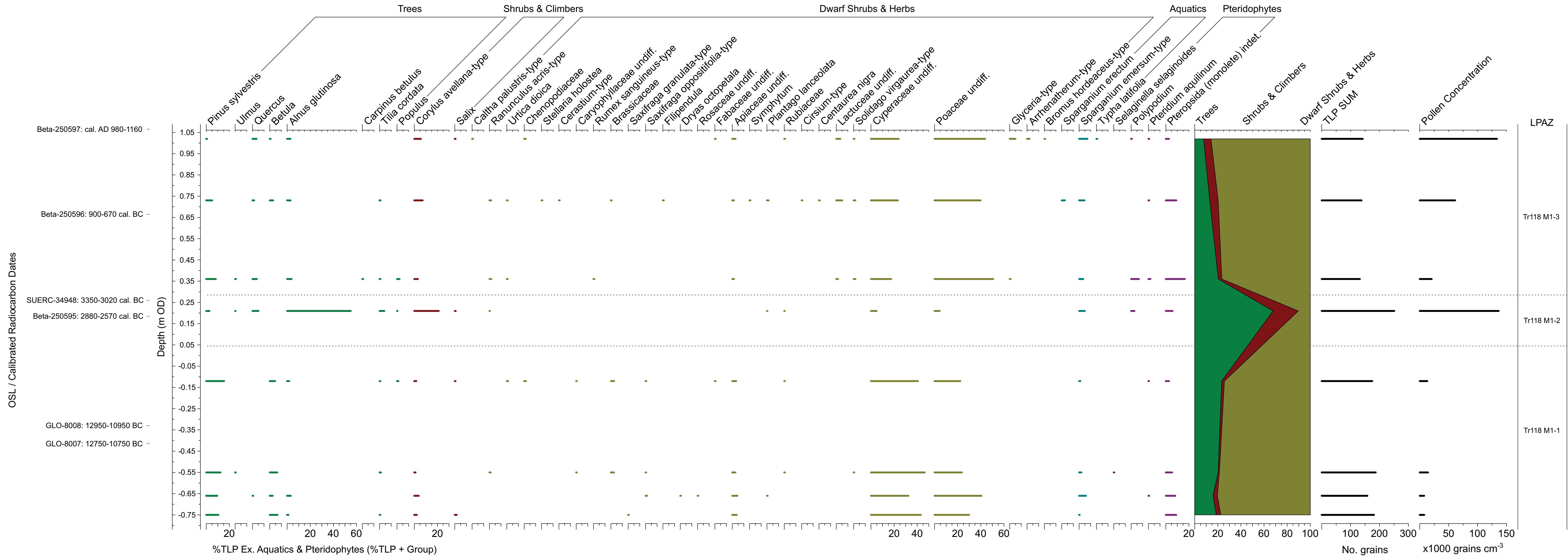

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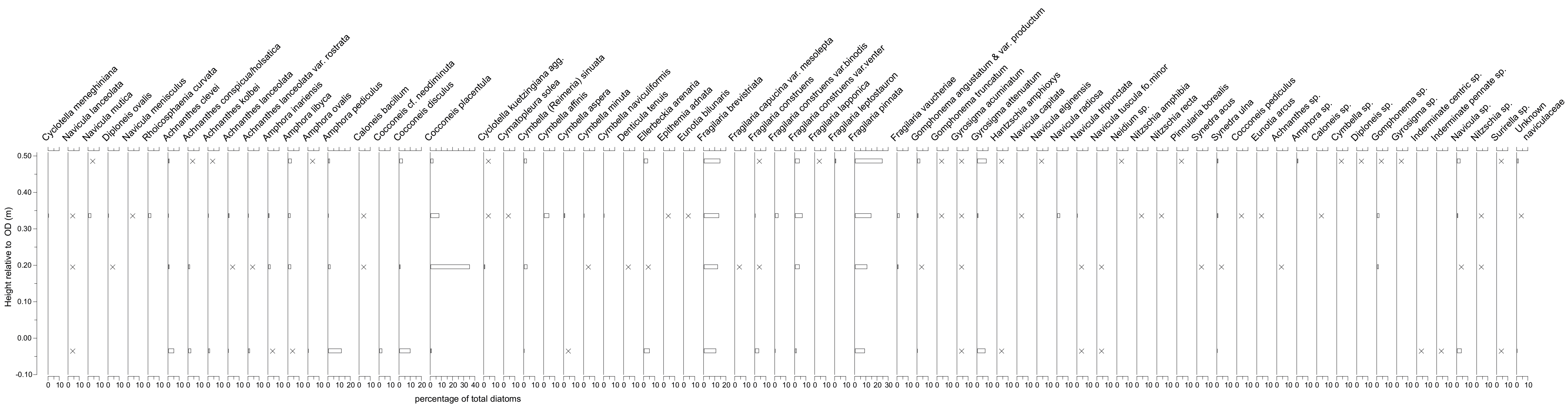
Pollen diagram from south-east facing section containing monolith <1>, from Trench 118

Figure 59



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Diatom diagram from north-east facing section containing monolith <9>, from Trench 118

Figure 60

Late Iron Age/Romano-British	Moving water species	Marsh loving species
Middle/Late Bronze Age	Ditch species	Shade-loving species
Late Pleistocene/Early Holocene	Intermediate species (F)	Intermediate species (T)
	Amphibious species	Open country species

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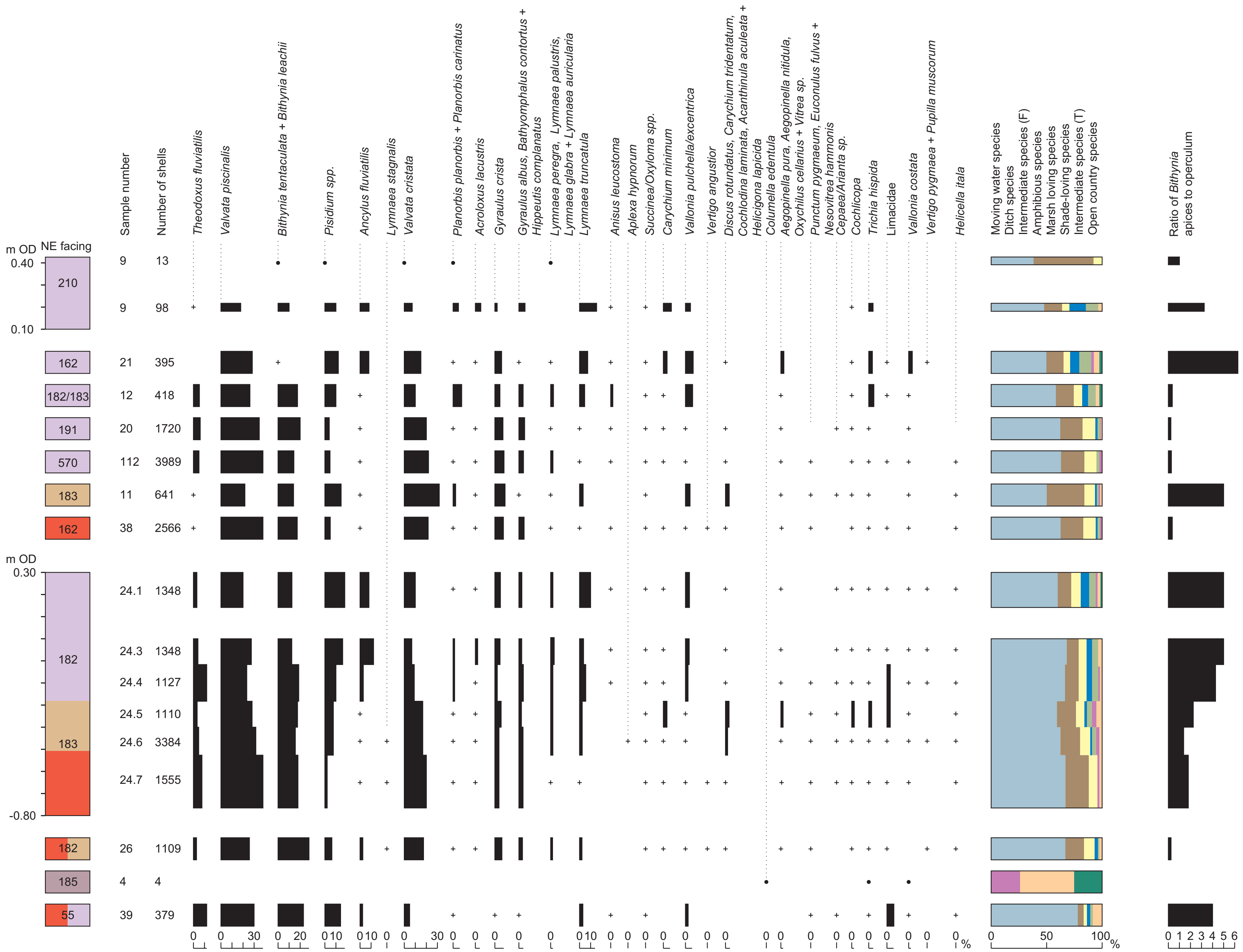
Composite mollusc diagram for channel deposits from the north-west and south-east facing sections of Trench 118, taken through the Middle/Late Bronze Age and Late Iron Age/Romano-British channels

Figure 61



Late Iron Age/Romano British
Middle–Late Bronze Age
Early Neolithic
Late Pleistocene/Early Holocene

Moving water species
Ditch species
Intermediate species (FW)
Amphibious species
Marsh loving species
Shade-loving species
Intermediate species (T)
Open country species

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Mollusc sequences through Late Pleistocene/Early Holocene, Early Neolithic, Middle/Late Bronze Age and Late Iron age/Romano-British deposits in the north-east facing evaluation section (except context 570) of Trench 118

Figure 62

By River, Fields and Factories

The Making of the Lower Lea Valley
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