Southampton Archaeology Unit

Archaeological watching brief at the Acorn Business Centre, 1-16 Empress Road, Southampton. SOU 1678.

Report 1216

AD Russel BA PhD MCIfA and T Riley BA, MSc
with contributions from V Yendell & A Davies of Museum of London Archaeology, Dr N Cameron of University College London, and Prof R Scaife of Southampton University

2016

Client: Vear Construction Ltd

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Front cover: The location of the site overlaid on the 1846 Royal Engineers' Map of Southampton

Summary Sheet

Site name/address: Acorn Business Centre, 1-16 Empress Road, Southampton.
SOU site code: SOU 1678
Contractor site code: SOU 1678
HET consultation number 7431
Planning application number: 13/00205/FUL
Grid reference of centre of site: 442730 113460
Fieldwork dates: 27/01/15 to 20/03/15
Type of fieldwork: Watching Brief and core retrieval
Name of contracting unit: Southampton City Council Archaeology Unit
Report author: AD Russel & T Riley
Name of client: Vear Construction Ltd
Non-technical summary: The Acorn Business Centre at 1-16 Empress Road, Southampton was redeveloped in 2014-15. An archaeological condition on the application resulted in an archaeological watching brief on the ground investigations and the retrieval and analysis of a sleeved core taken through the below ground deposits, which included prehistoric peat. The lowest deposit observed in the piling was the London Clay. This was overlain from -5.27m OD by sands and gravels of the Whitecliff Sand Member. These were cut by the valley of the Itchen in the Pleistocene period. The earliest surviving river valley deposits were sand and silt that included pond weed remains indicating standing fresh water. This was followed by increased organic content suggesting vegetation encroachment leading to peat formation. The peat was a mix of sedge and alder with alder becoming more prevalent towards the top, after which tidal inundation began to affect the area. The base of the peat, which was at c.-4m OD, was radiocarbon dated to the early Mesolithic period (10225 to 10165 cal BP) and the top of the peat, which was at c.-1.55m OD, was radiocarbon dated to the mid-Mesolithic period (7715 to 7620 cal BP). This would give a total rise in relative sea level of 2.45m over approximately 2250 years being on average just over 1mm a year. The changes in lithology, vegetation and hydrology seen in the deposits undoubtedly resulted from positive relative sea-level change, well documented for the Solent. The prehistoric deposits were overlain by disturbed tidal flat deposits and 19th century made ground. The base of the peat (10225 to 10165 cal BP), is the earliest date to be obtained from a layer of peat in the Itchen valley. To the north at SOU 1607 the base of the peat was 0.53m above a soil layer dated to 11100-10740 cal BP, and may be a similar date, but the peat itself was not dated. The top of the peat marks the point at which sea water entered the Itchen. At Empress Road this was at c.-1.55m OD, radiocarbon dated to the mid-Mesolithic period (7715 to 7620 cal BP). The peat at SOU 1607 to the north appears to have been deposited at a higher level, -0.9m OD, at an earlier date (8430-8340 cal BP). Other dates for peat in the Itchen have been calculated on their pollen content. At SOU 881 upstream of Empress Road the peat was thought to be deposited between c.9,500-8,000 BP, namely early Holocene, Flandrian chronozone 1 a, b,

and early c. termed Pre-Boreal and Boreal, (Godwin's pollen zones IV, V, and, early VI) (Watler 1998), and downstream at MSH2970 the peat was thought to have been deposited in the early Holocene period (*c*. 8500 to 7500 BP) and again in the later Middle Holocene period (*c*. 7000 to 5000 BP) but the peats were not radiocarbon dated (Williamson 2000).

The Empress Road site therefore provides important new evidence for the early chronology of the river Itchen. The earliest peat (dated to the early-Mesolithic) probably lay in a narrow channel and this is the first time it has been found; the later peat ties in with the dates from two nearby sites suggesting a wider deposit of peat in the mid-to late-Mesolithic period.

Archaeological watching brief on groundworks during the development of the Acorn Business Centre, 1-16 Empress Road.

AD Russel BA PhD MCIfA and T Riley BA, MSc, with contributions from V Yendell & A Davies of Museum of London Archaeology, Dr N Cameron of University College London, and Prof R Scaife of Southampton University

Site code	SOU 1678
Archaeology Unit report	1216
Ordnance Survey grid reference	442730 113460
SCC Accession Number	A2015.9

1. Summary

The Acorn Business Centre at 1-16 Empress Road, Southampton was redeveloped in 2014-15. An archaeological condition on the application resulted in an archaeological watching brief on the ground investigations and the retrieval and analysis of a sleeved core taken through the below ground deposits, which included prehistoric peat. The lowest deposit observed in the piling was the London Clay. This was overlain from -5.27m OD by sands and gravels of the Whitecliff Sand Member. These were cut by the valley of the Itchen in the Pleistocene period. The earliest surviving river valley deposits were sand and silt that included pond weed remains indicating fresh standing water. This was followed by increased organic content suggesting vegetation encroachment leading to peat formation. The peat was a mix of sedge and alder with alder becoming more prevalent towards the top, after which tidal inundation began to affect the area. The base of the peat, which was at c.-4m OD, was radiocarbon dated to the early Mesolithic period (Cal BP 10225 to 10165) and the top of the peat, which was at c.-1.55m OD, was radiocarbon dated to the mid-Mesolithic period (Cal BP 7715 to 7620). This would give a total rise in relative sea level of 2.45m over approximately 2250 years being on average just over 1mm a year. The changes in lithology, vegetation and hydrology seen in the deposits undoubtedly resulted from positive relative sea- level change, well documented for the Solent. The prehistoric deposits were overlain by disturbed tidal flat deposits and 19th century made ground. The base of the peat (10225 to 10165 cal BP), is the earliest date to be obtained from a layer of peat in the Itchen valley. To the north at SOU 1607 the base of the peat was 0.53m above a soil layer dated to 11100-10740 cal BP, and may be a similar date, but the peat itself was not dated. The top of the peat marks the point at which sea water entered the Itchen. At Empress Road this was at c.-1.55m OD, radiocarbon dated to the mid-Mesolithic period (7715 to 7620 cal BP). The peat at SOU 1607 to the north appears to have been deposited at a higher level, -0.9m OD, at an earlier date (8430-8340 cal BP). Other dates for peat in the Itchen have been calculated on their pollen content. At SOU 881 the peat was thought to be between *c.*7550 BP and *c.*6050 BP (Watler 1998), and downstream at MSH2970 the peat was thought to have been deposited in the early Holocene period (*c*. 8500 to 7500 BP) and again in the later Middle Holocene period (*c*. 7000 to 5000 BP) but the peats were not radiocarbon dated (Williamson 2000).

The Empress Road site therefore provides important new evidence for the early chronology of the river Itchen. The earliest peat (dated to the early-Mesolithic) probably lay in a narrow channel and this is the first time it has been found; the later peat ties in with the dates from two nearby sites suggesting a wider deposit of peat in the mid-to late-Mesolithic period.

2. Introduction

2.1 The Archaeology Unit of Southampton City Council carried out archaeological investigations at Empress Road (fig 1) on behalf of Vear Construction Ltd. The drilling of piles and the excavation of ground beam slots were observed. Museum of London Archaeology took a window sample through the below ground deposits to retrieve environmental evidence on 22/1/15. The observations were made by T Riley BA, MSc between 27/01/15 and 20/03/15. Dr AD Russel BA PhD MIfA managed the project. The maps and plans were prepared by T Riley. The report was edited by Dr AD Russel.

3. Aims and objectives

3.1 The purpose of the fieldwork was to make a record of the deposits that survived beneath the surface be they archaeological or natural, to take a cored sample of the peat, and analyse and date it (Southampton Archaeology 2014).

4. Site location, topography, and geology

4.1 The site (fig 1) lies at Ordnance Survey grid reference 442730 113460 on reclaimed land some 220m west of the modern west bank of the River Itchen, in the Bevois Valley district of Southampton.

4.2 The natural topography of the site has been partly obscured by land reclamation and modern urban development but the land to the north and west of the site slopes down towards the site. The site itself slopes gently down to the south. Surveyed levels at the site range from 2.05m AOD at the south-west corner to 3.09m AOD in the north part of the site. To the west of the site the land sloping down to the river is cut by a stream running from the south end of Southampton Common that created Bevois Valley (Burgess stream 17) and to the northeast a further stream (Burgess streams 18 and 19) has cut a steep valley carrying surface water from the Highfield area (Burgess 1982, 11-12).

4.3 The geological survey map (Ordnance Survey 1987) shows the surface geology at the site as made ground, overlying the Whitecliffe Sand. The higher ground immediately to the north lies on the laminated clays and sands of the Wittering Formation.

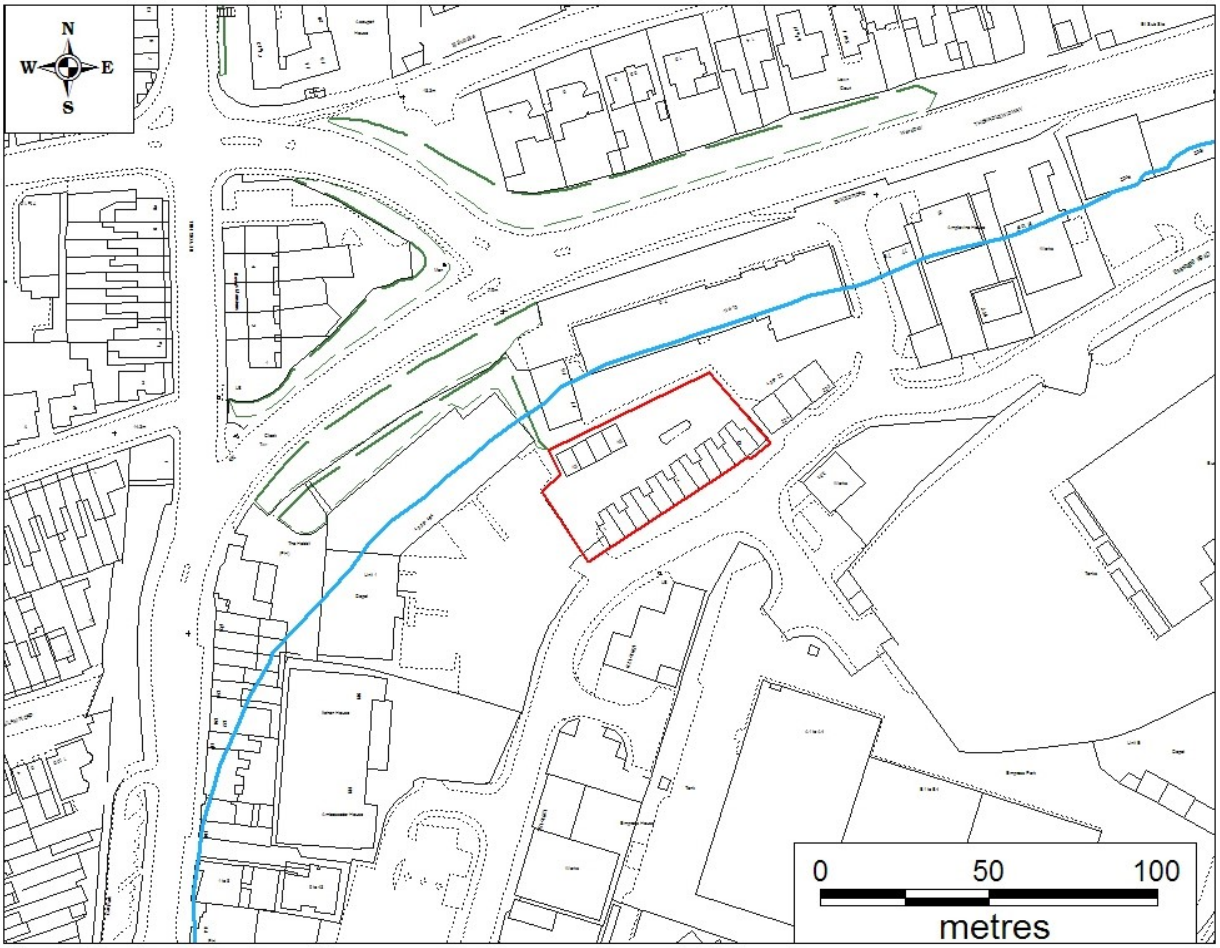


Figure 1: Location of the site. The blue line marks the 19th century shoreline.

5. Historical background

5.1 The site lies in an area that was formerly the intertidal zone in a bend of the River Itchen. To the north, the land sloped steeply down to the river shore.

5.2 The Bitterne Manor peninsula lies on the opposite side of the River Itchen. It was the site of a Roman settlement, with defences and quaysides, which has been identified with the Roman place name *Clausentum* in the Antonine Itinerary. Part of the site forms Scheduled Ancient Monument number 143 (Bitterne (Clausentum) Roman station), Many excavations, observations, watching briefs and accidental finds have been made in the area over the last 250 years. The site was occupied from before 70AD until the early 5th century.

5.3 There is a Saxon inhumation cemetery at Bitterne Manor, and it may have been a Late Saxon fort. It was the site of a medieval manor house of the Bishops of Winchester.

5.4 An accurately surveyed map of the Manor of Portswood, dated 1658, shows that the land just to the north of the site was an area of fields, probably a farm, belonging to one Henry Heath. The area subsequently became part of the grounds of Portswood House, a mansion built in 1776 for General Giles Stibbert of the East India Company. The house was demolished in 1852, after which Lawn Road was laid out.

5.5 The London and Southampton Railway, opened throughout in 1840, was carried across the river bend by an embankment with a bridge located at the north end to allow the tides to flow. This layout is recorded on the Royal Engineers' Map of 1846 (fig 2).

Fig 2. Detail of the Royal Engineers' map dated 1846, showing the site.

5.6 The railway embankment caused the area to silt up, forming marshland. The area was still marsh in 1870 but had been reclaimed by 1896, and by 1910 Empress Road had been laid out and residential development had begun. The terraced houses on the site are not shown on the 1909/1910 edition of the Ordnance Survey map but they are listed in Kelly's Street Directory for 1912.

5.7 By the early 1980s most of the houses in Empress Road had been demolished due to their poor condition and the area was designated for commercial use. The terrace of houses at the site were retained and converted to small commercial premises, forming the Acorn Enterprise Centre.

6. Archaeological background

The Southampton Historic Environment Record records numerous archaeological sites dating from the prehistoric to the post-medieval period nearby Full details of sites found up to the end of 2012 are given in the Desk Based Assessment carried out on the site in 2013 (Southampton Archaeology 2013). An updated HER search was carried out in December 2105, the most relevant sites are listed here and their positions are shown in figure 3.

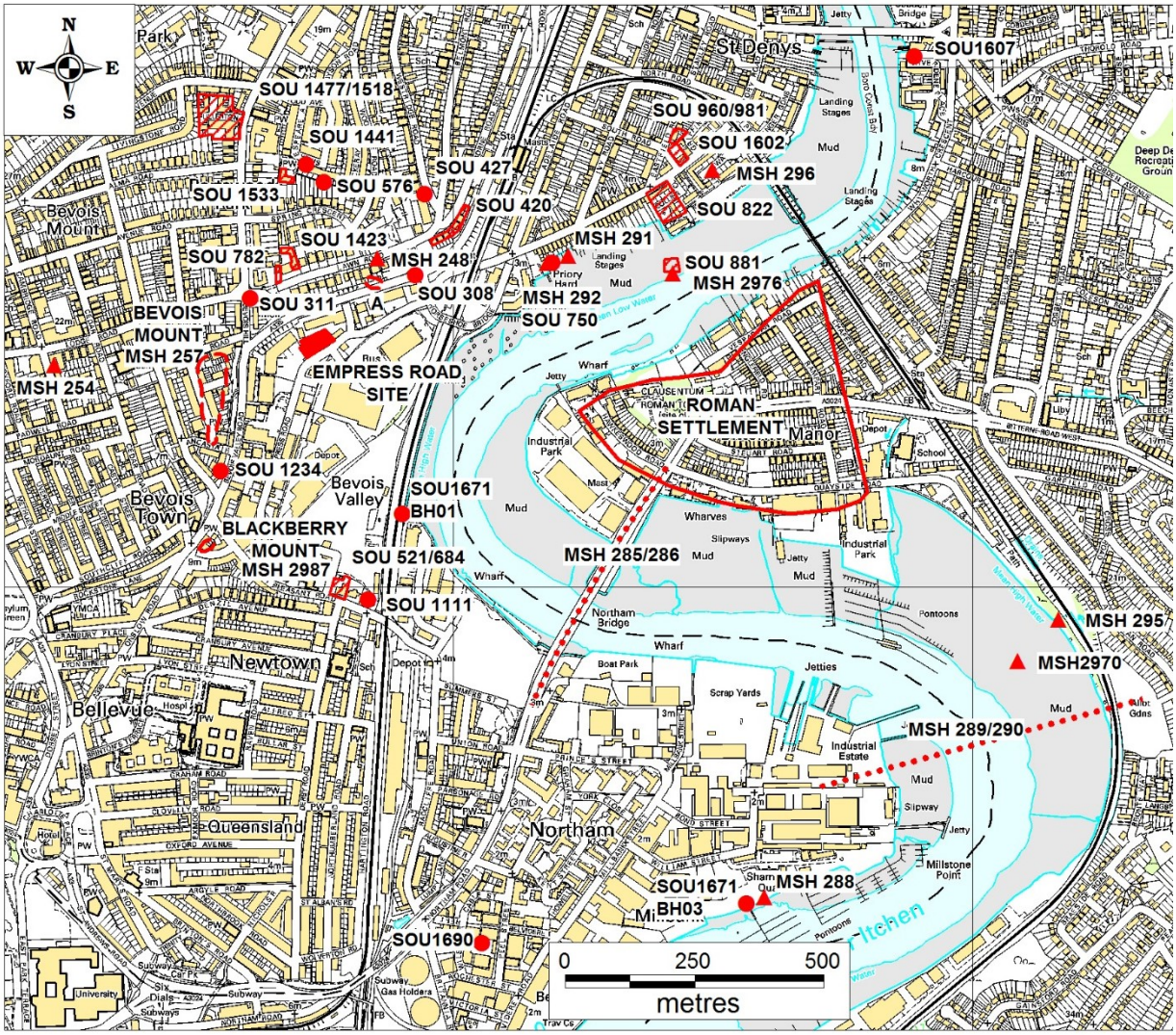


Fig 3. Archaeological sites and findspots in the vicinity of the site.
Red spots and hatched areas = sites (SOU numbers in text);
Red triangles = find spots (MSH numbers in text).

6.1 Prehistoric

A buried, gravel river terrace (MSH285) was found in boreholes sunk across the River Itchen along the line of Northam Bridge in the early 1950s. The river terrace is of Palaeolithic date. The top of the submerged gravel river terrace is at a fairly uniform depth, between -3.96m OD and -5.48m OD. The gravel is overlain by a bed of peat of Mesolithic date, 3.65m thick at its maximum (MSH 286). The terrace was formed in the late glacial (late Pleistocene) period, during a period of falling sea levels. The peat formed in the Mesolithic period, when sea levels were rising and submerging the late glacial river terrace (Everard 1954).

A buried, gravel river terrace (MSH289) was found in boreholes sunk across the River Itchen at Millstone Point before 1954. The river terrace is of Palaeolithic date, lies between -6.55m OD and -7.16m OD, and is about 3.65m thick. In the western part of the section the gravel terrace was overlaid by a peat deposit of Mesolithic date (MSH290) (Everard 1954).

Peat deposits (MSH1646/MSH2976) were found in 1998 during environmental core sampling at a site (SOU 881, see below) in the intertidal zone of the River Itchen, close to the site of the Roman settlement of Clausentum. The peat was dated by pollen analysis to between c.9500-8000 BP, namely early Holocene, Flandrian chronozone 1 a, b, and early c. termed Pre-Boreal and Boreal, (Godwin's pollen zones IV, V, and, early VI) (Watler 1998).

Further work on peat deposits south of the Clausentum peninsula (MSH 2970) found peat deposits dating from the early Holocene period (c 8,500 to 7,500 BP) to the later Middle Holocene period (c 7000 – 5000 BP) (Williamson 2000).

Two Neolithic stone axes, one of dolerite and one of greenstone (MSH245) were found at "Bevois Mount". The year of discovery is unknown, so it is uncertain what precise location is meant by "Bevois Mount". In the 18th and 19th century, Bevois Mount referred to a distinct mound or hill (MSH257) in the area of the present Clausentum Road, since destroyed by quarrying. This lay within the Bevois Mount Estate. A polished Neolithic flint axe (MSH254) was found at 26 Cambridge Road.

A bronze rapier (MSH288) of Middle Bronze Age date was found in 1982 during dredging of the River Itchen off Shamrock Quay (Hughes 1985, 92; (Cooper 1986).

SOU 311 Natural deposits were observed in a section at the junction of Thomas Lewis Way and Bevois Hill in 1987. Four possible Palaeolithic flint tools were retrieved from the deposits (SOU 311 Archive).

SOU 420 Excavations at 1 – 12 Osborne Road revealed two undated features. One was sub-rectangular, 260mm square and 600mm deep, with vertical sides and a flat bottom, filled with brickearth. The other was either part of a circular pit or the end of a ditch, 520mm x 230mm and 320mm deep, filled with brickearth containing a few small fragments of brick of unknown date and some charcoal. Four undated layers were excavated: natural clay, brickearth with charcoal, mixed brickearth and gravel and gravelly loam with burnt flint and seashell fragments. An unstratified flint blade of probable Mesolithic date was found (Russel 1992).

SOU 521/SOU 684 Undated peat and gravel foreshore deposits overlaid by 19th century reclamation deposits were found at 40 – 46 Mount Pleasant Road (Morton 1993; Peckham 1995).

SOU 1477/SOU 1518 A field evaluation (SOU 1477) and excavation (SOU 1518) at 81 – 97 Portswood Road, to the north-west of the site, found a number of worked and burnt flints, suggesting prehistoric activity. Several probable field-boundary or drainage ditches and a rubbish pit were dated to the Romano-British period. Late medieval and post-medieval pottery and ceramic building material were recovered from later deposits (Cottrell 2008 & 2011).

SOU 1607 A geoarchaeological borehole survey was undertaken on the site of The Boat House, Cobden Avenue on the east side of the River Itchen. It located an island in the river channel with a terrestrial soil that had formed in the early post-glacial period (radiocarbon date 9150-8790 cal.BC, 9575±35 BP). This was later buried beneath several metres of alluvial deposits laid down on channel margins and more open freshwater environments. In the late Mesolithic period, a thin peat layer formed in an alder carr wetland environment was deposited (radiocarbon date 6480-6390 cal. BC, 7575±35 BP. Above the peat was a deposit of estuarine alluvium with reed beds, probably laid down in the Middle to Late Bronze Age or Early Iron Age. These deposits were sealed by dumps of modern made ground. (MSH4971).

SOU 1671. Observations of boreholes along the west edge of the river Itchen located peat deposits in borehole 01 and borehole 03 (MSH5536).

SOU 1690. Investigations at a site in Peel Street revealed a layer of peat on the west bank of the river Itchen (MSH 5601).

6.2 Roman.

Three Roman graves (MSH248) containing small jars and other pottery were discovered during the making of Lawn Road (Davies, 1883).

Some Roman ceramic roof tile and possible fragments of Samian ware were found at 64 Priory Road (MSH292).

A Roman coin (a dupondius of Trajan, minted 96AD) was found near Priory Road during the clearance of prefabs in 1965 (MSH296). The site is now Janaway Gardens and Griffin Court.

SOU 750 A paved surface with a probable timber foundation was found below the intertidal mud at 64 Priory Road in 1962. The position of the find was some 15.25m from the present shoreline. The paving lay approximately 760mm inches below the surface of the mud and was overlaid by a gravel layer and a clay layer. The only dating evidence was a Roman tile found on top of the paving. The stones were each 150mm – 230mm thick and one stone was approximately 380mm x 610mm in size. Beneath the paving slabs were laid wooden logs some 230mm in diameter. A Roman or later date is suggested for the paved surface. It is interpreted as being a hard, possibly for a river crossing, marking the line of the Roman road from Winchester to Clausentum. The overlying layers may have been naturally deposited (Aberg 1962).

SOU 822 A watching brief at 154 – 170 Priory Road revealed evidence of Roman occupation comprising a ditch, possible rubbish pits, several other pits. Roman pottery, several coins and other finds were retrieved; the pottery dates from the 1st to 4th centuries AD (Cottrell 1997).

SOU 881 Groups of timbers were exposed in the inter-tidal mud off Priory Road in 1998. The structures were surveyed and sampled in 1998 – 1999. Radiocarbon and dendrochronological dates were obtained on several oak posts. The timbers appear to be three separate structures that have been interpreted as a Roman riverfront facility,

incorporating a jetty and shoreline revetment. It is thought to be associated with a river crossing from the Roman settlement at Bitterne Manor, perhaps on the route to Roman Winchester. The area is known locally as "The Causeway" (Beattie-Edwards 1999). Some unstratified Roman pottery and ceramic building material was recovered during cleaning around the timber piles and planks. The finds may be related to the timber feature or may have been washed onto the site by the river.

SOU 960/SOU 981 Archaeological investigations on land adjacent to 20 Eastfield Road (now 22 to 24a Eastfield Road) revealed the remains of a settlement of early Roman date, with a metalled road, probable timber-framed buildings and rubbish pits. A large quantity of iron slag was recovered suggesting that there was an iron working site close by (Cottrell 1999, Smith 2000; Smith 2002). The settlement may have formed a suburb of the settlement at Bitterne Manor.

SOU 1602 A watching brief on tree removal at the site of the Bridge Inn, Priory Road, revealed soils 550mm thick above a layer containing charcoal and burnt clay. A fragment of a 3rd – 4th century New Forest folded beaker was recovered (Russel 2012).

SOU 1477/SOU 1518 A field evaluation (SOU 1477) and excavation (SOU 1518) at 81 – 97 Portswood Road, to the north-west of the site, found a number of worked and burnt flints, suggesting prehistoric activity. Several probable field-boundary or drainage ditches and a rubbish pit were dated to the Romano-British period. Late medieval and post-medieval pottery and ceramic building material were recovered from later deposits (Cottrell 2008 & 2011).

6.3 Medieval

SOU 1111 An evaluation excavation at the former 30 – 38 Mount Pleasant Road, just east of the early 17th century Old Farmhouse Public House, revealed two sherds of residual late medieval pottery, found on the surface of a probable river deposit beyond the pre-19th century shoreline. The sherds were possibly associated with medieval occupation at Northam Farm. A buried soil was also found, probably on the former river edge. Reclamation deposits dating to the mid-19th century were found at the north end of the site. Topsoil layers contained post-medieval to modern finds (Smith 2001).

6.4 Post-Medieval

SOU 576 Limestone rubble, possibly from a robbed out wall, was found in a trench in the car park of Kingdom Hall in Shakespeare Avenue during a watching brief in 1994 (Shuttleworth 1994). It may have been associated with the Portswood House estate.

SOU 782 A buried soil horizon, two ditches and another possible ditch were observed in trenches on land west of 1 Lawn Road. The two ditches were undated, and the buried soil and possible ditch contained post-medieval ceramic building material (Smith 1997). All were thought to be associated with post-medieval agricultural activity but were possibly associated with the Portswood House estate.

SOU 1234 A watching brief on groundworks at 47 – 65 Bevois Valley Road revealed a limestone rubble wall of probable post-medieval date. The wall, of limestone rubble

in yellow sandy mortar, was aligned north-east – south-west. It had been truncated at some time, and its surviving height was about 450mm from the base of the footings (Whitehead 2003). The wall could not be closely dated but was probably post-medieval. Its alignment does not relate to any property boundaries or streets from the mid-19th century onwards, so it may pre-date these. It might be associated with landscaping on the Bevois Mount estate in the 18th century, but could be earlier.

SOU 1423 A watching brief at 1 – 3 Lawn Road revealed no features or deposits of archaeological significance although deposits relating to the demolition of the 18th century Portswood House were observed. Three sherds of 17th century pottery were recovered from machined spoil. They may have been derived from domestic refuse spread on former fields (Cottrell 2007).

SOU 1441 A watching brief at 42 Shakespeare Avenue revealed a large undated feature, interpreted as a natural drainage channel. A layer above this feature contained a few burnt flints and few fragments of brick (Everill & Thompson 2007).

SOU 1533 A watching brief carried out by Southampton City Council Archaeology Unit on groundworks for the construction of a new place of worship at Shakespeare Avenue, Portswood, revealed a former natural watercourse and features associated with the 18th century Portswood House (Cottrell 2010).

SOU 1477/SOU 1518 A field evaluation (SOU 1477) and excavation (SOU 1518) at 81 – 97 Portswood Road, to the north-west of the site, found a number of worked and burnt flints, suggesting prehistoric activity. Several probable field-boundary or drainage ditches and a rubbish pit were dated to the Romano-British period. Late medieval and post-medieval pottery and ceramic building material were recovered from later deposits (Cottrell 2008 & 2011).

7. Watching brief methodology

7.1 The methodology followed that specified in the Written Scheme of Investigation (Southampton Archaeology 2014). The archaeological work on site consisted of a watching brief on the augering of piles and the mechanical excavation of ground beams up to 700mm thick. The two areas of ground beams observed were numbered Trench 1 and Trench 2, a third area was not observed with agreement of Southampton City Council Historic Environment Team (fig 5).

7.2 All archaeological records were made using the Southampton City Council archaeological recording system. The colours of deposits were recorded using the Munsell Soil Color Chart and these are used in this report (Munsell Color 2000). All the artifacts recovered were 19th or 20th century and were not retained. The archive will be stored by Southampton City Council on completion of the project.

8. The results from the watching brief

8.1. Introduction

The augering of 83 piles was observed, followed by the excavation of ground beams. The ground beam trenches were allocated T1 and T2 each comprising a number of

trenches in which the ground beams were cast in concrete. The excavation of the trenches for the ground beams in the southwest part of the site was not observed by agreement with Southampton City Council Historic Environment Team.

The archaeology will be discussed by period. The periods are defined as follows:

Period	Period name	Approximate date span
0	Natural	Before 20,000 BP
1	Prehistoric	20,000 BP to 43 AD
2	Roman	43 AD-450 AD
3	Early Saxon	450 AD-650 AD
4	Middle Saxon	650 AD-850 AD
5	Late Saxon	850 AD-1066 AD
6	Anglo-Norman/Early Medieval	1066 AD-1200 AD
7	High Medieval	1200 AD-1350 AD
8	Late Medieval	1350 AD-1550 AD
9	Medieval (uncertain)	1066 AD-1550 AD
10	Post-Medieval	1550 AD-1750 AD
11	Early Modern	1750 AD-1900 AD
12	Modern	1900 AD onwards.

8.2. Period 0, Natural deposits.

The lowest deposit encountered in the piling was context 7 was a dark brown (10YR4/3) sandy clay; it was probably the London Clay. Above it was context 5, was a blueish grey (GLEY24/15B) sandy clay (fig 4), part of the Whitecliffe Sand Member.

Figure 4. Arisings from pile as it passed from the peaty context 4 to Whitecliffe Sand context 5.

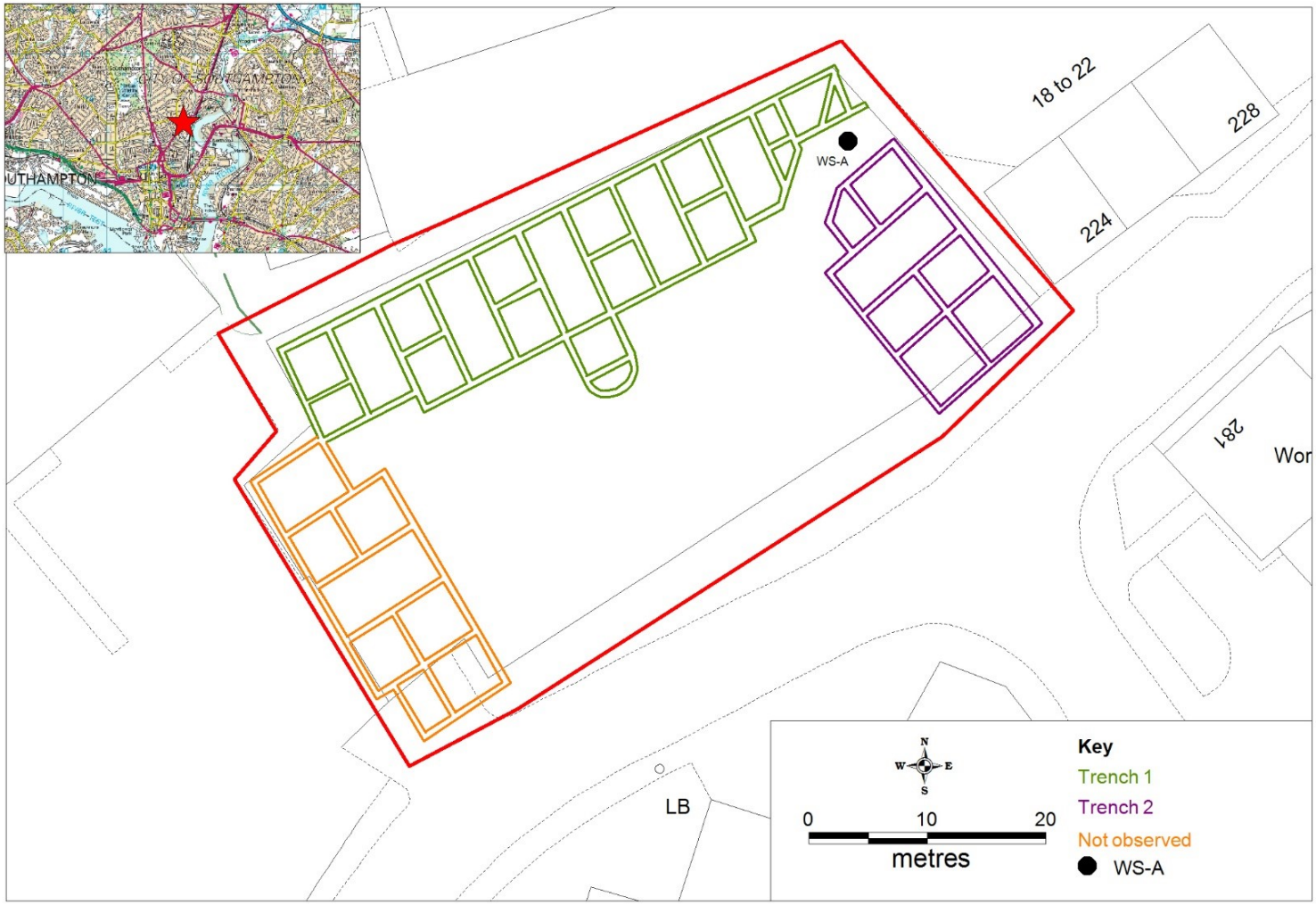


Fig 5. Plan of Ground beam trenches and location of Window Sample A.

8.3. Period 1, Prehistoric

Layer 4 was a layer of brown peat above layer 5. It included layers of very dark greyish brown clay loam. There were a few woody lumps, but no large fragments of wood were brought up in the piling, and the peat was very homogenous across the whole site.

8.4. Period 2-10, Roman to Post-Medieval

No deposits of these periods were identified. Intertidal muds would have built up over this period but the area showed signs of considerable later disturbance and no in-situ deposits were identified.

8.5. Periods 11 and 12, Early Modern and Modern

Layer 3 was a sticky, dark grey, almost black (10YR3/1) odoriferous silty clay. It was approximately 500mm thick, and contained early 19th Century transfer print china. Above layer 3 was layer 6, a light greyish brown (10YR6/2) silty clay some 500mm thick. It contained occasional fragments of Early Modern to Modern brick. Above layer 3 was layer 2, a compact grey (10YR5/1) clay, up to 2000mm thick. Above layer 2 was layer 8, a dark grey (10YR3/1) silty clay loam with patches of greenish grey (5Y5/2) clay throughout. It ranged in thickness from 50mm to 350mm, and included early modern brick, welsh roof slates, wood and concrete fragments, and fragments of a late 19th century toilet bowl. Above layer 8 was layer 1, a reddish brown silty loam covering the whole site and full of modern debris. It was between 400mm and 600mm thick, and was composed of the demolition of the previous houses on the site together with crushed material brought to the site (fig 6). Context 9 was assigned to unstratified 19th century finds in T2.

Fig 6. Northwest side of site showing maximum depth of excavation of ground beams.

9. Window Sample Methodology

By V Yendell, Museum of London Archaeology

9.1 On-site

9.1.1 The borehole (WS-A) was drilled at the location marked in Fig 5 on 22/1/15. The position was chosen as being close to the BH1 drilled by Soils Ltd in 2013 which had encountered 3.4m of peaty deposits (Soils Ltd 2013). A starter pit was hand-dug at the location and the hole was CAT-scanned for live services. The borehole was drilled with a rig supplied by the contractor under the supervision of a MOLA geoarchaeologist. Some of the basal sediments in the basal cores were very wet, subsequently retrieval of the natural was poor.

9.1.2 Continuous samples were collected through the alluvial deposits down to the surface of the underlying Whitecliffe sand member through made ground and alluvium. The cores were recovered in undisturbed 1m plastic tubes, of 100mm diameter.

9.1.3 Preliminary interpretation of the soil and sediment characteristics of the cores was made and an overview of the stratigraphy produced to characterise the deposit sequence and identify soil / sediment processes.

9.1.4 The geoarchaeologist kept a field log and a photographic record of the borehole.

9.1.5 The borehole samples were sealed and labelled and taken to MOLA geoarchaeology laboratories to be kept in controlled storage during the analysis stages of the work.

9.2 Off-site

9.2.1 The samples from the evaluation were retained and taken to the geoarchaeological MOLA laboratory, extruded and recorded according to standard sedimentary criteria.

9.2.2 The environmental remains within the core samples were examined by sub-sampling the borehole sequence for a range of environmental indicators. Blocks of sediment from selected key deposit locations were wet sieved using a 0.25mm mesh for macrofossils (e.g. seeds) and sub-samples submitted to external specialists for the assessment of microfossils (e.g. pollen and diatoms).

9.2.3 Suitable organic sediment was recovered and radiocarbon (14C) dating was carried out on selected organic remains.

10. The results from the Window Sample

By V Yendell, Museum of London Archaeology

10.1 The stratigraphic sequence

10.1.1 There follows a lithological description of the deposits recorded with an interpretation that provides a guide to and summarises the palaeoenvironmental findings in the subsequent sections (diatoms, pollen, botany and radiocarbon).

Empress Road WS-A						
OS National grid coordinates					442749.97	113492.15
Dimensions					8x0.1m	
Modern ground level/top of slab (m OD)					2.43	
Base of modern fill/slab (m OD)					1.83	
Base of deposits observed and/or base of intervention (m OD)					-5.27	
Surface of Holocene natural observed (m OD)					0.43	
Surface of Pleistocene or older natural observed (m OD)					-5.22	
Unit	**Depth below ground level (m)**		**Elevation (m OD)**		**Description**	**Interpretation**
1.11	0	0.6	2.43	1.83	Pink sands and gravel	Modern piling mat
1.11	0.6	1.2	1.83	1.23	Black (5YR 2.5/1) clayey loam and ash clinker, frequent brick pieces, occasional wood, rare, iron nail	Made ground - likely 19th century ground raising
1.11	1.2	2	1.23	0.43	Dark brown (7.5YR 3/2), sandy clay, occasional gravel mixed with red brick, firm	Made ground - likely 19th century ground raising
1.11	2	2.22	0.43	0.21	Very dark grey (5YR 3/1), mixed with yellow (10YR 7/8), sandy/gritty clay, soft	Made ground - disturbed/redeposited clays
1.11	2.22	3.35	0.21	-0.92	Dark yellowish brown (10YR 4/4), silty clay, mixed/swirled	Made ground - disturbed/redeposited clays
1.11	3.35	3.95	-0.92	-1.52	Very dark grayish brown (10YR 3/2), silty clay, soft and mixed	Made ground - disturbed/redeposited clays

1.10	3.95	4	-1.52	-1.57	Peat black (5Y 2.5/1), reed peat	Facies 4 - Short lived stable vegetated wetland, reed swamp, radiocarbon dated to the mid-Mesolithic (BETA 408320)
1.9	4	4.95	-1.57	-2.52	Very dark grey(10YR 3/1) mottled yellow (10YR 7/8), soft silty clay, very wet	Facies 4 - Unstable frequently inundated environment, frequent silting up and mudflat development
1.8	4.95	5	-2.52	-2.57	Peat black (5Y 2.5/1), reed peat	Facies 4 - Short lived stable vegetated wetland, reed swamp
1.7	5	5.55	-2.57	-3.12	Very dark grey mottled yellow (10YR 3/1), soft silty clay, very wet	Facies 4 - Unstable frequently inundated environment, frequent silting up and mudflat development
1.6	5.55	5.7	-3.12	-3.27	Peat, black (5YR 2.5/1)	Facies 3 - Vegetated wetland, reed swamp to wooded wetland as below
1.5	5.7	6	-3.27	-3.57	Very dusky red (2.5 YR 2.5/2), reed peat, slightly woody	
1.4	6	6.7	-3.57	-4.27	Peat, possibly reedy, spongy, black (5YR 2.5/1), graded up from below	Facies 3 - Sedge and reed to alder vegetated wetland. Brackish throughout with tidal inundation absent from the base but present at the top of the unit. Radiocarbon dated to the early Mesolithic (BETA 408321)
1.3	6.7	7.6	-4.27	-5.17	Olive brown (2.5Y 4/3), soft silty clay, slightly organic, some mixed backfill to top	Facies 2 - Sluggish water flow and vegetation encroachment
1.2	7.6	7.65	-5.17	-5.22	Fine sand and silt, very dark grey (N7/3)	Facies 2 - Pleistocene deposits to early Holocene fluvial channel, botanical remains indicates a Holocene (Mesolithic) date
1.1	7.65	7.7	-5.22	-5.27	Sand and gravel sub-angular, medium to large gravel, very dark grey (N7/3)	Facies 1- Pleistocene deposits

10.2 The Diatoms

By Nigel Cameron, Environmental Change Research Centre, Department of Geography, University College London, Pearson Building, Gower Street, London WC1E 6BT

10.2.1 Introduction

Eight samples were examined for diatoms to determine if diatoms were present or absent and to assess the potential of the sediments for further diatom analysis for palaeoenvironmental reconstruction. The diatom assessment of each sample takes into account the numbers of diatoms, the state of preservation of the diatom assemblages, species diversity and diatom species environmental preferences.

Table 1 The samples

Diatom sample no.	Depth of sample		Elevation of sample		Unit	Description	Interpretation
	Top	Base	Top	Base			
D1	5.56	5.58	-3.13	-3.15	1.6	Peat, black (5yr 2.5/1)	Vegetated wetland
D6	5.66	5.68	-3.23	-3.25			
D8	5.70	5.72	-3.27	-3.29	1.5	Very dusky red (2.5 YR 2.5/2), reed peat, slightly woody	Vegetated wetland, reed swamp to wooded wetland
D21	5.96	5.98	-3.53	-3.55			
D23	6.00	6.02	-3.57	-3.59	1.4	Peat reedy, spongy, black (5YR 2.5/1), graded up from below	Vegetated wetland, reed swamp
D3	6.60	6.62	-4.17	-4.19			
D46	7.50	7.52	-5.07	-5.09	1.3	Olive brown (2.5Y 4/3), soft silty clay, slightly organic, some mixed backfill to top	Sluggish water flow and vegetation encroachment
D47	7.60	7.62	-5.17	-5.19	1.2	Fine sand and silt, very dark grey (N7/3)	Pleistocene deposits to early Holocene fluvial channel

10.2.2 Methodology

Diatom preparation followed standard techniques (Battarbee *et al.* 2001). Two coverslips were made from each sample and fixed in Naphrax for diatom microscopy. A large area of the coverslips on each slide was scanned for diatoms at magnifications of x400 and x1000 under phase contrast illumination.

Diatom floras and taxonomic publications were consulted to assist with diatom identification; these include Hendey (1964), Werff & Huls (1957-1974), Hartley et al. (1996), Krammer & Lange-Bertalot (1986-1991) and Witkowski *et al.* (2000). Diatom species' salinity preferences are indicated using the halobian groups of Hustedt (1953, 1957), these salinity groups are summarised as follows:

1. Polyhalobian: >30 g l-1
2. Mesohalobian: 0.2-30 g l-1
3. Oligohalobian - Halophilous: optimum in slightly brackish water
4. Oligohalobian - Indifferent: optimum in freshwater but tolerant of slightly brackish water
5. Halophobous: exclusively freshwater

6. Unknown: taxa of unknown salinity preference.

10.2.3 Results & Discussion

The locations of the samples examined for diatoms are shown in Table 1. The results are summarised in Table 2 and diatom species data is presented in Table 3.

Table 2: Diatom assessment results

Diatom Sample No.	Diatoms	Diatom Numbers	Quality of Preservation	Diversity	Assemblage type	Potential for % count
D1	+	v low	Poor	mod	bk hal fw mar	v low
D3	+	v low	v poor	mod	bk mar	none
D6	-	-	-	-	-	none
D8	+	ex low	ex poor	1 frag	unknown	none
D21	+	ex low	ex poor	1 sp	fw	none
D23	+	mod	mod to poor	mod high	bk-mar fw	mod
D46	-	-	-	-	-	none
D47	-	-	-	-	-	none

Key: + *diatoms present; ex extremely; fw freshwater; bk brackish; est estuarine; mar marine; hal halophilous; mod moderate; frag fragment)*

Table 3: The presence of diatom taxa

Diatom Taxon/Laboratory Sample Number	**D1**	**D3**	**D8**	**D21**	**D23**
Polyhalobous					
Grammatophora sp.	1				
Paralia sulcata					1
Trachyneis aspera		1			
Polyhalobous to Mesohalobous					
Actinoptychus undulatus					1
Cocconeis scutellum	1	1			2
Mesohalobous					
Achnanthes brevipes	1				2
Achnanthes delicatula					1
Catenula adhaerans					1
Diploneis didyma	1	1			2
Navicula digitoradiata					1
Nitzschia punctata	1	1			1
Nitzschia hungarica					1
Scoliopleura tumida					1
Synedra tabulata (fasciculata)		1			1
Oligohalobous Halophilous					
Navicula cincta	1				
Oligohalobous Indifferent					

Achnanthes lanceolata					1
Cocconeis placentula & var.	1			1	2
Cymbella affinis	1				
Pinnularia viridis	1				
Unknown Salinity Group					
Navicula sp.	1				
Nitzschia sp.					1
Surirella sp.	1				
Unknown diatom fragment			1	1	

Key: 1 – present; 2 – common; 3 – relatively abundant

Diatoms were present in five of the eight samples and absent from three samples (D6, D46 and D47) (Table 2). In one sample (D23) there were moderately high numbers of diatoms, the quality of diatom preservation varied from moderate to poor, and there was a moderately high diversity of diatoms. However, in four of the diatomaceous samples the numbers of diatoms were very low or extremely low and the quality of diatom preservation was also very poor in these samples. In sample D21 the only diatom identifiable to the species level was the freshwater epiphyte *Cocconeis placentula*. It was not possible to identify the diatom fragment recorded in sample D8 to species level. Overall there was very low potential for gaining further information from analysis of sample D1 and there was no potential for gaining further information from the remaining six samples.

The diatom assemblages of three samples (D1, D3 and D23) are helpful in the interpretation of the former aquatic environments.

Sample D1 was taken from a black peat that was interpreted as representing a vegetated wetland environment. (Sample D6 was taken from the same sediment unit but did not produce diatoms). The diatom assemblage of sample D1 was composed of a mixture of brackish, halophilous and freshwater diatoms. A valve fragment and girdle bands of the polyhalobous, marine diatom genus *Grammatophora* were also present. The polyhalobous to mesohalobous, non-planktonic diatom *Cocconeis scutellum* was also present. Other shallow water, non-planktonic brackish-marine species present in D1 were the mesohalobous diatoms *Achnanthes brevipes, Diploneis didyma* and *Nitzschia punctata*. The freshwater and halophilous diatoms present in sample D1 were also shallow water, non-plankton and include *Cocconeis placentula, Cymbella affinis, Pinnularia viridis* and *Navicula cincta*. The diatom assemblage of sample D1, dominated by non-plankton, is consistent with a vegetated wetland. The presence of brackish-marine and marine taxa along with freshwater and halophilous diatoms shows that the habitat was affected by flooding from the marine environment and salinity levels would have been at least periodically high.

Both samples D3 and D23 were taken from a black peat that was interpreted as representing a vegetated wetland, reed swamp. The diatom assemblage of sample D3 was composed of polyhalobous, polyhalobous to mesohalobous and mesohalobous diatoms. These diatoms include the marine benthic diatom *Trachyneis aspera*; the marine brackish non-planktonic species *Cocconeis scutellum*; and the mesohalobous

non-plankton *Diploneis didyma, Nitzschia punctata* and *Synedra tabulata*. This is a shallow water diatom assemblage, consistent with the vegetated wetland interpretation, which has no oligohalobous indifferent, freshwater species present. The assemblage of sample D3 represents an environment with high salinity that was affected by coastal waters, although there is no evidence for allochthonous marine plankton that is often present in tidal habitats.

Sample D23 is from a peat that was also interpreted as being derived from a vegetated wetland with reed swamp. This sample contains the best preserved diatom assemblage from the sequence. The diatom assemblage is of brackish-marine species with a lower number of freshwater taxa; the most common of these is the oligohalobous indifferent, epiphyte *Cocconeis placentula*. The most common brackish-marine diatoms are *Cocconeis scutellum, Achnanthes brevipes* and *Diploneis didyma*. These are all shallow water, nonplanktonic types that are associated with tidal environments. The marine planktonic species *Paralia sulcata* and marine-brackish planktonic species *Actinoptychus undulatus* were also present. The remainder of the mesohalobous taxa are from brackish water. These shallow water, non-planktonic diatoms include *Achnanthes delicatula, Catenula adhaerans, Navicula digitoradiata, Nitzschia punctata, Nitzschia hungarica* and *Scoliopleura tumida*. The diatom assemblage of sample D23 indicates a wetland that was strongly affected by saline, coastal water with a relatively small component of oligohalobous indifferent taxa with growth optima in freshwater.

10.2.4 Conclusions

Diatoms were only present in five of the eight samples and in four of the five diatomaceous samples the diatoms were very poorly preserved. Despite the generally poor quality of diatom preservation the diatom assemblages that are present are informative. The diatoms show for example that the peat deposits represented by samples D1, D3 and D23 were affected by saline, coastal waters. The mainly non-planktonic, brackish-marine diatoms in these samples are from shallow-water habitats that were at least periodically affected by tidal waters. Oligohalobous indifferent (freshwater) diatoms and allochthonous planktonic marine diatoms are relatively less common in these samples.

10.3 The Pollen

By Prof Rob Scaife, Southampton University

10.3.1 Introduction

This report presents the results of an analysis of a 2.75m peat and mineral sediment profile at Empress Road. Empress Road is in proximity to two sites previously examined in the region of the River Itchen, Southampton at NGR SU 432133 and SU 435130 by Watler (1998) and Williamson (2000) respectively. These sites appear to be estuarine peat exposed on the foreshore of the lower Itchen River. Initially these were thought to be the typical late Holocene, late Neolithic and Bronze Age coastal inter-tidal peat sequences which occur around much of the Hampshire and the Isle of Wight coastline (Tomalin et al 2012). These Itchen sites, in fact, differ in that they are early Holocene (Flandrian Chronozone I) sediment sequences which appear to fill a palaeovalley/channel which is, coincidentally, more or less at contemporary sea-level height. There are other early Holocene sites in Southampton but these sequences

occur at substantial depths along the fringes of Southampton Water. Watler and Williamson produced pollen data and diagrams which demonstrate typical early Holocene (pre-Boreal and Boreal) seral woodland colonisation after the close of the Devensian cold stage. This latest profile from the Itchen area contrasts with the data of Watler and Williamson in being of older age.

10.3.2 Methodology

Pollen samples (Table 4) of 1.5ml volume were processed using standard techniques for the extraction and concentration of the sub-fossil pollen and spores (Moore and Webb 1978; Moore et al. 1991). The sub-fossil pollen and spores were identified and counted using an Olympus biological research microscope fitted with Leitz optics at magnifications of x400 and x1000. An assessment pollen sum of up to 150 pollen grains was counted for each sample, that is, where preservation permitted. In some of the humified upper alder carr peat pollen

Table 4: Samples assessed for pollen

Pollen sample no.	Depth of sample		Elevation of sample		Unit	Description	Interpretation
	Top	Base	Top	Base			
P48	3.95	4.00	-1.52	-1.57	1.10	Peat black (5Y 2.5/1), reed peat	Vegetated wetland, reed swamp
P49	4.95	5.00	-2.52	-2.57	1.8	Peat black (5Y 2.5/1), reed peat	Vegetated wetland, reed swamp
P1	5.56	5.58	-3.13	-3.15	1.6	Peat, black (5yr 2.5/1)	Vegetated wetland
P8	5.70	5.72	-3.27	-3.29	1.5	Very dusky red (2.5 YR 2.5/2), reed peat, slightly woody	Vegetated wetland, reed swamp to wooded wetland
P23	6.00	6.02	-3.57	-3.59	1.4	Peat reedy, spongy, black (5YR 2.5/1), graded up from below	Vegetated wetland, reed swamp
P3	6.60	6.62	-4.17	-4.19			
P46	7.50	7.52	-5.07	-5.09	1.3	Olive brown (2.5Y 4/3), soft silty clay, slightly organic, some mixed backfill to top	Sluggish water flow and vegetation encroachment
P47	7.60	7.62	-5.17	-5.19	1.2	Fine sand and silt, very dark grey (N7/3)	Pleistocene deposits to early Holocene fluvial channel

was sparse and lesser counts were achieved. Fern spores and miscellaneous microfossils were counted outside of the basic pollen sum. A pollen diagram (*Fig 3*) has been plotted using Tilia and Tilia View. Percentages have been calculated in a standard way, as follows:

Sum = % total dry land pollen (incl. Alnus)
Marsh/aquatic = % tdlp + sum of marsh/aquatics.
Spores = % tdlp + sum of spores.
Misc. = % tdlp + misc. pre-Quaternary pollen/spores.

Pollen taxonomy, in general, follows that of Moore and Webb (1978) modified according to Bennett et al. (1994) and Stace (1992).

10.3.3 Results

Pollen and spores were extracted from seven of the eight samples examined between 3.95m and 7.52m bgs (below ground surface). The lowest sample (P47) at 7.60m - 7.62m bgs in basal sand was barren. The pollen was in variable states of preservation and not abundant reflecting the depositional habitat which was in large part an on-site, floodplain, carr woodland. This habitat was micro-biologically active (in the summer) and such habitats can be marginal for pollen preservation.

Although there is a very substantial thickness of peat, the pollen is largely homogeneous throughout with little stratigraphical variation in the principal taxa present. Tree and shrub pollen were dominant with generally few herbs except for Poaceae in the lower levels. Two local pollen zones have, however, been delimited although these are tentative. These zones are characterised in Table 5.

Table 5

Local pollen zone .	Palynological characteristics
l.p.z. 2 3.95m to 5.64m Alnus-Dryopteris Peat	Trees and shrubs are dominant with fewer herbs than preceding l.p.a.z. 1. Alnus is dominant (to 57%). Quercus (15%) and Corylus avellana type (20%) are also important. There are lesser numbers of Ulmus (5%), Betula (2-3%) and sporadic Pinus, Tilia and Salix. Herbs include low values/occurrence of Ranunculus type, Brassicaceae, Poaceae (c. 5%) and Cyperaceae (8% in upper sample) within the marsh category. Monolete Dryopteris type Pteropsida attains highest values at the top of the profile (70% sum + spores). There are small numbers of Osmunda regalis and Pteridium. There is a single peak of Sphagnum at the base of the zone (5.55m - 5.58m).
l.p.z. 1 5.64m to 7.62m Quercus-Corylus avellana type-Alnus Cyperaceae Lower silty clay and transition into peat	The basal sample at 7.51m differs from above with high values of reworked geological palynomorphs and a greater diversity of herb taxa (albeit still small). There are also higher values of Betula (15%) and Corylus avellana type (45%) than above. Quercus (11%) is present. There are small numbers of Pinus (2-3%, Ulmus, Alnus and Salix. Quercus and Alnus values increase upward (36% and 30%) respectively whilst Corylus avellana type declines (c.25-35%). Herbs are dominated by Poaceae (to 38%) with small numbers of Brassicaceae, Scrophulariaceae, Asteraceae types and Plantago maritima type in the basal sample. Marsh taxa comprise Cyperaceae with high basal values (19%) declining upward. There are occasional Typha angustifolia/Sparganium type, Typha latifolia and Osmunda regalis (fern). The latter are in the upper zone. Fern are dominated by Dryopteris type (increasing from 15%-55%) sum + spores) with small numbers of Pteridium aquilinum (2-3%), Polypodium and Osmunda regalis noted.

10.3.4 The inferred vegetation and environment

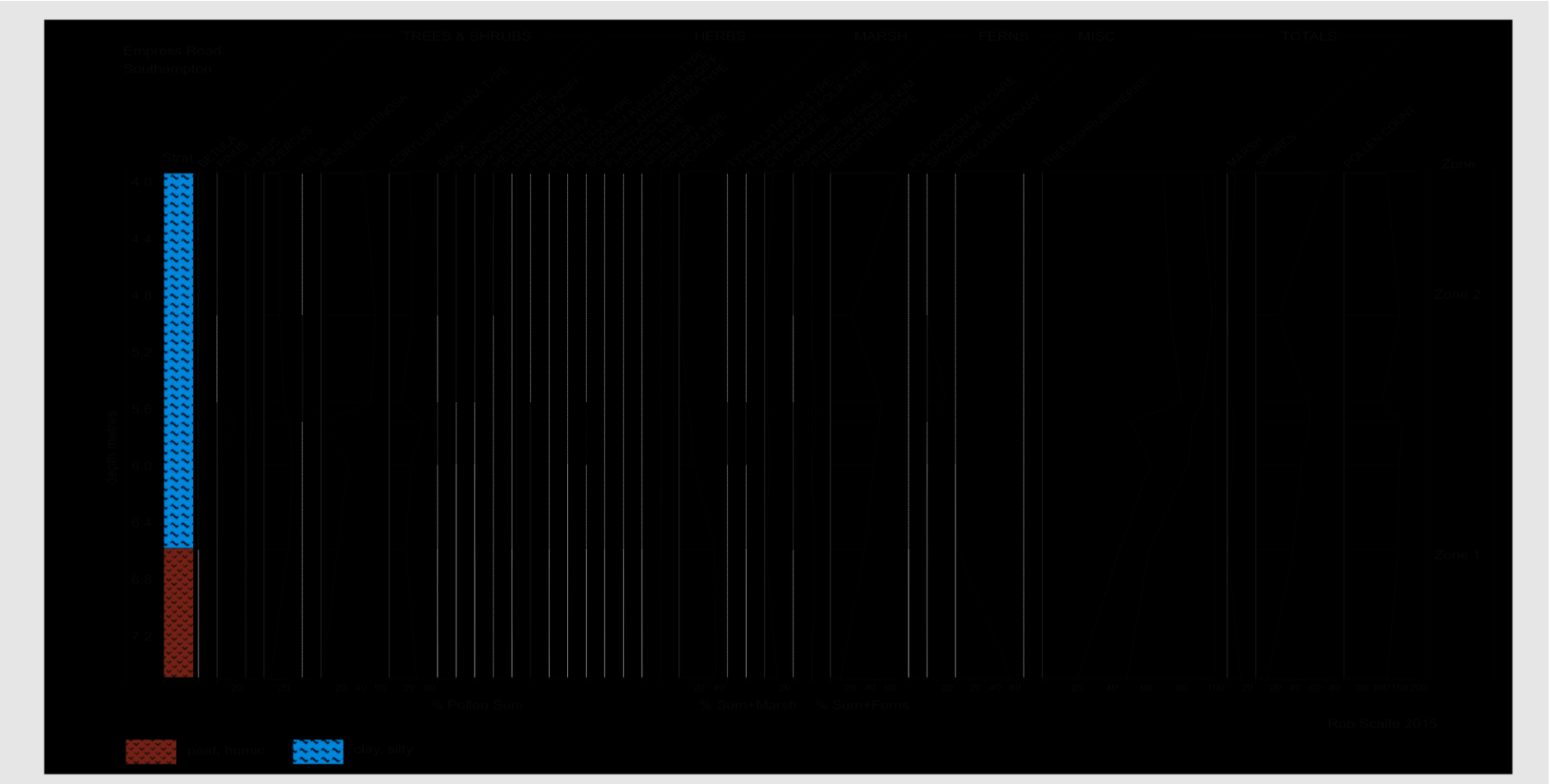
10.3.4.1 The on-site vegetation: The stratigraphical change from minerogenic (silty-clay) sediment to highly humified peat is mirrored in the changing pollen assemblages of the on-site vegetation (Table 6). It is probable that these stratigraphical changes occurred in response to regional sea-level rise. Post glacial eustatic change affected the freshwater fluvial systems by ponding-back. This expanded wetland habitats and, instigated a hydroseral vegetation succession. Here such initial waterlogging was accompanied by growth of a grass sedge fen (7.50m) on a floodplain with overbank sedimentation which was also laden with reworked geological palynomorphs derived from earlier alluvial sediment or eroded bedrock. Occasional Salix (willow) pollen, which is under represented in pollen spectra, indicates some local growth although fluvial transport may also be responsible.

Initially, Alnus (alder) was not present but became progressively more important as it colonised the region and entered suitable wetland/marsh habitats. This is apparent from 6.60m after which alder pollen numbers/percentages increase progressively except for one anomalous level. This was accompanied by change to a peat forming community and it is clear that alder developed into dominant alder carr floodplain woodland (Alnetum). This was a relatively dry habitat which had high biological activity in the summer and this is the reason for poor pollen preservation in some samples. The change to carr woodland is mirrored by a reduction in fen herb taxa. The habitat was probably subject to winter flooding for up to three months, the maximum which alder can tolerate (Tansley 1939). This habitat remained throughout the time-span represented in the peat sequence. The ground flora and damper areas maintained some fen herb vegetation with Cyperaceae (sedges) and Osmunda regalis (Royal fern). The large numbers of Dryopteris type spores are from typical ground flora ferns. The high values are also an indication of the poor preserving condition and differential preservation in their favour.

Whilst it is probable that the changes in stratigraphy and the on-site vegetation resulted from positive (relative) sea- level change which is well documented for the Solent (Long and Scaife 2011), there is little palynological evidence for this at Empress Road. Only Plantago maritima (sea-plantain) is recorded from the lower level. However, as noted, the effects of eustatic change will have manifested itself well into the freshwater zone (of the Itchen) above the limits of saline influence. It is also probable that peat accumulation was keeping pace and was in equilibrium with rising water table to give the substantial thickness found here. This may have been over a relatively short time-span as for such a thickness of humic material, there are few substantial changes in the pollen stratigraphy.

10.3.4.2 The dry-land vegetation: The dominance of alder on the sample site and its high pollen production and over representation in pollen spectra (Andersen 1970, 1973, Janssen 1959) will have had a strong taphonomic effect on the pollen

Table 6: Empress Road. Local pollen zonation and palynological characteristics of the profile



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assemblages of other taxa. The density and micro-climate of the alder carr will have restricted pollen input to the site (Tauber 1967). Adjacent areas of better drained heavy soil provided a woodland component of Quercus (oak) and Corylus (hazel). Ulmus (elm) pollen is also consistently present and was a component of this woodland. There was some increase in the upper peat (\l.p.a.z. 2). This woodland appears to have changed little during the period represented by the peat accumulation. The reduction of the tree taxa in l.p.a.z.2 is attributed to the increase of alder (within the pollen sum as noted above). Betula (birch) and Pinus (pine) are high pollen producers of anemophilous pollen with a strong propensity for long distance transport. The small values recorded here are, therefore, not regarded as significant.

10.3.4.3 Empress Road in relation to the known local Palaeoecology
Watler (1998) and Williamson's (2000) pollen data from the Itchen are from relatively close proximity to Empress Road. These sites show typical early Holocene tree and shrub migration and succession as the principal woodland trees responded to climatic amelioration at the end of the last cold stage (Devensian). Typical expansion, to dominance, of Betula (birch) is seen and was followed by a period of dominance of Pinus (pine) and Corylus (hazel). Subsequently Quercus (oak) and Ulmus (elm) deciduous woodland, being more competitive, ousted the pioneer birch and pine. Alnus (alder) and Tilia (lime) were incoming towards the end of the early Holocene (Fl.Ic). However, Watler also noted an Early Holocene, but minor expansion of alder which compares with other data from the early Holocene from the Mountbatten Centre (Scaife 1988a). These data compare with those from other local, early Holocene sites including the classic study of the George V Dock (Godwin and Godwin 1940) and the more recent analyses undertaken at Southampton sites prior to urban development. These include Kent Road (Scaife 1992b), A3057 (Scaife 1997); Mountbatten Park (Scaife 1998a) and Hotel Ibis, West Quay (Nichols and Scaife 2008). Further afield but also with records of Flandrian Chronozone I vegetation are, Langstone Harbour (Scaife 2000); Nursling (Seagrief 1959), Testwood (Scaife 1992a) and Bouldnor Cliff (Scaife 2001, 2011). These sites provide detail of the changing status and dynamic biogeography of the early Holocene period for this region.

It is, however, clear that the Empress Road pollen profile is not comparable with the Itchen profiles of Watler and Williamson being much older. One of the most diagnostic aspects of the middle Holocene (late Mesolithic) and late prehistoric period until the middle Bronze Age was the importance of Tilia (lime) dominated woodland. This tree was one of the last to arrive prior to separation of Britain from mainland Europe. Subsequently it became dominant, or at least co-dominant, with oak over large areas of southern and Eastern England until anthropogenic clearance in the late Neolithic to middle Bronze Age (Birks et al. 1975; Birks 1989; Moore 1977; Scaife 1980, 2000; 2003; Greig 1982). Such lime woodland is also seen at a number of Southampton sites including Kent Road Depot, Mountbatten Park, West Quay and Western Esplanade.

The Empress Road sediment profile represents a rapid peat accumulation which occurred before the establishment of lime woodland and after the earlier dominance of pine.

10.3.5 Summary and conclusions
The following principal points can be made.

- Sub-fossil pollen and spores were recovered from seven of the eight samples examined. Pollen was absent in the basal sample at 7.62m -7.60m.

- Pollen preservation and absolute pollen numbers were poor. This is attributed to the environment of deposition in a biologically very active semi-terrestrial environment of the floodplain alder carr woodland.

- The vegetation record is very homogeneous for such a thickness of peat, but two local pollen assemblage zones have been recognised which relate to the on-site seral change from a grass-sedge floodplain (zone 1) to one of dominant alder carr woodland (zone 2).

- There was no evidence of human activity.

- The data from Empress Road has been compared with the nearby River Itchen profiles of Watler and Williamson and other pollen data from the Southampton region as a whole. Whilst the other Itchen sites show typical early Holocene seral woodland development with birch, pine, hazel, oak and elm, this is not present at Empress Road, where the dry-land woodland comprised oak and hazel with some elm.

- The profile precedes the previously analysed profiles with peat accumulating asynchronously in response to changing regional sea-level and fluvial and ground water response.

10.4 The Botanical remains

By A Davies, Museum of London Archaeology

Eight bulk samples from a sequence at Empress Road were processed by wet sieving and the residues stored in water. The residue from the lowest sample in the sequence (7.50 – 7.60m) consisted mostly of sand, with occasional very small fragments of vegetation, but all other residues were very organic, and composed largely of wood, root/lets, unidentified plant epidermis and a little moss. Seeds were very rare in all samples, with fewer than 10 seeds from each sample. It is therefore not possible to make a detailed environmental reconstruction, but a few observations can be made.

Several seeds of pondweed (*Potamogeton* sp.) were the only species seen in the sandy basal sample (7.50–7.60m), indicating the presence of standing water at this time. Each of the samples between 6.33m and 5.50m included a number of sedge (*Carex* sp.) seeds, suggesting the continuation of a wet or damp environment, as did single observations of burr-reed (*Sparganium erectum*) at 5.70–5.80m and possible yellow iris (cf. *Iris pseudocorus*) at 5.80–5.90m. The large amount of vegetation preserved in these samples suggests that silting had occurred and a marshy environment developed.

Seeds and catkins of alder (*Alnus glutinosa*) in samples from 6.12–6.23m and 4.95–5.00m are consistent with a damp, waterside environment and further evidence for trees in the landscape was seen in the form of hazel (*Corylus avellana*) nut shells at 6.23–

6.33m and 5.9–6.0m, and birch (*Betula* sp.) seeds in the three samples between 6.33 and 5.9m, and the top sample from 4.95 to 5.00m (though birch seeds may have been blown from some distance away).

Occasional evidence of dry-ground plants was also seen in most samples, with the largest number (though only four taxa) from 6.12 to 6.23m. Occasional fragments of beetle exoskeleton were seen in three samples from 7.50–7.60m, 6.12–6.23m and 4.95–5.00m.

10.5 The Radiocarbon dating

Two radiocarbon dates were submitted to Beta Analytic for AMS dating in order to ascertain the absolute age of the sequence. The δ ^{13}C levels confirm the samples are from terrestrial and not aquatic plants. Terrestrial trees and plants preferentially uptake the lighter isotopes of carbon (resulting in a ratio of approximately -25‰ or -26‰) while relative enrichment of ^{12}C takes place in freshwater and marine plants resulting in less negative values (-16‰ and -15‰ respectively). When dating terrestrial plant material, samples are corrected if the δ ^{13}C deviates from c -25‰. The radiocarbon dates are presented in Table 7 and the material submitted is shown in Photo 1 and Photo 2.

Table 7: Radiocarbon dating results.

Sample Elevation (m OD)		Lab code	Service	Material Pre-treatment	Measured Age	d13C	Conventional Age	2 Sigma Calibration
Top	Base							
-3.9	-4.03	BETA 408321	AMS	Acid/Alkali/Acid	10050 +/- 30 BP	-28.4 o/oo	8990 +/- 30 BP	Cal BC 8275 to 8215 (Cal BP 10225 to 10165)
-1.52	-1.57	BETA 408320	AMS	Acid/Alkali/Acid	6920 +/- 30 BP	-29.2 o/oo	6850 +/- 30 BP	Cal BC 5765 to 5670 (Cal BP 7715 to 7620)

11 Conclusions

11.1 The lowest deposit was the London Clay. Above it, from -5.27m OD, were sands and gravels (facies 1). These have been interpreted as Pleistocene deposits. The overlying sand and silt (facies 2) contained botanical remains that indicate a Holocene (Mesolithic) date. The presence of pond weed seeds within this unit indicates standing fresh water at this time. This environment then shows signs of silting up, with increased organic content (unit 1.3, section 10.1.1) in the sediments above suggesting vegetation encroachment and continued standing water.

11.2 Peat (facies 3), as opposed to organic clay, is recorded from -4.27m OD. On visual inspection this lower peat (unit 1.4, section 10.1.1) appeared to be a reed peat rather than a wood peat and the macro-botanical remains indicated sedge and reed vegetation, but the basal pollen sample did indicate the presence of a wooded alder wetland and the diatom evidence indicates shallow brackish waters but with no evidence of tidal marine inundation. This basal level has been radiocarbon dated to the early Mesolithic (Cal BC 8275 to 8215 (Cal BP 10225 to 10165) BETA 408321, Table 7) and the palaeoenvironmental evidence is consistent with that date. The mix of sedge and alder in the different environmental proxies may indicate the early encroachment of alder in this part of the landscape. Alder catkins become more prevalent in the macro-botanical remains towards the top of this unit as the woodland carr becomes dominant and the diatom evidence suggests tidal inundation had begun to affect the area by the top of this unit (at -3.57m OD). Similar conditions and vegetation prevail into the overlying peat units (units 1.5 and 1.6).

11.3 From -3.12m OD (facies 4) vegetation growth and organic accumulation appears to have halted, at least in the immediate vicinity with silty clays (units 1.7 and 1.8, section 10.1.1) representing an unstable landscape prone to more frequent inundation and possible mudflat formation. These were intespersed with very short-lived periods of stabilisation and vegetation represented by thin (c 0.05m thick) bands of peat (units 1.8 and 1.10, section 10.1.1). The upper most of these vegetated horizons was radiocarbon-dated to the mid-Mesolithic (Cal BC 5765 to 5670 (Cal BP 7715 to 7620) BETA 408320, Table 7). Little or no change is present in the pollen between these vegetated horizons.

11.4 The changes in lithology, vegetation and hydrology likely resulted from positive relative sea- level (RSL) change, well documented for the Solent (Long and Scaife 2011). It appears that the sequence at this site demonstrates early Holocene pooling water, early to mid-Mesolithic vegetation growth around this backwater pool and a slow reduction of standing water until the formation of post mid-Mesolithic mudflats after tidal inundation from -1.52m OD. The off-site pollen evidence suggests the river valley was surrounded predominantly by oak and hazel woodland, but birch cannot have been far away as birch seeds were present as macrofossils.

11.5 From -1.52m OD the early to mid-Mesolithic peat and clay sequence is overlain by redeposited/disturbed clays, undated but probably 19th century, overlain by Victorian and later made ground (unit 1.11, section 10.1.1).

11.6 The base of the peat (10225 to 10165 cal BP), is the earliest date to be obtained from a layer of peat in the Itchen valley. To the north at SOU 1607 the base of the peat was 0.53m above a soil layer dated to 11100-10740 cal BP, and may be a similar date, but the peat itself was not dated.

11.7 The top of the peat marks the point at which sea water entered the Itchen. At Empress Road this was at c.-1.55m OD, radiocarbon dated to the mid-Mesolithic period (7715 to 7620 cal BP). The peat at SOU 1607 to the north appears to have been deposited at a higher level, -0.9m OD, at an earlier date (8430-8340 cal BP).

11.8 Other dates for peat in the Itchen have been calculated on their pollen content. At SOU 881 the peat was thought to be between *c.*7550 BP and *c.*6050 BP (Watler 1998), and downstream at MSH2970 the peat was thought to have been deposited in the early Holocene period (*c.* 8500 to 7500 BP) and again in the later Middle Holocene period (*c.* 7000 to 5000 BP) but the peats were not radiocarbon dated (Williamson 2000).

11.7 The Empress Road site therefore provides important new evidence for the early chronology of the river Itchen. The earliest peat (dated to the early-Mesolithic) probably lay in a narrow channel and this is the first time it has been found; the latest peat ties in with the dates from nearby sites suggesting a wider deposit of peat in the mid-to late-Mesolithic period.

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Appendix 1. Context list

Stone abundance: 0 = virtually stone free; 5 = gravel

Context	Category	Keyword	Munsell Page	Munsell No	Texture	Stone abundance	Period
1	Layer	Piling mat			Rubble	5	Modern
2	Layer	Site	10YR	5/1	Sandy clay	0	Modern
3	Layer	Site	10YR	3/1	Silty clay loam	1	Late 19th C
4	Layer	Peat	10YR	3/3	silt	0	Prehistoric
5	Layer	Whitecliffe Sand	Gley 2	4/15B	Sandy clay	0	Palaeogene
6	Layer	Site	10YR	6/2		1	Modern
7	Layer	London Clay	10YR	4/3	clay	1	Eocene
8	Layer	Site	5Y	5/2	Silty Clay	2	Modern
9	Unstrat	Unstrat					Modern