Floating Landing Stages, Cambridgeshire

Geoarchaeological Watching Brief Report:

By Carl Champness

on behalf of

Atkins and Fugro Engineering Service Ltd

June 2012

Oxford Archaeology

Report Number:	V1
Site Name:	Geoarchaeological Watching Brief Report: Floating Landing Stations, Cambridgeshire
HER Event No:	-
Date of Works:	October 2011
Client Name:	Fugro Engineering Services Ltd and Atkins Global Ltd
Client Ref:	
Grid Ref:	Water Newton – TL 10887 97356 - BH1, Brownshill – TL 37055 72767 - BH6, Denver – TF 58804 01051 - BH3, Hermitage – TL 39324 74664 - BH5 / Hermitage Lock Marina - BH7, Old Bedford – TF 58675 01593 - BH4 and Salters Lode –TF 58636 01646 - BH2
Site Code:	CAFLS11
Finance Code:	CALANSWB
Receiving Body:	CCC stores Landbeach
Accession No:	N/A

Prepared by: Carl Champness
Position: Geoarchaeologist
Date: May 2012

Checked by: Rebecca Nicholson
Position: Environmental Manager
Date: June 2012
Signed: ....

Disclaimer
This document has been prepared for the titled project or named part thereof and should not be relied upon or used for any other project without an independent check being carried out as to its suitability and prior written authority of Oxford Archaeology being obtained. Oxford Archaeology accepts no responsibility or liability for the consequences of this document being used for a purpose other than the purposes for which it was commissioned. Any person/party using or relying on the document for such other purposes agrees and will by such use or reliance be taken to confirm their agreement to indemnify Oxford Archaeology for all loss or damage resulting therefrom. Oxford Archaeology accepts no responsibility or liability for this document to any party other than the person/party by whom it was commissioned.

Oxford Archaeology East,
15 Trafalgar Way,
Bar Hill,
Cambridge,
CB23 8SQ
t: 01223 850500
f: 01223 850599
e: oaeast@thehumanjourney.net
w: http://thehumanjourney.net/oaeast

Table of Contents

Summary

In October 2011 Oxford Archaeology undertook a Watching Brief on geotechnical boreholes associated with the creation of series of new floating landing stages adjacent to seven locks across Cambridgeshire and Norfolk. The scheme aimed to provide new or replace existing landing stages for users of the waterways to safely moor whilst using the locks.

The drilling of 7 boreholes were monitored across three main sites: Water Newton, Downham Market, and Earith. The purpose of the Watching Brief was to provide base-line data regarding the character, extent and archaeological potential of the alluvial and peat stratigraphy that may be effected by the Scheme. The borehole samples were examined for signs of archaeological indicators and were sub-sampled for further sedimentary analysis and radiocarbon dating.

Despite the sites being located near to areas which have previously produced significant prehistoric, Roman and Medieval archaeology, no archaeological deposits were identified within the boreholes sequences.

A series of boreholes were taken through the base of the modern river beds revealing that the Fenland sequence has been significantly truncated or removed in these locations. Prehistoric Fen peat deposits was only found to be preserved along the river banks at the Earith and Downham Market sites. These sequences have the potential to preserve import early prehistoric remains and contain a sequence of environmental and hydrological change that spans the Holocene. The surface of these peats are preserved at depths of 5.25m bg (-1.25m OD) at Salter Lodge, 4.65m bgl (+0.15m OD) at Denver Lock, 3.6m bgl (-0.9m OD) at the Old Bedford Sluice and 4.45m bgl (+1.95m OD) at Hermitage Lock. The peat sequences accumulated from the early Bronze Age into the late Roman period.

Two of the sequences provided indirect evidence of archaeological potential, in the form of buried soils at Water Newton (BH01) and Downham Market (BH04). In the former, an early Mesolithic landsurface was found sealed underneath a lower peat overlain by channel deposits. A later buried alluvial soil containing charcoal was also identified within OABH4 underlying post-medieval made-ground deposits, possibly associated with the digging of the Old and New Bedford rivers.

The main impact of the proposed Scheme will be predominantly from piled structures in the base of the modern riverbeds. Only at Salter's Lode, Old Bedford Sluice and Hermitage Lock will adjustments be made to the river banks to aid site access. The bank-side modifications are to be confined to a depth of 1m and will leave the identified buried surfaces and Nordelph peat sequence unaffected by these works.

1 Introduction

1.1 Location and scope of work

1.1.1 In October 2011 Oxford Archaeology was commissioned by Atkins/Fugro Engineering Services Ltd to undertake a Watching Brief on geotechnical boreholes associated with a Floating Landing Station Scheme adjacent to seven locations across Cambridgeshire and Norfolk. The project aims to provide new landing stations (or replace existing ones) to provide users of the waterways in these areas with a safe place to moor their boats whilst they utilise the locks.

1.1.2 The primary aim of the Watching Brief was to provide base-line data regarding the character, extent and archaeological potential of the buried Holocene fen and peat stratigraphy that may be affected by the Scheme. Each of the boreholes was monitored on site by a geoarchaeologist and samples were retained and submitted for further sedimentary assessment and for dating.

1.1.3 This report outlines the results of the Watching Brief and radiocarbon dating, whilst assessing the potential impacts of the scheme on any buried archaeological resource.

1.2 Geology, topography and land-use

Background

1.2.1 The sites are located across the southern part of the Fenland Basin, which was formerly a low-lying natural marsh and tidally influenced area just above sea-level. The fens were artificially drained from the 17th century onwards, up to the present-day. The area is protected from further flooding by tall drainage banks, a network of drainage ditches and pumps. With the support of a large drainage system, the Fenland has become a major arable agricultural region in southern England.

1.2.2 This area has seen a complex sequence of sedimentation and landscape change since the end of the last glaciation. During the past 10,000 years (Holocene or Flandrian periods) infilling of the Fenland Basin has occurred as a result of rising sea-level and local processes which has resulted in the accumulation of up to c. 30m of sediment in the deeper parts of the Basin (Waller 1994, Wheeler and Waller 1995). The sediment sequences comprise intercalated freshwater peats, alluvial silts, clays and lacustrine deposits, as well as minerogenic sediments indicative of brackish water incursion.

1.2.3 The formation of these deposits has attracted a great deal of research; as early as the 1800s Skertchly recognised the complexity of the Fenland sediment sequences (Skertchly 1877, cited in Waller 1994).The Fenland Research Committee was established in the 1930s, which, pioneered by Sir Harry Godwin, resulted in a number of seminal papers on the stratigraphy of the Fenland deposits. Godwin was largely responsible for the establishment of a four-part chronostratigraphic division of Basal/Lower Peat, Fen Clay, Upper Peat, and Upper Silt. However, the major limitation of this work was the lack of absolute dating, and Godwin's studies were concentrated in the southern Fens. Subsequently, further and more widespread research in the

1950s, coupled with the advent of radiocarbon dating, highlighted major flaws with the existing chronostratigraphic divisions. During the 1970s the British Geological Survey established a new tripartite division (Gallois 1979, cited in Waller 1994 and Wheeler & Waller 1995). This system, however, still retained the very broad stratigraphic units adopted by Godwin, and has also since been found to be too simplistic and imprecise (Wheeler and Waller 1995).

<table>
<tr><th>Skertchly (1877)</th><th>Godwin and Clifford (1938)</th><th>Gallois (1979)</th><th>Wyatt (1984); Horton (1989); Horton and Aldiss (1992).</th></tr>
<tr><td rowspan="2">Fen Silt</td><td>Upper silt</td><td>Terrington Beds</td><td>Terrington Beds</td></tr>
<tr><td>Upper peat</td><td>Nordelph Peat</td><td>Upper leaf of the Nordelph Peat</td></tr>
<tr><td rowspan="6">Peat</td><td rowspan="5">Fen Clay</td><td rowspan="5">Barroway Drove Beds</td><td>Upper member of the Barroway Drove Beds</td></tr>
<tr><td>Lower leaf of the Nordelph Peat bed</td></tr>
<tr><td>Lower member of the Barroway Drove Beds</td></tr>
<tr><td>Middle Peat</td></tr>
<tr><td>Lower member of the Barroway Drove Bed</td></tr>
<tr><td>Lower Peat</td><td>Lower Peat</td><td>Lower Peat</td></tr>
</table>

Table 1: Generalized Holocene stratigraphy of the Fen Basin (from Wheeler and Waller, 1995).

1.2.4 It should also be noted that at an individual site scale, especially in Fen edge situations, the sequences may be complex, vertically conflated and strongly influenced by local topography and hydrology. Not every event will be represented in every sequence and there may be confusion in the application of the macro-stratigraphic overview of the Fenland sequence, particularly in the absence of absolute dating evidence.

1.2.5 Most of the areas encompassed by the present Watching Brief are drained and cultivated former peat fen. The topsoil is mainly peat derived and represents a fertile and easily farmed soil. The topsoil and peat, however, are wasting away as a result of drainage and farming. The area is accessed by wide regularly laid out dirt tracks, locally termed 'droves'. They are accompanied by deep drainage ditches on either side and are raised slightly above the surroundings. Usually the droves are slightly raised due to wastage of peat on the surrounding arable land.

1.2.6 The site specific geology of the three main areas is described in more detail below:

Water Newton Site

1.2.7 The surface geology of the area is predominantly mapped as alluvial deposits overlying Jurassic Grantham Formation - Sandstone, Siltstone And Mudstone (BGS sheet 158 scale 1:50,000). The site is located at the edge of the Nene river valley, close to the Pleistocene river terrace located to the south where the current village of Water Newton now lies. The deposits likely to be encountered within this area comprise inter-stratified sequences of Holocene fluvial and alluvial clays, silts and peats associated with a floodplain sequence.

Downham Market sites (Salter's Lode, Old Beford Sluice and Denver Lock)

1.2.8 The surface geology of the area is predominantly mapped as tidal mudflats (BGS sheet 159 scale 1:50,000), with a swathe of alluvium/peats present to the south associated with the Ouse Washes. The underlying bedrock is mapped as Jurassic Kimmeridge Clays that rise up to the east and west. The sites are located at the mouth of a narrow river valley of the Great Ouse, at the edge of the main tidal zone.

Earith sites (Hermitage and Brownhill Locks)

1.2.9 The surface geology of the area is predominantly mapped as alluvium (BGS sheet 187 scale 1:50,000), with a swathe of alluvium present associated with the Ouse Washes to the north. No Holocene deposits are mapped on the higher ground to the south of the site where there are outcrops of Kimmeridge Clay. It is likely that shallow Holocene peat deposits once extended further into the margins of these areas. Discrete deposits of Pleistocene river gravels and fluvial glacial deposits are noted skirting the fen edge and these are likely to extend beneath the Holocene sequences within the area.

1.2.10 This area lies beyond the established limit of the Fen Clay marine incursion and the sequences become shallower against the areas of higher ground. The higher ground which defines the Isle of Ely only became isolated as a fenland island at the start of the middle Bronze Age (c.1500 BC). During this period marine incursion from the north resulted in the backing up of freshwater systems and expansion of marsh and fen environments (Evans 2003).

1.3 Archaeological and historical background

1.3.1 No previous desk-based assessment for the project has been undertaken of the known archaeology potential of the proposed sites. However, archaeological sites and findspots are known within the areas surrounding the sites from the Norfolk and Cambridge Heritage Environmental Records.

Water Newton site

1.3.2 Scatters of Mesolithic and Neolithic tools and worked stone indicate that the margins of the River Nene were extensively exploited by hunter-gatherers. This activity appears to have been focused along the floodplain edge, indicating that hunter-gatherer communities were exploiting the rich resources of the floodplain.

1.3.3 The extensive Bronze Age ritual platform and post alignment at Flag Fen lies *c.17*km to the west of the site, with the field systems of Fengate (Pryor 2001). This area was a shallow, open fen basin, which was sufficiently dry to permit the construction of the Flag Fen settlement, although the repeated rebuilding and artificial raising of this settlement may reflect rising water levels. The site was abandoned by the end of the Bronze Age.

1.3.4 During the South West Fen Dyke Survey, archaeological observation of Mustdyke, between Flag Fen and the channelled River Nene, noted a buried soil cut by features, some containing charcoal and Bronze Age flints. Elements of the Flag Fen timber platform were noted, as was the Fen Causeway (French & Pryor 1993, 92-7, 100).

1.3.5 The village of Water Newton also lies in a rich Roman landscape dominated by the '*vicus*' of *Durobrivae*, together with roads, forts, villas and industrial sites, the distribution of which stretches across the parishes of Water Newton, Chesterton, Castor and Ailsworth, in the broader context of the Lower Nene Valley. The main industries were specialised in iron working and pottery manufacture that developed on both sides of the river.

1.3.6 The site is located in an area of significant Roman and Saxo-Norman activity identified within the village of Water Newton, principally a Roman villa located towards the south east of the village (Butcher & Garwood 1994). Both Roman and Saxon features in the form of ditches and gullies have been identified underneath the village (O'Brian 2003). Apart from these ditches, the principal archaeological features are a Roman quarry and a possible Roman stone coffin found within the chapel graveyard (Casa-Hatton and Wall 1999). Excavation at Mill Lane has also revealed evidence of Roman, Saxo-Norman and medieval field boundaries and drainage ditches in the low-lying floodplain of the river Nene.

1.3.7 One of the major discoveries made close to the site is the Water Newton Treasure or Silver Plate, indicating the presence of a wealthy proto-Christian community at *Durobrivae* in the fourth century. A late Saxon and medieval settlement is also located to the south west of the village buried partly underneath the present dual carriageway. In 1958 excavations revealed a late Saxon stockade and ditch (possibly associated with a hall) and a series of 13th century drystone walls, sheepfolds with gates, ditches, ovens and small pits (Webster and Green 1964).

1.3.8 There is high potential for the site to contain prehistoric to early Medieval archaeology associated with the nearby settlements and associated areas of activity on the floodplain. This may include features such as drainage ditches, middens and wooden structures (e.g. bridges and waterfronts) associated with the river edge.

Downham Market sites (Salter's Lobe, Old Beford Sluice and Denver Lock)

1.3.9 The area has been the focus of significant Roman activity along the line of the Fen Causeway, a Roman road. The causeway runs from a junction with Ermine Street and King Street near Peterborough, across the Cambridgeshire and Norfolk fens. In places the road is known to run along the crest of a roddon (a former natural watercourse) and is therefore quite sinuous, while straighter sections may follow an artificial canal close to the sample sites.

1.3.10 In Norfolk, the Fen Causeway runs between Upwell and Denver, but in places there is more than one possible route. East of Denver, the road possibly divides into two, with one route heading due east to the Roman town of *Venta Icenorum* at Caister St Edmund and the other heading northeast towards the Roman town at Brampton.

1.3.11 In the surrounding fields to the site the road is visible as a cropmark on aerial photographs, whilst in several places it survives as a landscape feature. Sections of the road have been excavated on a number of occasions, revealing a metalled surface and side ditches. At Denver, it is dated to the 1st century AD, and there is evidence of extensive settlement and salt production beside it, just west of the current sites (Allen 2000).

1.3.12 Excavations at Downham West in 1993 revealed a complex sequence of deposits, including the roddon of a natural watercourse into which the Roman canal had been dug, probably in the early 2nd century AD. A road surface was found to pre-date the canal, while a second road surface probably ran beside the canal.

1.3.13 There is therefore medium to high potential that these sites may contained evidence of Roman channel/fen edge activities associated with a variety of activities like fishing, salt-making, trapping and river transport.

Earith sites (Hermitage and Brownhill Locks)

1.3.14 Two major parts of the landscape appear to have attracted occupation in this area: the fen and the River Ouse. Recent environmental research in the fen has shown that the recorded episodes of Mesolithic marine transgression did not affect marginal areas of the southern fen until the later prehistoric period. The fen near Earith remained mostly dry until *c*. 1000 BC, offering flood-free grazing all year around (Evans 1987, 27ff.). As a consequence, many sites which now appear to be located in the fen were originally distributed along the old course of the Ouse which acted as a corridor of communication and movement.

1.3.15 Evidence of prehistoric activity in the form of flint scatters and cut features has been recorded in the higher clays of the western side of the Isle of Ely, largely as a result of more recent investigations as a result of commercial development and gravel extraction. The evidence suggests low-level activity probably reflecting seasonal visits during the Neolithic and Bronze Age (Evans 2003, 8).

1.3.16 During the Roman period the surrounding river gravels were densely settled. The best known site is that excavated at Fen Drove, some 0.5Km to the north-east of Earith (Tebbutt 1941; Green 1955). Recent investigations at Colne Fen have also confirmed a strong Roman presence in the area (Evans and Patten 2003; Regan 2001a, 2001b and 2003; Regan and Evans 2000).

1.3.17 Both within and immediately outside Earith, Roman occupation is characterised by a significant linear distribution of finds along the banks of the palaeochannels of the Great Ouse. Saxon remains are more elusive, although the place-name might suggest a Saxon origin. The village is first recorded as *Herethe* in 1244 from the Old English *ear* and *hyd*, meaning 'muddy landing place' (Mawer and Stenton 1926, 204).

1.3.18 A Civil War fort known as the Bulwark was strategically placed to command an important river crossing. The monument includes earthworks comprising a square inner enclosure, corner bastions, perimeter defences and outworks as well as a small steel-domed gun emplacement positioned within the earlier fortifications during World War II.

1.3.19 There is high potential for the site to contain archaeology of multiple periods ranging from prehistoric to Civil War along the banks of the waterways.

2 Aims and Methodology

2.1 Aims

2.1.1 The aims of the Watching Brief can be defined as follows:

- To characterize the sequence of sediments and patterns of sedimentation throughout the sites, including depth and lateral extent of major stratigraphical units and the nature of any basal land surface pre-dating the Holocene sediment deposition and peat formations.
- To identify significant variations in the deposit sequence indicative of localized features such as topographical highs or palaeochannels.
- To identify the location and extent of any waterlogged organic deposits and address the potential and likely location of the preservation of archaeological and palaeoenvironmental remains.
- To clarify the relationship between sediment sequences with periods of soil formation and peat growth and the effects of relatively recent disturbances including the location and extent of made-ground.
- To assess the potential impact of the scheme on the buried archaeological resource.
- To develop a chronostratigraphic framework from the sedimentary sequence for each area.

2.2 Methodology

2.2.1 The excavation of 7 boreholes was monitored across the three main site areas by a geoarchaeologist. The boreholes were drilled using a shell and auger cable percussion rig up to depths of 6-15m from both river edge locations and from several floating platforms located in the river. Bulk and disturbed samples were retrieved at intervals for geotechnical purposes as well as a smaller number of *in-situ* piston samples.

2.2.2 The sediments were described according to Jones *et al* 1999 *The Description and Analysis of Quaternary Stratigraphic Field Sections,* Technical Guide No 7, Quaternary Research Association 1999, to include information about depth, texture, composition, colour, clast orientation, structure (bedding, ped characteristics etc.) and contacts between deposits. Notes were also made on the presence/absence of visible ecofactual, or artefactual inclusions.

2.2.3 The lithological data from each sample location was in-putted into geological modelling software (©Rockworks14) for analysis and correlation of deposits into key stratigraphical units. These units have been used to demonstrate and describe the nature of sediment accumulation patterns across the sites.

3 Results

3.1 General

3.1.1 The evidence from the boreholes revealed that a range of different sediment types are present throughout the site areas. A number of broad stratigraphical units have been identified. It should be noted, however, the sedimentary sequence demonstrated considerable variation in lithology and further subdivision, which proved difficult to compare samples given the large distances and different geomorphologies between sample locations.

3.1.2 The results presented in the main text of this report provide an overview of the findings of the geoarchaeological field monitoring. The detailed descriptions of the borehole logs are included in Appendix A. Each sedimentary unit is referred to in terms of positive depths below borehole ground level (bgl) and metres above sea-level (m OD).

3.1.3 The sediments are discussed in terms of both the individual sample locations and the wider fenland sequence.

3.2 Stratigraphic sequence

3.2.1 Details of the main stratigraphic units are presented in Table 2 based on elevation of the surface of the deposits (m OD) and include the following in order of deposition:

1. Bedrock (BC)
2. Pleistocene gravel (GRAV)
3. Lower peats (LP)
4. Lower silts and clays (LC)
5. Upper peat complex (UP)
6. Upper silty/sandy clays (UC)
7. Topsoil (TS)

No	Name	Easting	Northing	Top:TS	UC	UP	LC	LP	GRAV	BC
BH01	Water Newton	510910	297406	+7.40	+7.20	-	+5.20	+4.70	+3.80	+3.60
BH02	Salter's Lode	558639	301652	+5.25	+5.05	-1.25	-3.25	-	-	-6.45
BH03	Denver Lock	558790	301064	+4.65	+4.50	+0.15	-1.85	-	-	-3.8
BH04	Old Bedford Sluice	558552	301470	+3.60	+1.80	-0.9	-4.1	-	-	-6.15
BH05	Hermitage Lock	539301	274661	+4.45	+1.95	-1.25	-	-	-1.85	-6.05
BH06	Brownshill Lock	536981	272762	+0.45	-	-	-	-	-1.75	-4.95
BH07	Hermitage	539282	274678	+0.50	-	-	-1.7	-	-5.5	-6.4

	Lock									

Table 2: Stratigraphy summary

3.2.2 A more detailed discussion of the specific borehole sequences are described and discussed below:

3.3 Water Newton Landing Stage (BH01)

3.3.1 One borehole was drilled at the edge of the gravel terrace at the interface with the floodplain of the River Nene. The borehole was drilled in a pasture field next to the boundary ditch and bank, approximately 15m north of the present lock.

3.3.2 The bedrock was encountered at a depth of 6.50m bgl (+0.90m OD) in BH01 as a stiff blackish grey silty clay with a platy structure. This was overlain by a thick sequence of Pleistocene fluvial laminated sands and sandy gravel deposits to a depth of 3.80m bgl. A transitional deposit of fine silty sands and organic silts were encountered above and separated the gravels from the overlying peats. These deposits appear to mark the transition from the late Pleistocene to the onset of the Holocene.

3.3.3 A fibrous organic silts was found to overly the Pleistocene sands and gravels between 3.50m and 2.70m bgl in depth (+3.90m and +4.70m OD). These deposits probably formed within a low-energy floodplain environment, representing a range of shallow wetland environments. The deposits also contained occasional whole shell freshwater molluscs and decayed plant remains.

3.3.4 The organic silts were overlain by a sequence of soft grey structureless silty clay deposits that were only briefly interrupted by the development of thin organic silt at 2.20-2.30m bgl (+5.20m and +5.10m OD). The deposits would have formed within a waterlogged channel environment. These deposits became more oxidised and yellowish brown in colour further up the sequence, potentially representing a period of drying-out. The sequence was overlain by moderately firm dark greyish brown alluvial silty topsoil.

3.3.5 No archaeological material or deposits were identified within the floodplain sequence. The deposits appear to represent the development of an early transitional shallow wetland environment that survives at the edge of the floodplain. This area was later fluvially active which appears to have removed any later prehistoric peat sequence within the area.

3.4 Downham Market Landing Stages (BH02-BH04)

3.4.1 Three boreholes were drilled some distance apart in the location of Salter Lode, west of Downham Market. The first borehole BH02 was drilled to the north of the Great Ouse Sluice, just east of Salter's lodge. BH03 was drilled to the south, just 20m east of the Denver Lock on a grassy floodbank. BH04 was located to the south, on a thin raised strip of land next to the Old Bedford Sluice, between the New and Old Bedford Rivers.

3.4.2 The bedrock was identified at approximately 8.50m bgl (-3.25m OD) in BH02 and BH03, but was found to be deeper in BH04 at a depth of 9.75m bgl (-6.15m OD). The weathered Ampthill Clay was encountered at the base of the sequence as a stiff grey silty clay with occasional yellow mottling. The bedrock was overlain by a loose dark grey fluvial silty sand/clay with occasional pockets of peat or organic silts. No Pleistocene gravels were recorded at the base of these sequences.

3.4.3 In BH02 the bedrock was overlain by soft dark bluish grey structureless silty clay between 11.70m to 8.50m bgl (-6.45m to -3.25m OD). Similar deposits were identified within BH03 and BH04. This in turn was overlain by the main peat sequence which was identified between 8.50m to 6.50m bgl (-3.25m and -1.25m OD) in BH02; 6.50m to 4.50m (-1.85m to +0.15m OD) in BH03; and 7.00m to 4.50m (-3.4m to -0.9m OD) in BH04. These sequences represent the development of series of different transitional shallow wetland environments varying from reedswamp to alder carr, where vegetation growth managed to keep pace with rising ground water-levels. These environments would have been semi-dry and particularly favourable to early prehistoric communities.

3.4.4 The peats were overlain by a thick sequence of laminated clayey silts and sands representing the formation of the fen tidal clays. These deposits formed within an estuarine environment, managed and regulated by the Old Bedford Sluice; their laminated nature indicates that they are still affected by tidal fluctuations.

3.4.5 A possible buried soil was also identified at a depth of 1.80m to 2.00m bgl (+1.80m - +1.60m OD) in BH04, overlying the alluvial sequence. A thick deposit of firm brown silty sand deposits containing occasional small post medieval brick fragments and pale grey mortar sealed beneath the topsoil in BH04. This deposit may represent the up-cast material derived from the digging of the Old and New Bedford Rivers.

3.5 Earith Landing Stages (BH05-BH07)

3.5.1 Three boreholes were located near to Earith. Two boreholes (BH05 and BH07) were undertaken to the east of the town next to Hermitage Lock and BH06 was undertaken further south, to the north of Brownhill Lock.

3.5.2 Pleistocene fluvial gravels were recorded in all the boreholes overlying the bedrock. The gravels were recorded at a depth of 6.30m bgl (-1.85m OD) in BH05 underlying an alluvial sequence and river embankment. The gravels were also encountered at 2.20m in BH06 and 5.00m bgl in BH07 (-1.75m and -4.5m OD) at the base of the current river bed and drilled from two floating platforms.

3.5.3 The gravels were generally recorded as a dense, poorly sorted sandy gravel composed of 60-80% small to medium angular to sub-rounded flint pebbles within a matrix of grey or olive-yellow fine to coarse sand. In general the gravels represent cold-climate Pleistocene deposits deposited in high-energy braided stream systems. Any ecofactual or artefactual material recovered from these deposits are likely to have been subject to considerable reworking.

3.5.4 Overlying the gravels and bedrock within BH05 was a complex sequence of friable blackish brown peat and organic laminated fine silt which contained large wood fragments. This sequence was identified between 6.30m to 5.70m bgl (-1.85m and -1.25m OD). The sequence represents the accumulation of the upper Nordelph peat sequence.

3.5.5 The organic sequence was overlain by soft inter-digitating grey clayey silts, with frequent complete shells and occasional organic silt lenses and reworked peat lumps. Estuarine shells were also present within its upper deposits. These deposits were probably formed within an inter-tidal channel which was subject to both freshwater and brackish incursions. They were overlain by 2.50m of river embankment deposits.

3.5.6 Only gravels were recorded at the base of the river bed in BH06 and 2.80m of silty clay alluvium was found to overly the gravels in BH07. These sequences have low to no archaeological or palaeoenvironmental potential. Only the sequence within BH05 has any archaeological potential.

3.6 Finds Summary

3.6.1 No finds were recovered during the watching brief, only a small charcoal concentration was identified associated with a possible buried soil at 1.80m in BH04. Small fragments of possible post-medieval brick and mortar were also recovered from the overlying sand deposits but these were not particularly diagnostic.

3.7 Environmental Summary

3.7.1 Samples were collected opportunistically from all boreholes. The primary purpose of this was to retain reference material for more detailed lithological examination as part of this assessment and also to look for material suitable for radiocarbon dating.

3.7.2 Peat samples were priorities for sampling and processing as they provided the best prospects for providing datable material to establish a chronological framework for the sequences.

3.8 Radiocarbon dating

3.8.1 Six radiocarbon dates were obtained to help develop a chronological sedimentary framework for the borehole sequences. Two samples were taken from the top and base of the most representative organic horizons identified in the boreholes taken from each of the three main site areas.

3.8.2 The sample information and results of the radiocarbon dating are shown in Appendix A and summarised below within Table 2:

SAMPLE NO	LAB CODE	EVENT CODE	CONTEXT	Depth bgl	Depth m aOD	MATERIAL	δ13C ‰	RESULT BP	CALIBRATED DATE BC/AD at 2σ
3	SUERC-38922 (GU26630)	CAFLS11-BH4 (Salters Lodge)	Peat	4.50-4.65	-0.90 - -1.05	Monocot leaf or stem	-25.3	1700±30	AD 256 - 413 (95.4%)
4	SUERC-38923 (GU 26631)	CAFLS11-BH4 (Salters Lodge)	Peat	6.95-7.00	-3.35 - -3.40	Sedge and bogbean nutlets	-25	3810±30	2400-2201BC (1.6%), 2347-2189 BC (83.7%), 2182-2140 BC (10.2%)
14	SUERC-38924 (GU 26632)	CAFLS11-BH5 (Hermitage Lock Site)	Peat	3.70-3.80	+0.75 - +0.65	Monocot leaf or stem	-26.4	1620±30	AD 357-364 (0.9%) AD 382- 539 (94.5%) 539
16	SUERC-38925 (GU26633)	CAFLS11-BH5 (Hermitage Lock Site)	Peat	6.00-6.10	-1.55 - -1.65	Alder seeds	-25.6	3640±30	2132-2084 BC (16.0%) 2056-1920 BC (79.4%)
11	SUERC-38920 (GU26628)	CAFLS11-BH1 (Water Newton site)	Peat	3.10-3.20	+4.30 - +4.20	Monocot stem/leaf	-2.63	9065±35	8306-8236 BC (95.4%)
12	SUERC-38921 (GU26629)	CAFLS11-BH1 (Water Newton site)	Organic silt	3.70-3.80	+3.70- +3.60	Sedge and bogbean nutlets	-25.9	10030±35	9768-9386 BC (95.4%)

Table 2: Radiocarbon results.

3.8.3 The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standards, background standards and the random machine error.

3.8.4 The calibrated age ranges are determined using the University of Oxford Radiocarbon Accelerator Unit calibration program OxCal 4.1 (Bronk Ramsey 2009). Terrestrial samples are calibrated using the IntCal09 curve while marine samples are calibrated using the Marine09 curve.

3.8.5 Where possible waterlogged seeds of alder and sedges were used to date the sequence as they are believed to represent species that would have been growing on the peat/organic silt. In a few instances no seeds were found to be preserved within the samples for dating, and Monocot stems were used as a viable alternative.

3.8.6 The earliest sequence is recorded from the organic sequence within BH01 represented an early Mesolithic organic deposit preserved at the floodplain edge sequence of the River Nene. No later prehistoric peat sequences were identified within this sequence.

3.8.7 The dating of the peat sequences in BH04 and BH05 is more typical of a fen sequence, with the initiation of the peat accumulation from the early Bronze Age into the late Roman period. These deposits represent a range of wetland habitats where the growth of vegetation was able to keep pace with the rising fen ground water-levels.

4 Discussion

4.1 Significance and reliability of the results

4.1.1 Despite the success of the Fenland Survey (Hall and Coles 1994), the Fens remain a key area for future research. Little is known about the early development of fen river systems, and few deeply buried sites have been investigated, consequently their nature and extent is not well understood. Useful data for the Neolithic–Middle Bronze Age are heavily biased towards fen-edge sites (*e.g.* West Row Fen, Suffolk: Martin and Murphy 1988) and coastal sites (*e.g.* Blackwater Site 28: Murphy 1989 and in prep.) which may not be typical. However, at present very little archaeological activity has been identified away from the fenland edge.

4.1.2 The sediment sequences at the various sites were recorded successfully during the Watching Brief and environmental samples for scientific dating were collected. These sequences provide a useful indication of the types of sedimentary environment represented at these locations and their suitability as indicators for archaeological activity and preservation of remains. However, a number of points must be made regarding the reliability of these results. Inference based on such a limited dataset of one or two samples for each area has inherent problems relating to the small sample size; inevitably the samples may not be entirely representative of the each site sequence. The absence of archaeological material within the borehole samples may therefore not necessarily reflect a true absence of archaeology at these sites.

4.1.3 In spite of the issue of sample representation, the work has been able to assess the likelihood of archaeology being present and preserved within these locations. It therefore offers a good insight into the depth of potential archaeological horizons and where they potentially could survive.

4.2 Archaeological potential

4.2.1 The results of the watching brief have served well in broadly characterizing the sediment sequences present across the three main areas. No significant archaeological features or deposits were identified during the monitoring works. The potential of the sequences are discussed below in more detail.

4.2.2 The earliest sequence identified during the monitoring was within BH01, at Water Newton. An early Mesolithic peat sequence was identified dating from 9768-9386 cal. BC to 8306-8236 cal BC, overlying the floodplain gravels. These deposits represent the development of a shallow reedswamp environment at the edge of the floodplain. There is potential in this for early Mesolithic archaeology to be preserved underneath the peats, associated with a pre-inundation floodplain surface. Early Mesolithic archaeology has been identified at the edges of the floodplain commanding particular vantage points. The peat sequence was later sealed by a sequence of laminated silty clays as a results of rising river levels. Any later prehistoric peat development seems to have been removed by later channel activity in this location.

4.2.3 Significant Neolithic-Bronze Age archaeology has been identified previously within the wider area associated with the fen peat sequence within the flag fen Basin (Pryor 2001). The Bronze Age peats were not found to be preserved at Water Newton and therefore the potential of the sequence to preserve similar early prehistoric remains is considered to be low. No evidence of any later activity or any Roman river front structures associated with the Roman town were noted.

4.2.4 A more typical fenland peat sequence was found to be preserved between +0.15 and -4.1m OD at Downham Market and Earith, within boreholes BH04 and BH05, dating from 2400-- 2140 cal. BC and from cal. AD 256-413 in BH04 and from 2132-1920 cal. BC and cal. AD - 539 in BH05. The peat profiles from these samples relate to accumulation of the Upper (Nordelph) peat which began to form under conditions of rising groundwater during the 2nd millennium BC. Prior to this the area was likely to have been mainly tidal mudflats dissected by various creeks and rivers. These environments have previously produced limited archaeological remains and are widely consider to be unfavourable environments for significant human activity. The peat accumulation appears to have continued into the mid to Late Roman period before fen clays took over as a result of a rising sea-levels in the late Roman period and its subsequent effects within the river valleys of the fenlands.

4.2.5 Prehistoric trackways, platforms and other timber structures have been identified associated with the surface of the Nordelph peats (Pryor 2001), particularly where they are located close to areas of high ground or narrow crossing points. These features are believed to have aided movement across wetland zones in response to rising ground water-levels within the fens, but are also sometimes interpreted as platforms for ceremonies associated with deposition of metalwork (Pryor 2001), or as jetties into rivers. Very little has been found within the fen basin itself away from areas of higher and drier ground. Also the extensive drainage of the Cambridgeshire fenlands has potentially had a devastating effect on waterlogged and organic preservation in the area.

4.2.6 Later archaeological remains are known to be present within the wider areas surrounding these sites in the form of significant Roman and medieval activity. There is a high potential for archaeology of these periods to be located within these sites and this could be impacted by bankside modification. This evidence may include such organic remains as fish traps, bank revetments and remains associated with other riverside activities.

4.2.7 The boreholes from the current river beds either came straight down on to bedrock/Pleistocene gravels,(BH06), or had a heavily truncated alluvial sequence, (BH07). These sequences have no or very limited archaeological and palaeoenvironmental potential.

4.2.8 The preservation of biological remains suitable for palaeoenvironmental reconstruction for the Holocene period has been recorded within the borehole samples. These sequences are unlikely to have been affected by the extensive drainage that has occurred across the fenland since the 17th century which has helped destroy some of the organic remains in the area. The organic deposits sampled in the boreholes have the potential to preserve insect, plant remains, snails and wood remains, as has been recorded during these works. Consequently, these sequences have good potential for palaeoenvironmental and hydrological reconstruction.

5 Conclusions

5.1.1 Despite the number of archaeological sites located in or near to these areas which have previously produced significant prehistoric, Roman and Medieval archaeology, no archaeological deposits were identified within the boreholes sequences. No pottery or other types of finds or anthropogenic indicators were identified within the samples that would suggest the presence of significant archaeological activity within or close to these sites.

5.1.2 Prehistoric peat deposits were found to be preserved within BH02-BH05 taken from the river banks at the Earith and Downham Market sites. These sequence have the potential to preserve import early prehistoric remains and contain a sequence of environmental and hydrological change that spans the Holocene. The surface of these peats are preserved at 5.25m bgl Salter Lodge, 4.65m bgl at Denver Lock, 3.6m bgl at the Old Bedford Sluice and 4.45m bgl at Hermitage Lock.

5.1.3 Two of the sequences provided indirect evidence of archaeological potential, in the form of buried soils at Water Newton (BH01) and Downham Market (BH04). In the former, an early Mesolithic landsurface was sealed by a lower peat sequence which was in turn overlain by channel deposits. A later buried alluvial soil containing charcoal was also identified within OABH4 underlying post-medieval made-ground deposits possibly associated with the digging of the Old and New Bedford rivers.

5.1.4 No archaeological potential was identified in BH06 and BH07 at the base of the modern river beds, where the Fenland sequence has been significantly truncated or removed.

5.2 Potential scheme impact

5.2.1 The proposed scheme will involve the construction of new or renovating existing landing stations using various types of piles and pile arrangements in their construction. The majority of the impact will be at the base of the current river beds and occasionally on the surrounding river banks. The proposed impact at each location is summarised within the table below:

No	Site	Proposed impact	Impact depth	Archaeological potential
BH01	Water Newton Site	Sheet pile wall in river	Limited to the river bed	Medium-High
BH02	Salter's Lodge	Circular hollow section piles and	Into the river bed and possibly	Medium

		sheet piling	bankside	
BH03	Denver Lock	Circular hollow section piles	Limited to the river bed	Medium
BH04	Old Bedford Sluice	H-section piles	Limited to the riverbed and crest of river bank	Medium-High
BH05	Hermitage Lock	Circular hollow section piles	Limited to the river bed and bankside	Medium
BH06	Brownhill Lock	Circular hollow section piles	Limited to the river bed	Low
BH07	Hermitage Lock	Circular hollow section piles	Into the river bed and bankside	Low

Table 2: Proposed scheme impacts

5.2.2 The majority of impact will be confined to the use of either piles or sheet piles into the base of the truncated sequences preserved underneath the present watercourses. Only at Salter's Lode, Old Bedford Sluice and Hermitage Lock will adjustments be made to the river banks to aid site access. This bank-side impact is likely to be confined to a depth of 1m and ramped down towards the rivers. The identified buried surfaces and Nordelph peat sequence will therefore be unaffected by these works.

5.2.3 Any further mitigation of the pile structures will be restricted by the fact that the majority of the impact will be in parts of the river beds. Due to the limited impact of the current designs and difficulty of investigating submerged sequences, no archaeological potential is envisaged within the current waterways, especially at Denver and Brownhill Locks.

5.2.4 Only if the impact depths significant exceed 1m within the riverbanks will any deposits of archaeological and palaeoenvironmental potential be affected.

Bibliography

Allen. J 2000. Norfolk Landscape Archaeology Report.

Burton R. G. O. 1987. The role of thermokarst in landscape development in eastern England. In Periglacial Processes and Landforms in Britain and Ireland, Boardman, J. (ed.), Cambridge University Press, Cambridge, 203-208

Burton R. G. O. West, R. G. 1991. Mepal Fen , Cambridgeshire. In Central East Anglia and the Fen Basin, Field Guide, Lewis, S. G. Whiteman, C. A. Bridgland, D. R. (eds) Quaternary Research Association

Butcher, S. & Garwood, P. 1994 Rescue excavation: 1938 to 1972. London: English Heritage.

Casa-Hatton, R. and Wall, W. 1999. A Late Roman Cemetery beside the A1 near Durobrivae (Water Newton): Archaeological Recording. Cambridge Archaeological Field Unit. Report 165.

Evans, C. 1987. ‘Nomads in “Waterland”? Prehistoric Transumance and Fenland Archaeology. PCAS LXXVI (1987): 27-39.

Evans, C. 2003. Power and island communities: Excavations at the Wardy Hill ringwork, Coveney, Ely. Cambridgeshire. East Anglian Archaeology Report No. 103, Cambridge Archaeological Unit

Evans, C. and Patten, R. 2003, *Excavations at Colne Fen, Earith: The Holme Fieldsystem*. CAU rep. No. 527.

French, C.A.I. and Pryor, F.M.M., 1993. The South-West Fen Dyke Survey Project, 1982-86. *East Anglian Archaeology* 59.
Gallois, R. W. 1988. Geology of the Country around Ely. Memoir of the British Geological Survey, sheet 173, HMSO: London

Green, M. 1955. 'Roman Pottery Kiln at Earith, Hunts'. PCAS XLVIII (1955):44- 46.

Hall, D. 1996. The Fenland Project Number 10: Cambridgeshire Survey, Isle of Ely and Wisbech. East Anglian Archaeology Report No. 79, Fenland Project Committee, Cambridge County Council

Mawer, A.; Stenton, Sir F. eds., 1926 The place-names of Bedfordshire and Huntingdonshire, English Place-Name Society, 3. p204

O'Brian, L. unpublished 2003. Roman and Medieval finds at Land East of Mill Lane, Water Newton,Huntingdonshire. Excavation. Report, Hertfordshire Archaeological Trust Report 1270.

Pryor, F. 2001. The Flag Fen Basin: Archaeology and Environment of the Fenland Landscape: English Heritage.

Regan, R. 2001a, *An Archaeological Evaluation at Colne Fen, Earith: The Camp Ground (Site VII)*. CAU Rep. No. 430.

Regan, R. 2001b, *An Archaeological Evaluation at Colne Fen, Earith: The Holme*. CAU Rep. No. 436.

Regan, R. 2003, *An Archaeological Excavation at Colne Fen, Earith Sites V and VI: Longdale Hale*. CAU Rep. No. 537.

Regan, R. and Evans, C. 2000, Excavations at Colne Fen, Earith: Sites III and IV. CAU Rep. No. 398.

Tebbutt C. F. 1941, *Bluntisham* cum *Earith, Huntingdonshire, Records of a Fenland Parish*. St Neots.

Waller M. 1994. The Fenland Project Number 9: Flandrian environmental change in Fenland. East Anglian Archaeology Report No. 70, Fenland Project Committee, Cambridge County Council

Webster, G. and Green, C 1964 'Excavations on a Medieval Site at Water Newton, in the County of Huntingdon in 1958', *PCAS* LVI-LVII (1964): 68-87.

West, R. G. Burton, T. G. O. Andrew, R. and Pettit, M. E. 2002. Evolution of a periglacial landscape in the Late Devensian: environments and palaeobotany of the Mepal area, Cambridgeshire, England. *Journal of Quaternary Science*, 17 (1), 31 – 50.

West, R. G. Peglar, S. Pettit, M. E. Preece, R. C. 1995. Late Pleistocene deposits at Block Fen, Cambridgeshire, England. *Journal of Quaternary Science*, 10, 285 – 310.

Wheeler, A. J. and Waller, M. P. 1995. The Holocene lithostratigraphy of Fenland, eastern England: a review and suggestions for redefinition. Geological Magazine, 132, 223 – 233.

Appendix A. Radiocarbon Results

Appendix B. OASIS Report Form

All fields are required unless they are not applicable.

Project Details

OASIS Number	oxfordar3-90100		
Project Name	Floating Landing stages, Cambridgeshire		
Project Dates (fieldwork) Start	18-10-2011	Finish	26-10-2011
Previous Work (by OA East)	No	Future Work	Unknown

Project Reference Codes

Site Code	CAFLS11	Planning App. No.	
HER No.		Related HER/OASIS No.	

Type of Project/Techniques Used

Prompt	Environmental (unspecified schedule)

Please select all techniques used:

☐ Field Observation (periodic visits)	☐ Part Excavation	☐ Salvage Record
☐ Full Excavation (100%)	☐ Part Survey	☐ Systematic Field Walking
☐ Full Survey	☐ Recorded Observation	☐ Systematic Metal Detector Survey
☐ Geophysical Survey	☐ Remote Operated Vehicle Survey	☐ Test Pit Survey
☐ Open-Area Excavation	☐ Salvage Excavation	☒ Watching Brief

Monument Types/Significant Finds & Their Periods

List feature types using the NMR Monument Type Thesaurus and significant finds using the MDA Object type Thesaurus together with their respective periods. If no features/finds were found, please state "none".

Monument	Period	Object	Period
	None		None
	Select period...		Select period...
	Select period...		Select period...

Project Location

County	Cambridgeshire	Site Address (including postcode if possible)	
District			
Parish			
HER	Cambridgeshire		
Study Area		National Grid Reference	

Project Originators

Organisation	OA EAST
Project Brief Originator	
Project Design Originator	
Project Manager	Liz Stafford
Supervisor	Christof Heisterman

Project Archives

Physical Archive	Digital Archive	Paper Archive
Location ...	Location ...	Location ...
Accession ID ...	Accession ID ...	Accession ID ...

Archive Contents/Media

	Physical Contents	Digital Contents	Paper Contents
Animal Bones	☐	☐	☐
Ceramics	☐	☐	☐
Environmental	☐	☐	☐
Glass	☐	☐	☐
Human Bones	☐	☐	☐
Industrial	☐	☐	☐
Leather	☐	☐	☐
Metal	☐	☐	☐
Stratigraphic		☐	☐
Survey		☐	☐
Textiles	☐	☐	☐
Wood	☐	☐	☐
Worked Bone	☐	☐	☐
Worked Stone/Lithic	☐	☐	☐
None	☐	☐	☐
Other	☐	☐	☐

Digital Media	Paper Media
☐ Database	☐ Aerial Photos
☐ GIS	☐ Context Sheet
☐ Geophysics	☐ Correspondence
☐ Images	☒ Diary
☐ Illustrations	☐ Drawing
☐ Moving Image	☐ Manuscript
☒ Spreadsheets	☐ Map
☐ Survey	☐ Matrices
☒ Text	☐ Microfilm
☐ Virtual Reality	☐ Misc.
	☒ Research/Notes
	☐ Photos
	☐ Plans
	☒ Report
	☐ Sections
	☐ Survey

Notes:

Scottish Universities Environmental Research Centre
Director: Professor A B MacKenzie Director of Research: Professor R M Ellam
Rankine Avenue, Scottish Enterprise Technology Park,
East Kilbride, Glasgow G75 0QF, Scotland, UK
Tel: +44 (0)1355 223332 Fax: +44 (0)1355 229898 www.glasgow.ac.uk/suerc

RADIOCARBON DATING CERTIFICATE

20 March 2012

Laboratory Code	SUERC-38920 (GU26628)
Submitter	Rebecca Nicholson Oxford Archaeology South Janus House Osney Mead Oxford OX2 0ES
Site Reference	CAFLS11
Context Reference	BH1
Sample Reference	11
Material	Waterlogged Plant Macrofossil : Monocot stem/leaf
δ^{13}C relative to VPDB	-26.3 ‰
Radiocarbon Age BP	9065 ± 35

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standards, background standards and the random machine error.

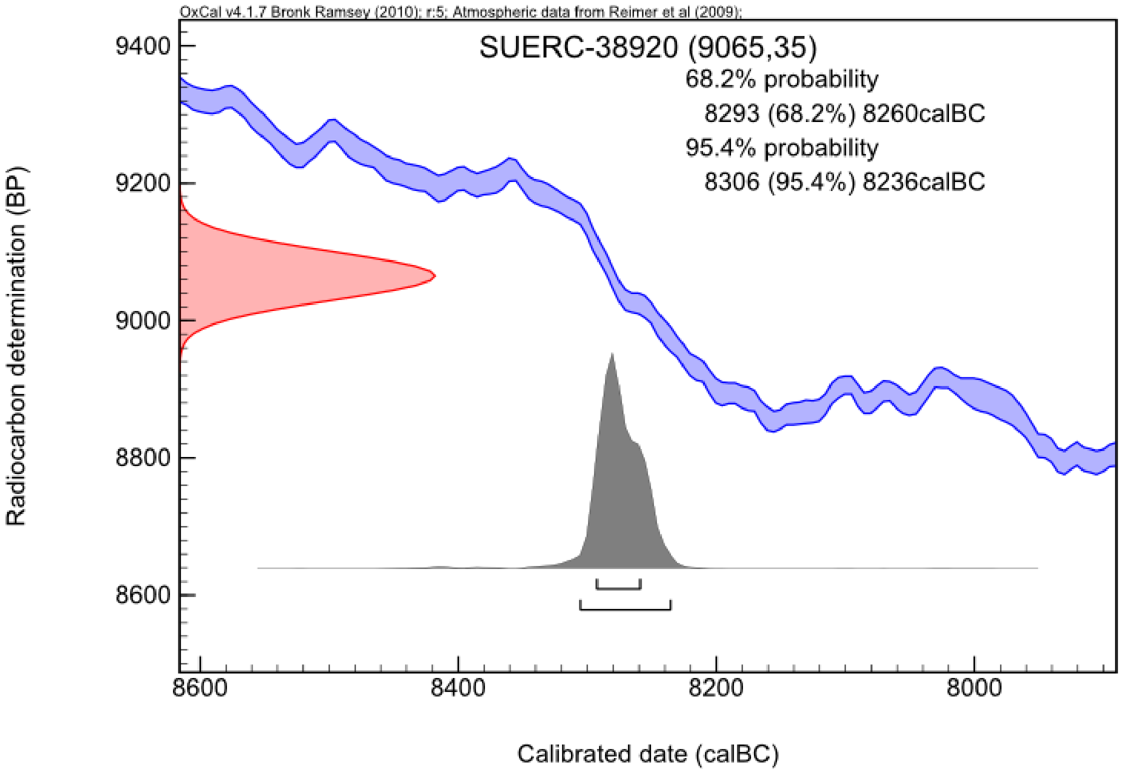
The calibrated age ranges are determined using the University of Oxford Radiocarbon Accelerator Unit calibration program OxCal 4.1 (Bronk Ramsey 2009). Terrestrial samples are calibrated using the IntCal09 curve while marine samples are calibrated using the Marine09 curve.

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- Date :-

Checked and signed off by :- Date :-

Calibration Plot



Scottish Universities Environmental Research Centre
Director: Professor A B MacKenzie   Director of Research: Professor R M Ellam
Rankine Avenue, Scottish Enterprise Technology Park,
East Kilbride, Glasgow G75 0QF, Scotland, UK
Tel: +44 (0)1355 223332   Fax: +44 (0)1355 229898   www.glasgow.ac.uk/suerc

RADIOCARBON DATING CERTIFICATE

20 March 2012

Laboratory Code	SUERC-38921 (GU26629)
Submitter	Rebecca Nicholson Oxford Archaeology South Janus House Osney Mead Oxford OX2 0ES
Site Reference	CAFLS11
Context Reference	BH1
Sample Reference	12
Material	Waterlogged Plant Macrofossil : Sedge (Carex sp.) and bogbean (Menyanthes trifoliata) nutlets
$\delta^{13}C$ relative to VPDB	-25.9 ‰
Radiocarbon Age BP	10030 ± 35

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standards, background standards and the random machine error.

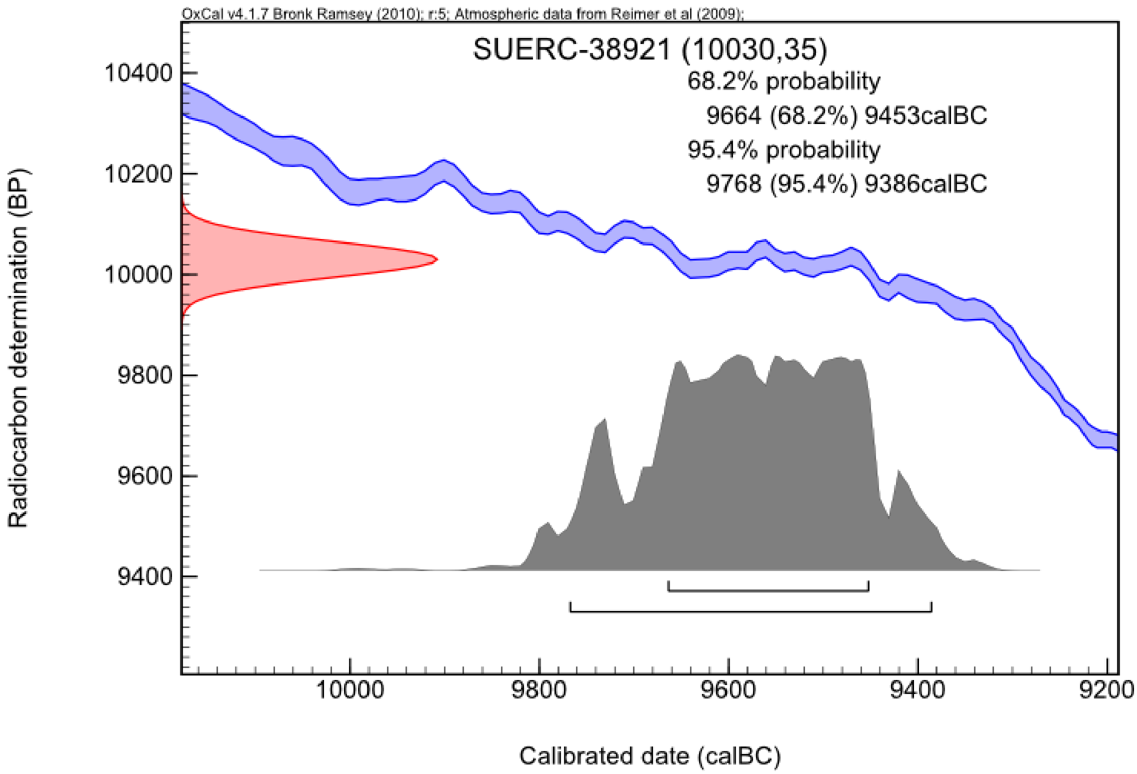
The calibrated age ranges are determined using the University of Oxford Radiocarbon Accelerator Unit calibration program OxCal 4.1 (Bronk Ramsey 2009). Terrestrial samples are calibrated using the IntCal09 curve while marine samples are calibrated using the Marine09 curve.

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- Date :-

Checked and signed off by :- Date :-

Calibration Plot



Scottish Universities Environmental Research Centre
Director: Professor A B MacKenzie Director of Research: Professor R M Ellam
Rankine Avenue, Scottish Enterprise Technology Park,
East Kilbride, Glasgow G75 0QF, Scotland, UK
Tel: +44 (0)1355 223332 Fax: +44 (0)1355 229898 www.glasgow.ac.uk/suerc

RADIOCARBON DATING CERTIFICATE

20 March 2012

Laboratory Code	SUERC-38922 (GU26630)
Submitter	Rebecca Nicholson Oxford Archaeology South Janus House Osney Mead Oxford OX2 0ES
Site Reference	CAFLS11
Context Reference	BH4
Sample Reference	3
Material	Waterlogged Plant Macrofossil : Monocot leaf/stem
$\delta^{13}C$ relative to VPDB	-25.3 ‰
Radiocarbon Age BP	1700 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standards, background standards and the random machine error.

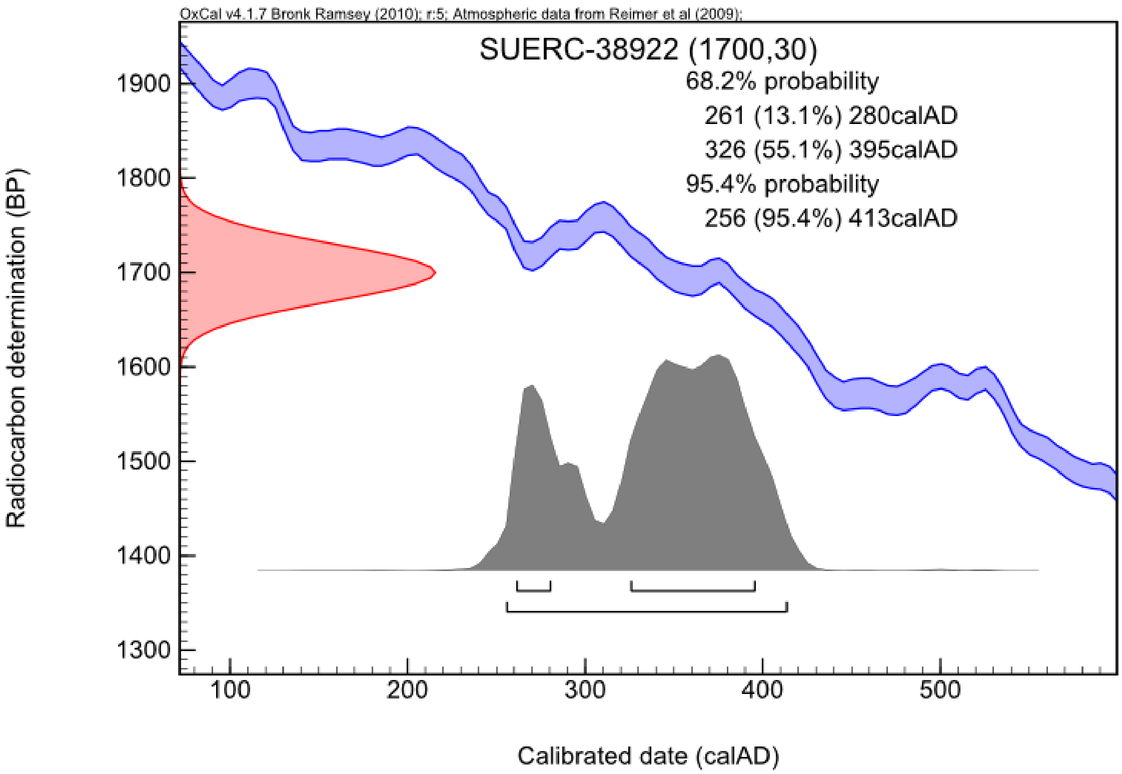
The calibrated age ranges are determined using the University of Oxford Radiocarbon Accelerator Unit calibration program OxCal 4.1 (Bronk Ramsey 2009). Terrestrial samples are calibrated using the IntCal09 curve while marine samples are calibrated using the Marine09 curve.

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- Date :-

Checked and signed off by :- Date :-

Calibration Plot



Scottish Universities Environmental Research Centre
Director: Professor A B MacKenzie Director of Research: Professor R M Ellam
Rankine Avenue, Scottish Enterprise Technology Park,
East Kilbride, Glasgow G75 0QF, Scotland, UK
Tel: +44 (0)1355 223332 Fax: +44 (0)1355 229898 www.glasgow.ac.uk/suerc

RADIOCARBON DATING CERTIFICATE

20 March 2012

Laboratory Code	SUERC-38923 (GU26631)
Submitter	Rebecca Nicholson Oxford Archaeology South Janus House Osney Mead Oxford OX2 0ES
Site Reference	CAFLS11
Context Reference	BH4
Sample Reference	6
Material	Waterlogged Plant Macrofossil : Sedge (Carex sp.), bogbean (Menyanthes trifoliata) nutlets, Cf. Schoenoplectus sp (club rush)
$\delta^{13}C$ relative to VPDB	-25.0 ‰ assumed
Radiocarbon Age BP	3810 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standards, background standards and the random machine error.

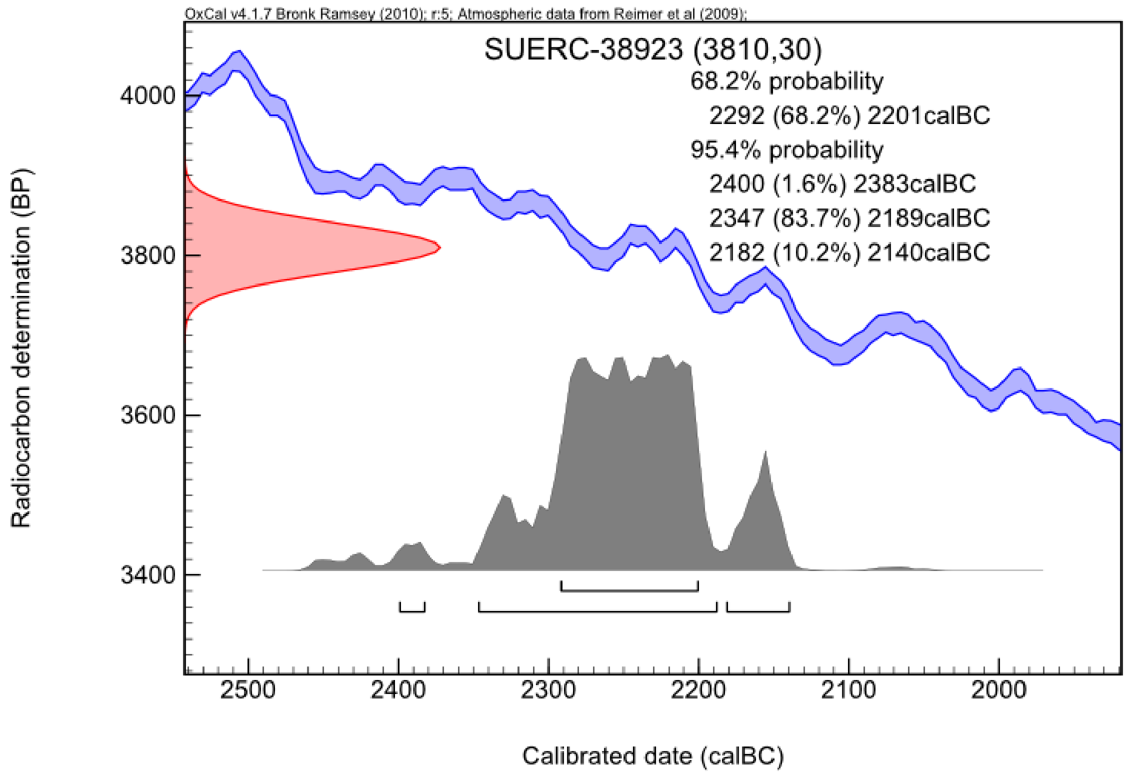
The calibrated age ranges are determined using the University of Oxford Radiocarbon Accelerator Unit calibration program OxCal 4.1 (Bronk Ramsey 2009). Terrestrial samples are calibrated using the IntCal09 curve while marine samples are calibrated using the Marine09 curve.

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- Date :-

Checked and signed off by :- Date :-

Calibration Plot



Scottish Universities Environmental Research Centre
Director: Professor A B MacKenzie Director of Research: Professor R M Ellam
Rankine Avenue, Scottish Enterprise Technology Park,
East Kilbride, Glasgow G75 0QF, Scotland, UK
Tel: +44 (0)1355 223332 Fax: +44 (0)1355 229898 www.glasgow.ac.uk/suerc

RADIOCARBON DATING CERTIFICATE
20 March 2012

Laboratory Code	SUERC-38924 (GU26632)
Submitter	Rebecca Nicholson Oxford Archaeology South Janus House Osney Mead Oxford OX2 0ES
Site Reference	CAFLS11
Context Reference	BH5
Sample Reference	14
Material	Waterlogged Plant Macrofossil : Monocot leaf/stem
$\delta^{13}C$ relative to VPDB	-26.4 ‰
Radiocarbon Age BP	1620 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standards, background standards and the random machine error.

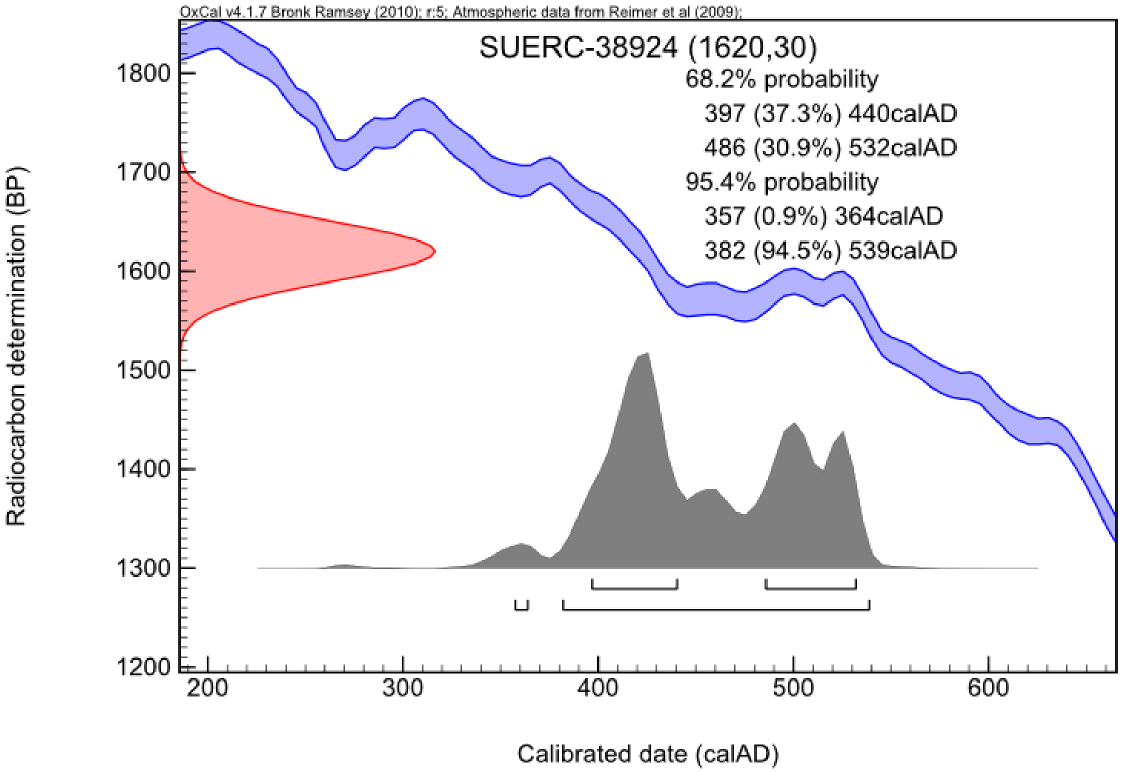
The calibrated age ranges are determined using the University of Oxford Radiocarbon Accelerator Unit calibration program OxCal 4.1 (Bronk Ramsey 2009). Terrestrial samples are calibrated using the IntCal09 curve while marine samples are calibrated using the Marine09 curve.

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- Date :-

Checked and signed off by :- Date :-

Calibration Plot



Scottish Universities Environmental Research Centre
Director: Professor A B MacKenzie Director of Research: Professor R M Ellam
Rankine Avenue, Scottish Enterprise Technology Park,
East Kilbride, Glasgow G75 0QF, Scotland, UK
Tel: +44 (0)1355 223332 Fax: +44 (0)1355 229898 www.glasgow.ac.uk/suerc

RADIOCARBON DATING CERTIFICATE

20 March 2012

Laboratory Code	SUERC-38925 (GU26633)
Submitter	Rebecca Nicholson Oxford Archaeology South Janus House Osney Mead Oxford OX2 0ES
Site Reference	CAFLS11
Context Reference	BH5
Sample Reference	16
Material	Waterlogged Plant Macrofossil : Alder (Alnus sp.) seeds and cone frag
$\delta^{13}C$ relative to VPDB	-25.6 ‰
Radiocarbon Age BP	3640 ± 30

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standards, background standards and the random machine error.

The calibrated age ranges are determined using the University of Oxford Radiocarbon Accelerator Unit calibration program OxCal 4.1 (Bronk Ramsey 2009). Terrestrial samples are calibrated using the IntCal09 curve while marine samples are calibrated using the Marine09 curve.

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email g.cook@suerc.gla.ac.uk or Telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- Date :-

Checked and signed off by :- Date :-

Calibration Plot