ARCHAEOLOGICAL SERVICE REPORT

Targeted Inter-tidal Survey

Fishtrap STU 067 on the River Stour
(Photo: D. Grady, English Heritage)

L.Everett
Suffolk County Council Archaeological Service

SCCAS REPORT No. 2007/192
OASIS ID No. 33260

Lucy Robinson, County Director of Environment and Transport
Endeavour House, Russell Road, Ipswich, IP1 2BX
Tel. (01473) 583000

Suffolk County Council

Environment and Transport

Targeted inter-tidal field survey

Summary

Following a rapid walkover survey of the Suffolk coast and inter-tidal estuaries, nine of the sites recorded were identified as potentially archaeologically significant (Everett *et al* 2003). These were earmarked as requiring further work, not only to better understand them as individual sites, but also to be able to provide a strong curatorial response to coastal planning as it impacts on the historic environment (Loader, 2005). Radiocarbon dating of a fish trap in Holbrook Bay on the River Stour returned a date of *cal* AD 680–850 (at 95% probability from the Bayesian model) for its main structure, confirming the Saxon date that was supposed from its form and parallels. Five other post-built structures in Holbrook Bay were radiocarbon dated to the post-medieval period and further samples submitted from these features may be able to date them more closely. A series of posts, laid timbers and possible wattle fragments at Barber's Point on the River Alde were planned and dated. Whilst the plans hinted at the possibility of trackways or a fish trap, no function for the structure was obvious from the plans alone. Radiocarbon samples dated the feature to *cal* AD 650–780 (at 95% probability from the Bayesian model), a date which ties in with known Saxon activity on the banks of the river within 50m of the waterlogged wood.

Introduction

A field survey of the inter-tidal zone of the Suffolk coast and estuaries was carried out as part of a larger archaeological study of the Suffolk coast and its hinterland. The field survey element comprised a rapid ground-based survey of the rivers Orwell, Deben, Butley, Ore, Alde, Blyth and the north bank of the Stour. These shorelines were walked at low tide to look for, and record, any features, structures and finds in the mudflats, salt-marsh and eroded land surfaces. 547 new or amended records were added to the SMR as a result, although the vast majority of these were undated, and are likely to post-date the embanking of the rivers. However, some sites were believed to be of some archaeological significance and worthy of further study in order to assess their importance (Everett *et al* 2005). A Project Design was prepared by Suffolk County Council Archaeological Service in December 2005 and submitted to English Heritage, in order to address the need for further work on certain sites identified during the rapid field survey.

The scope and methodology for further work were defined by the Project Design and applied to nine sites detailed below. Their locations are shown by Figure 1.

SITE	NATURE OF EVALUATION
Holbrook Bay post built structures- STU 067, STU 038, STU 050, STU 068, STU 079 and STU 080	Plan and sample dating of timbers from each structure
Snape Warren causeway- SNP 045	Plan and sample dating of timbers from structure
Trimley Marsh wood scatter- TYN 106	Plan and sample dating of timbers from structure
Barber's Point- FRS 047	Plan and sample dating of timbers from structure

Table 1: Inter-tidal sites requiring further evaluation

All inter-tidal structures identified for further work required dating in order to ensure they demonstrated the level of archaeological potential currently believed. Radiocarbon dating was identified as critical in meeting this objective, with samples being taken in accordance with advice from English Heritage specialists.

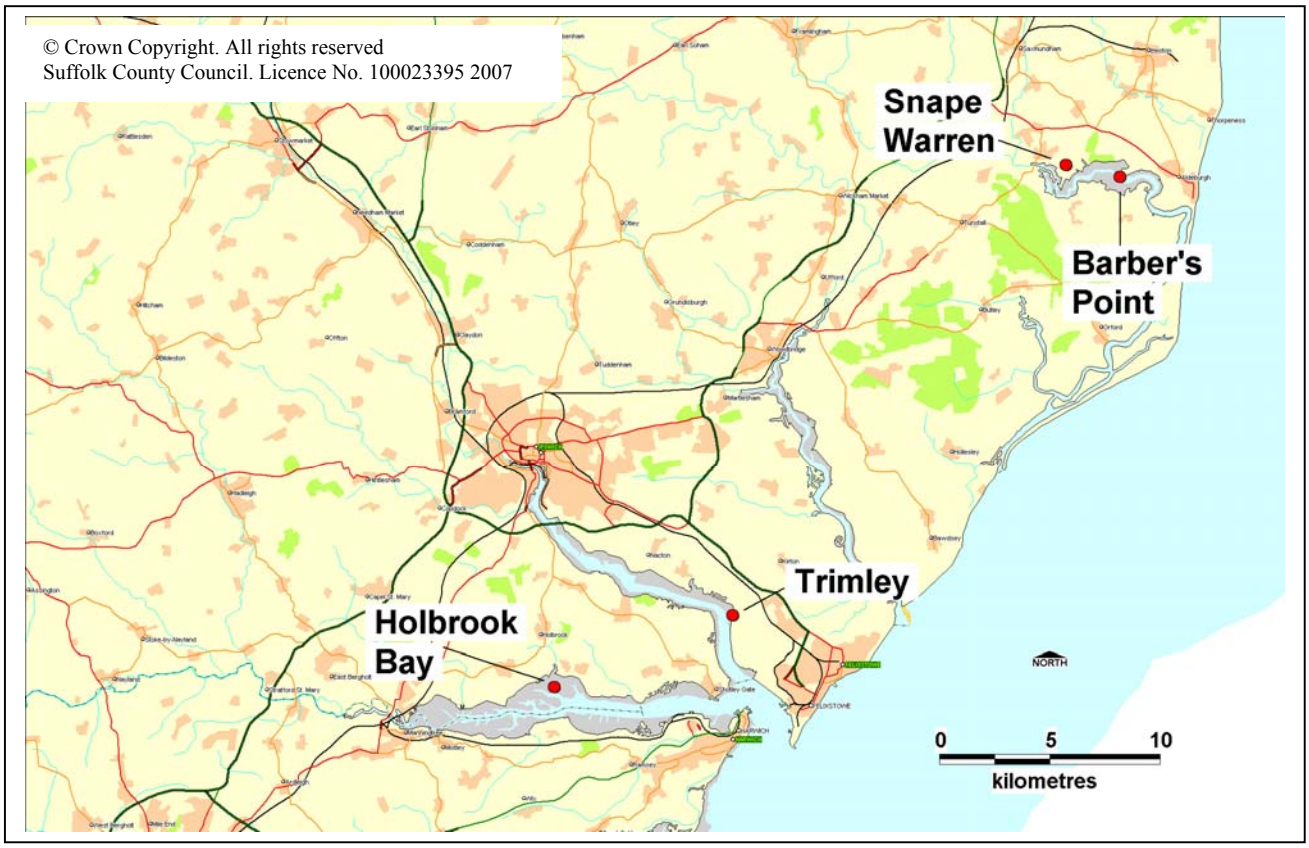


Figure 1: Locations of sites identified for evaluation

Methodology

All sites were visited at a suitable low tide to ensure that surviving structures were fully exposed and visible for as long as possible, to allow adequate time for recording. Each was surveyed using a total station theodolite (TST) to record existing features 3-dimensionally, with each feature planned in its entirety where possible. Where more detail was necessary, and it was practical to do so, areas of interest were planned by hand at a scale of 1:10 or 1:20. Each site was recorded under its own unique SMR code, allocated following its identification during the rapid field survey.

Two samples per phase from each timber structure were collected and sent for assessment in accordance with the advice received from Alex Bayliss, Team leader, Scientific Dating Team, English Heritage.

No surviving timbers were suitable for dendrochronology.

Results

Trimley Marshes- TYN 106

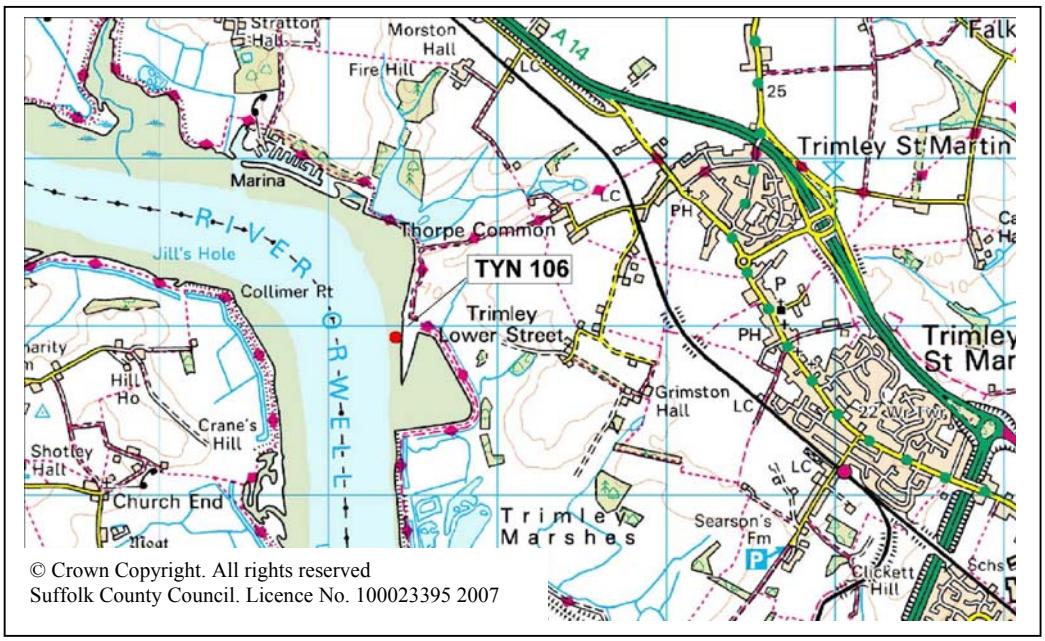


Figure 2: Location of wooden structure on foreshore at Trimley Marshes

The site only came to light during the summer of 2004, possibly having been exposed after erosion of the salt-marsh during the winter months. The site was located close to the newly created nature reserve at Trimley Marshes on the River Orwell, and comprised a series of possible roundwood wattles running parallel with, and pressed into grey clay exposed along the foreshore. This spread of timbers measured no more than 2 metres in width and 11m in length, and was extremely localised, appearing to be eroding out from under the retreating salt-marsh edge. While the timbers looked to be deliberately laid, they show no obvious evidence of being pegged down or held in place, other then being pressed into the land surface. A small area adjacent, comprising mixed organic material, including small wood chips and charcoal, along with some larger pieces of wood with apparent chisel points, all point to this being a man-made structure, and is at least suggestive of the remains of an early slipway for boats.
When the site was revisited for full recording, no structural remains survived. This is not entirely surprising given its unstable nature and the dynamic environment it occupied. Despite an extensive search of the surrounding foreshore and eroding salt-marsh edge, no further archaeological evidence was identified.

Snape Warren causeway- SNP 045

Since a group of apparently unworked horizontal timbers within a salt-marsh creek were initially identified as a site of potential archaeological significance, study of the early OS maps has identified a bridge or crossing point at this location (Figure 3). This also ties in with SNP 074, a track across the marshes identified from aerial photographs and present on the 1st edition Ordnance Survey map of c.1880. The presence of a track across the marshes concurs with the belief of the current landowner that his grandfather installed a bridge or causeway at this point to allow carts access to the marshes. As there was good evidence to suggest that this feature was unlikely to be of any great age, the timbers were not sampled, but a photographic record was made.

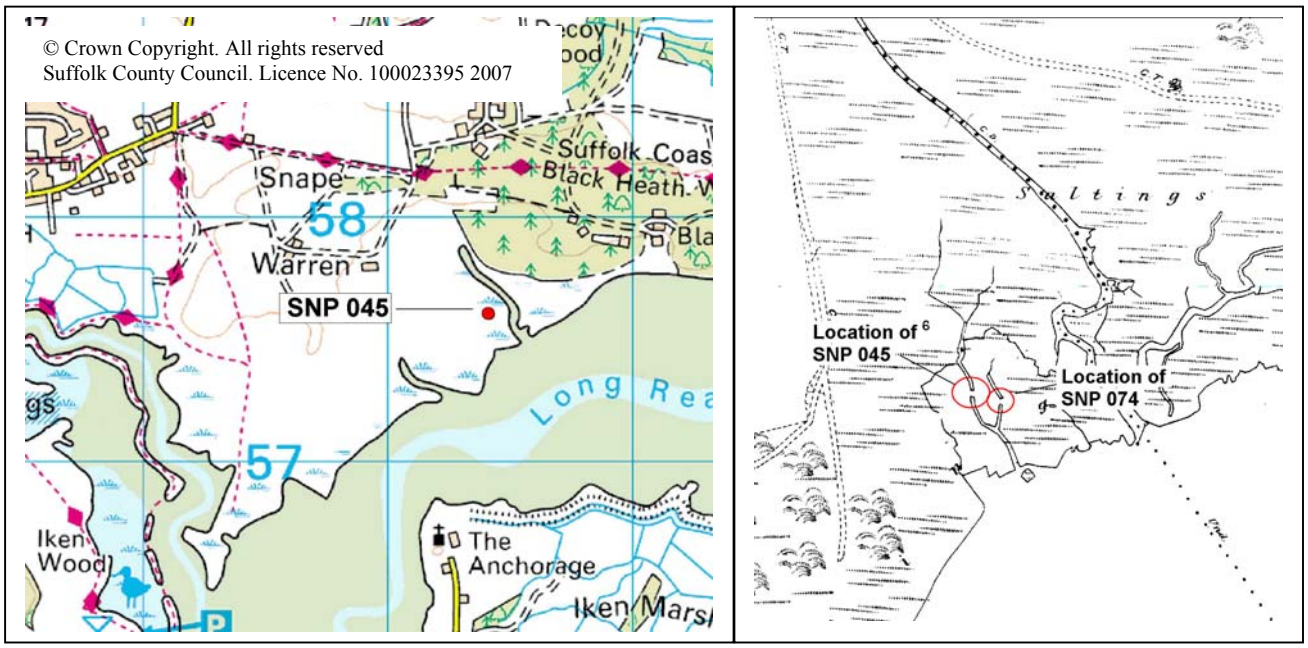


Figure 3: Location of timbers within a tidal creek, Snape Warren and extract from the 1st edition Ordnance Survey map, showing a track across the salt-marsh creeks

Holbrook Bay- STU 067

This feature is visible on aerial photographs as a structure on the mud flats of the intertidal zone of the River Stour, approximately 500m from the northern bank, and has been interpreted as a fish trap, or weir. The structure was plotted in its entirety using rectified aerial photographs taken by Damien Grady in 2004 (Figure 5). It consists of two linear features that form a 'V' shape pointing eastwards to the main channel of the estuary (Figures 4 & 5) and seems to have been constructed to collect fish on the ebb tide at the point where the two arms meet. The southern arm is almost 310m in length and is defined by dense rows of parallel posts (Plate 1). Fragments of wattle panelling survive along the southern edge of the main body of the southern arm (Plate 2), south of which is a row of single or double posts. The northern arm is around 180m long and survives as a low earthwork. This is probably due to the accumulation of silts and aggregates over an arrangement of more eroded posts that may originally have been of a similar length to the southern arm. A roughly circular arrangement of smaller or more eroded posts can be seen at the point, or 'eye' of the feature (Hegarty and Newsome, 2005).

The foreshore at this point in Holbrook Bay comprises a firm, gravelly surface covered by a thin layer of detreital mud, allowing easy access by foot as far as the low tide line. A total of eight samples were collected from various elements of the fish trap (see Table 2) and their locations plotted with the TST. However, the long distance over which surveying took place (c.1km) and the poor visibility on the day the fieldwork was carried out, resulted in inaccuracies in the survey and the sample locations are shown on the original plan taken from the air photographs. The samples taken were as follows-

SAMPLE	DESCRIPTION AND SOURCE	WOOD ID
1	Upright post from narrow/secondary alignment at eastern end of southern arm	*Alnus glutinosa* alder
3	Upright post from narrow/secondary alignment. Midway along southern arm	*Alnus glutinosa* alder
4	Sample from horizontal wattle panel at eastern end of southern arm	*Corylus avellana* hazel
5	Sample from horizontal wattle panel midway along southern arm	*Corylus avellana* hazel

6	Sample from horizontal wattle panel at western end of southern arm	*Corylus avellana* hazel
7	Upright post from main/dense alignment at eastern end of southern arm	*Fraxinus excelsior* ash
8	Upright post from main/dense alignment midway along southern arm	*Fraxinus excelsior* ash
9	Upright post from main/dense alignment at western end of southern arm	*Salix sp./Populus sp.* willow/poplar

Table 2: Wood samples taken from STU 067

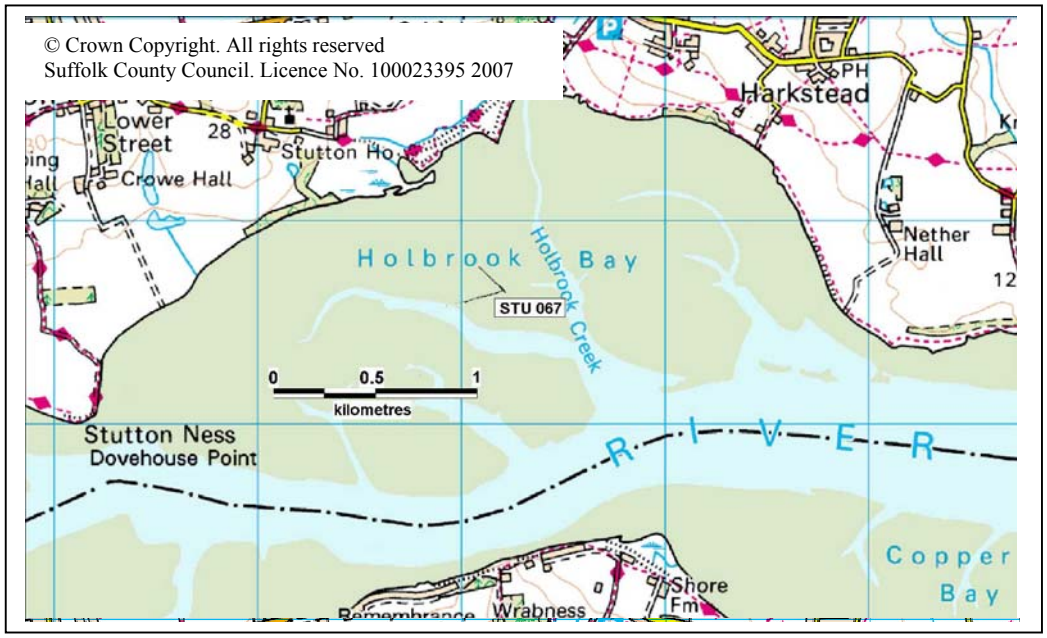


Figure 4: Location of site STU 067 within Holbrook Bay

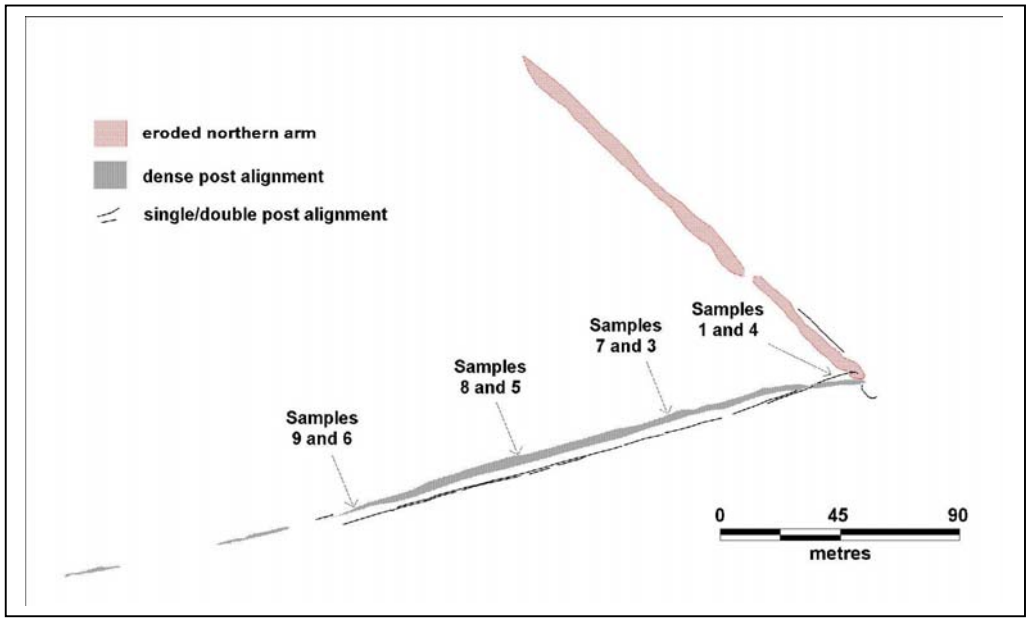


Figure 5: Plan of fish trap STU 067 and locations of samples

Plate 1: STU 067, showing the main structure of densely packed posts and the more ephemeral post line between the main structure and the waterline. Looking south west down the southern arm.

Plate 2: STU 067, remains of wattle hurdle or matting between main structure and ephemeral post line. Looking south east

Of the eight elements sampled for radiocarbon dating, six returned a very similar date range after Bayesian modelling of *cal* AD 680–850 (at 95% probability) and are likely to be in the range *cal* AD 630–690 (at 68% probability). These six samples all came from the main southern arm or the wattle panels that run alongside it. The remaining two samples were taken from the more ephemeral post line to the south of the main arm and crossing it at its eastern end. These returned a later date of *cal* AD 880–1025 (at 95% probability) suggesting either later re-use of the feature or a repair. The full radiocarbon dates are listed in Table 1 in the complete report included as Appendix I.

Holbrook Bay- STU 038, STU 050, STU 068, STU 079 and STU 080

A series of timber structures were recorded on the high tide line in Holbrook bay, immediately in front of, and in the case of STU 079, eroding out of the salt marsh. These appeared to be roughly circular or semi-circular in plan and constructed of round, upright timbers which had been axed to a pencil point to be driven into the ground.. Individual timbers had an average diameter of c.90mm and the structures measured between 5m and 11m in diameter, with an average gap between posts of c.800mm. A sample of posts were cleaned below the level of the foreshore to see if any sign of wattle was present around the uprights which might suggest the features had once been enclosed. No evidence of wattle or any other form of walling was found, nor was there evidence of charring, cut marks or other modifications of the roundwood timbers used.

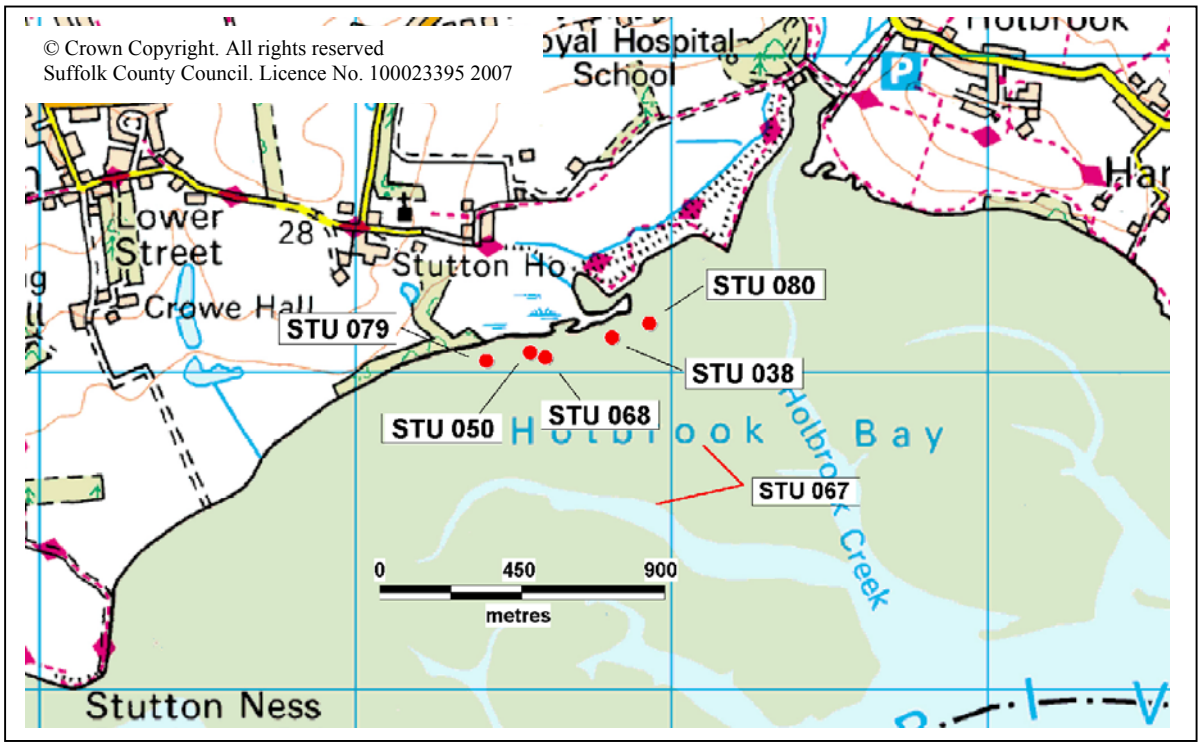


Figure 6: Location of sites studied within Holbrook Bay

Initially, two samples were taken from each structure STU 079 and STU 050, and plans made using the TST. The posts removed were excavated to their full depth in order to recover any worked points below the ground level (Plate 3). All four samples had axe-cut pencil points. Radiocarbon dating of these returned a date range of 16th-19th centuries (D. Hamilton, pers comm). A request from English Heritage to collect more samples in order to tighten up the dating, resulted in a further 15 timbers being collected, comprising 3 posts from each of 5 structures, including re-sampling of STU 079 and STU 050. These secondary samples have been sent for processing.

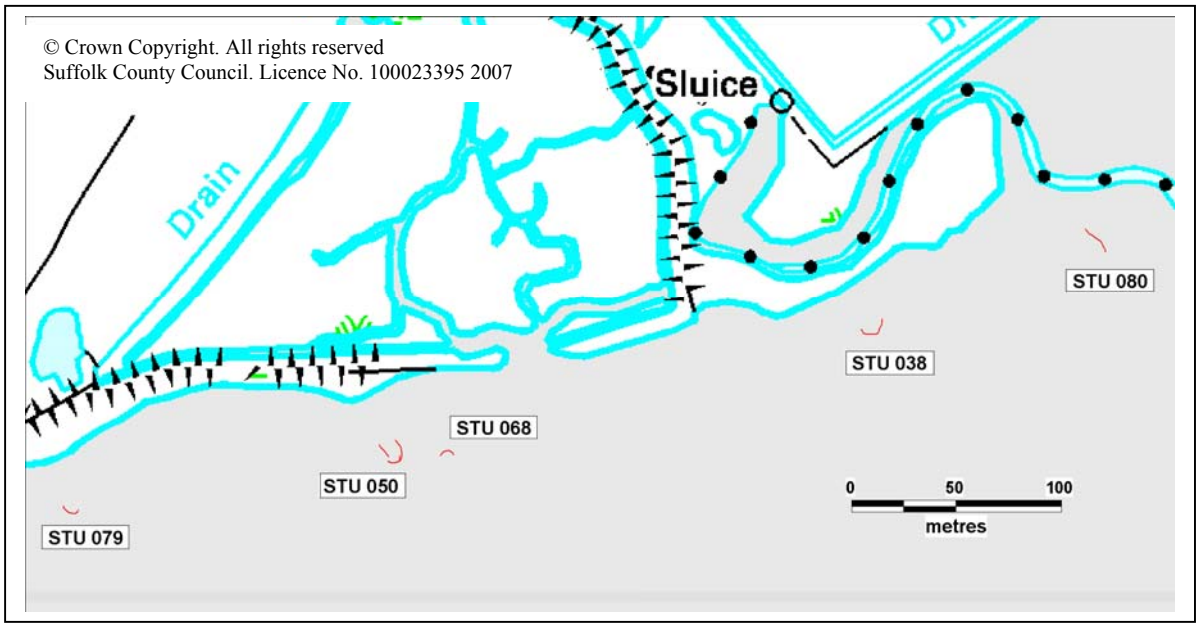


Figure 7: Plan of post-built structures in Holbrook Bay

Plate 3: Axe cut sample A from STU 079

Plate 4: STU 080 looking east south east (photographed in 2003)

Plate 5: STU 038, looking north west (photographed in 2003)

Plate 6: STU 050, looking north east (photographed in 2003)

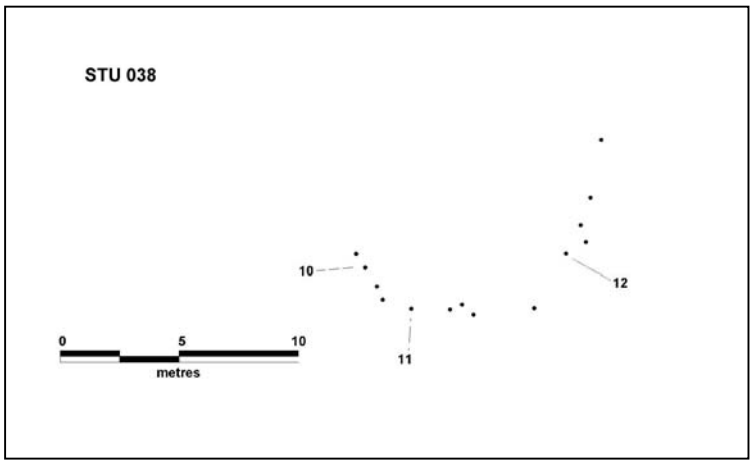


Figure 8: TST plan of STU 079 showing location of samples taken. Samples A and B were from the initial visit, numbered samples were collected subsequently.

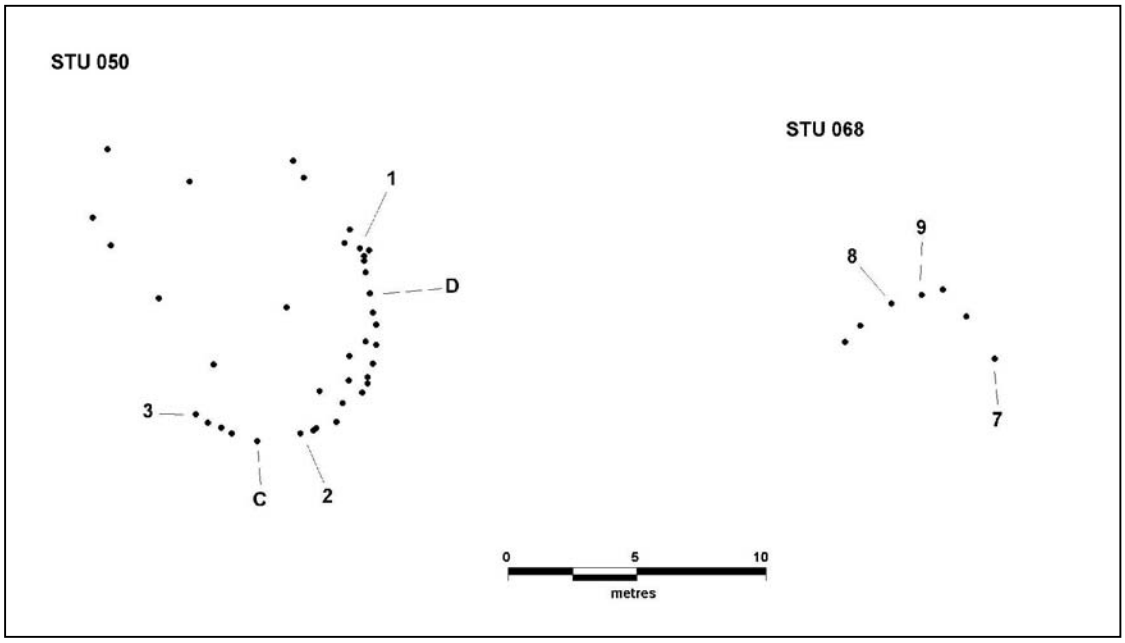


Figure 9: TST plans of STU 050 and 068 showing location of samples taken. Samples C and D were from the initial visit, numbered samples were collected subsequently.

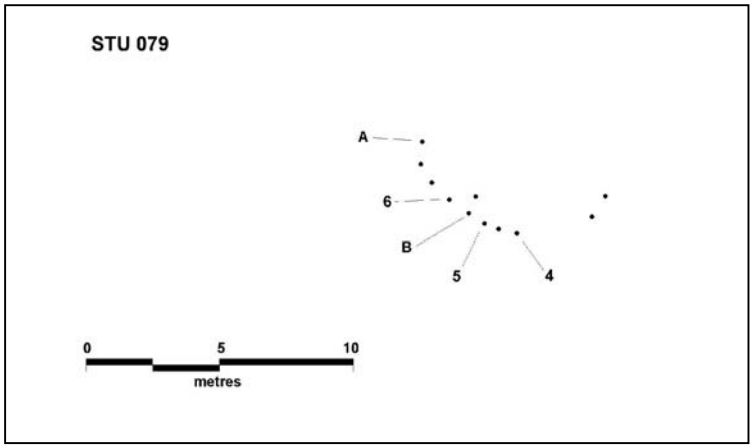


Figure 10: TST plan of STU 038 showing location of samples taken.

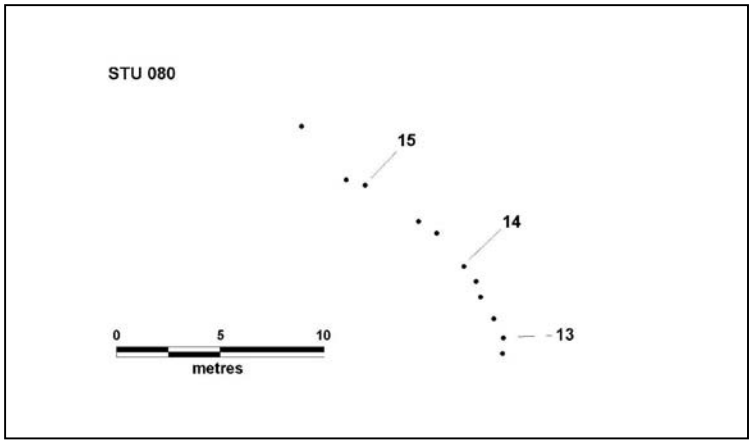


Figure 11: TST plan of STU 080 showing location of samples taken.

Barber's Point- FRS 047

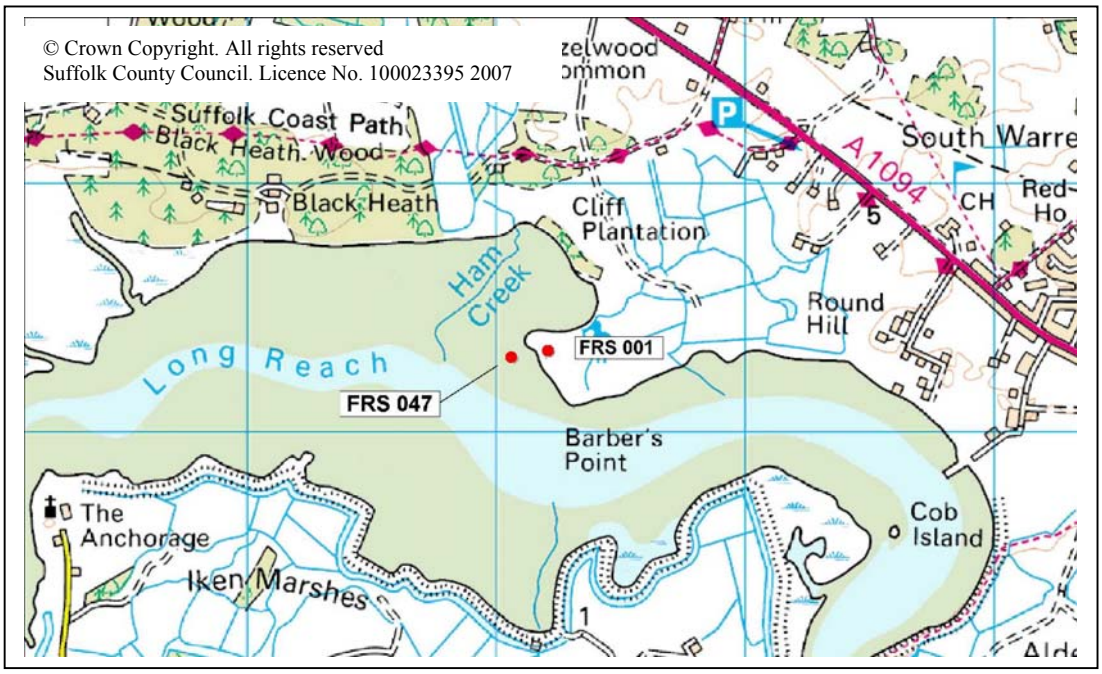


Figure 12: Location of site FRS 047

Man-made wooden structures were discovered on the foreshore of the River Alde by members of a team excavating a Roman and middle Saxon terrestrial site at Barber's Point in 2004 (FRS 001). In March 2006, four areas of one or more fragmentary wooden structures were planned using a combination of TST and scale drawing, with samples taken from each planned area for radiocarbon dating. The site was located between the high and low tide lines on the north side of the River Alde at TM4306 5730, approximately 43m from the shore, with structural fragments visible over an area of c.900 square metres. The foreshore at this point comprises a firm, gravelly surface covered by a layer of detreital mud, allowing easy access by foot as far as the low tide line.

The site comprises various areas of upright posts, wattle fragments and large, horizontally laid pieces of roundwood which have no bark and appear to be unworked. Many of the horizontals are scattered but one area (Area 3, Plate 9; Figure 16) was very structured, consisting of c.1m wide linear spread of SE-NW aligned horizontal timbers, none of which appeared to be worked, over a distance of approximately 11m. A small section of this was excavated to fully expose the timbers visible on the surface and to identify any further structural elements between or beneath them (Plate 9, Figure 16). All the areas of wattle, upright posts and wood scatters appear to be roughly SE-NW, the same alignment as the main channel of the Alde at this point. The upright posts were all heavily eroded but appeared to be quite small, averaging roughly 600mm in diameter.

Repeated visits were made to survey this site and on all occasions, despite timing the visit with the lowest possible tides, high easterly winds kept the tide high and pushed the tide back in more quickly than might have been expected. This resulted in a short window of opportunity to work on the timber and so only small areas were drawn to scale, with an overall plan produced by the TST (Figures 13-16).

Six samples were collected and submitted for radiocarbon dating (Table 3). Their locations were recorded on scale drawings and by the TST (see Figures 13-16).

SAMPLE	DESCRIPTION AND SOURCE	WOOD ID
1	Sample from probable wattle panel, area 1, unworked	gorse/broom
2	Horizontal roundwood from substantial wattle or track, area 3, unworked	cf. elder
3	Horizontal roundwood from substantial wattle or track, area 3, unworked	*Quercus sp.* oak
4	Sample from probable wattle panel, area 2, unworked	gorse/broom
5	Sample from probable wattle panel, area 2, unworked	gorse/broom
6	Upright roundwood timber from low tide line, unworked	*Quercus sp.* Oak

Table 3: Wood samples taken from FRS 047

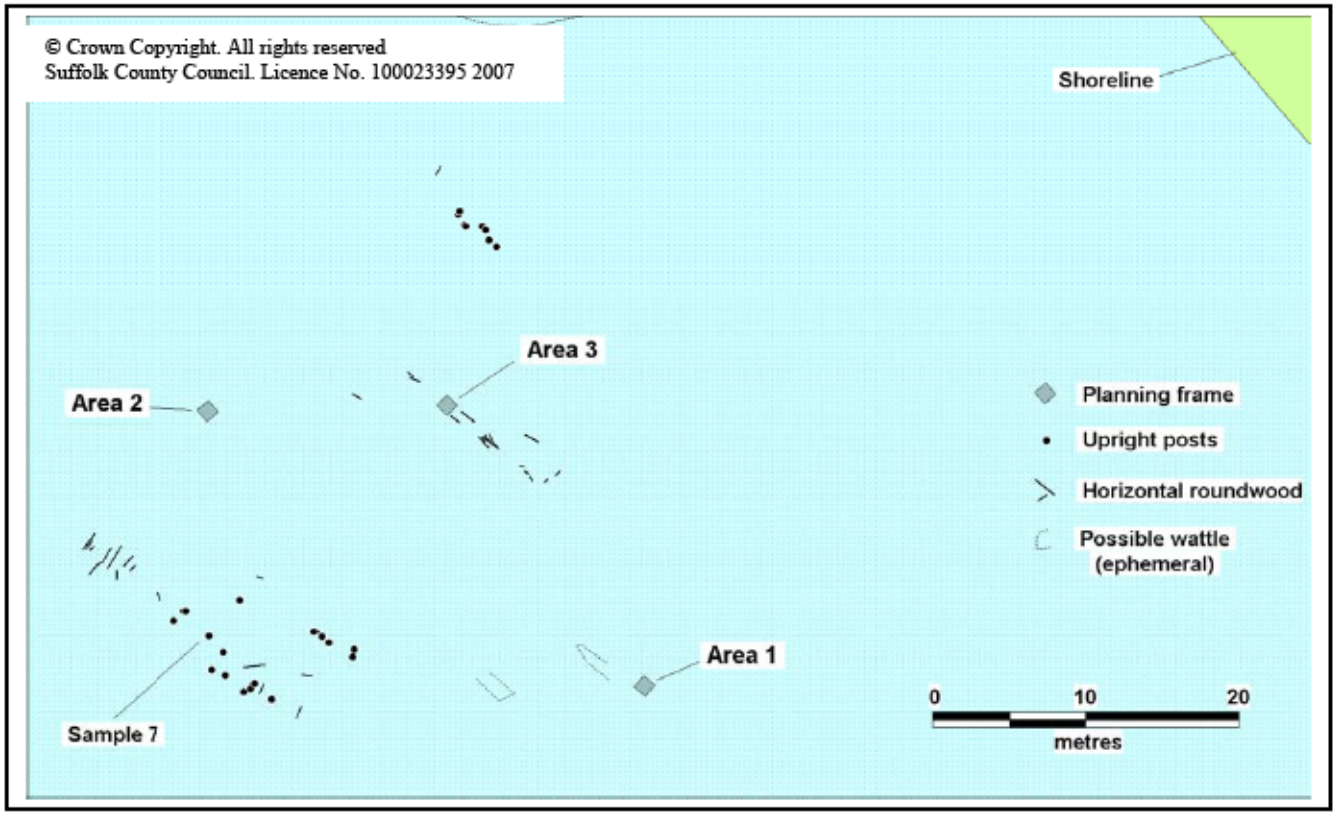


Figure 13: TST plan of FRS 047

The six elements sampled for radiocarbon dating all returned a very similar date range after Bayesian modelling of *cal* AD 650–780 (at 95% probability) and probably in the range cal AD 660–710 (at 68% probability). Radiocarbon dating results are included in full in Table1 in Appendix I.

Plate 7: FRS 047 Area 1, looking NE

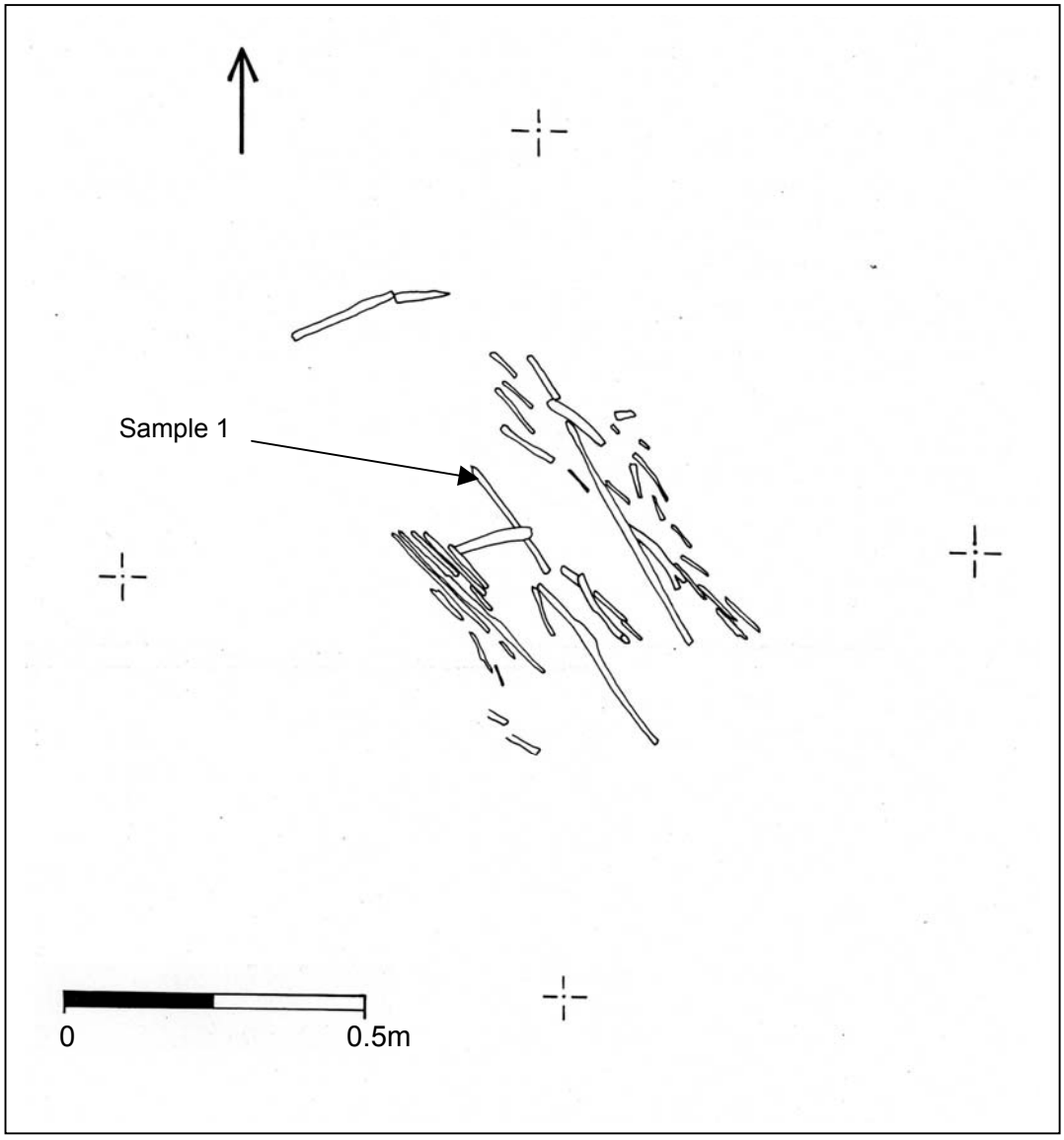


Figure 14: FRS 047 Area 1

Plate 8: FRS 047 Area 2, eastern end, looking NE

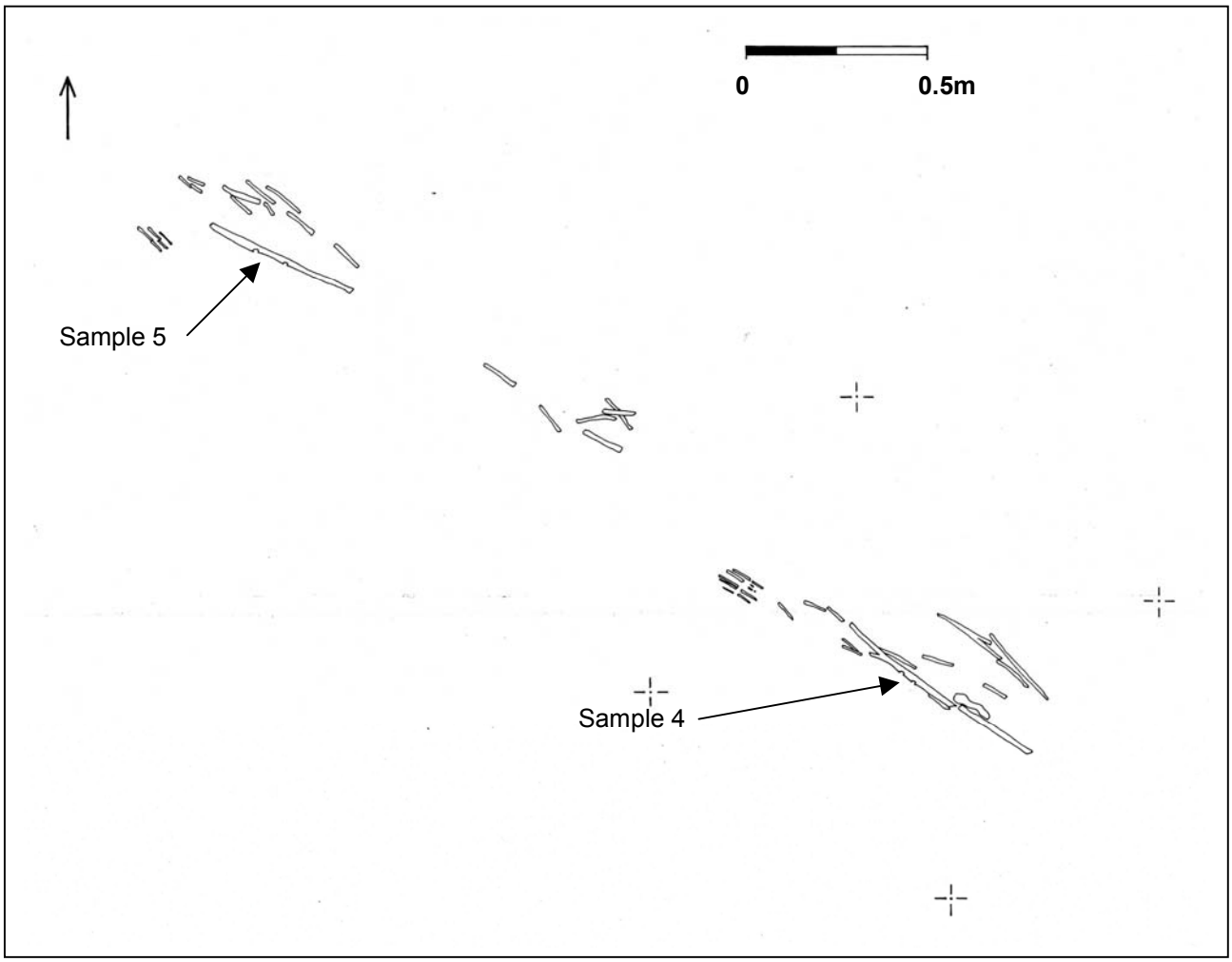


Figure 15: FRS 047 Area 2

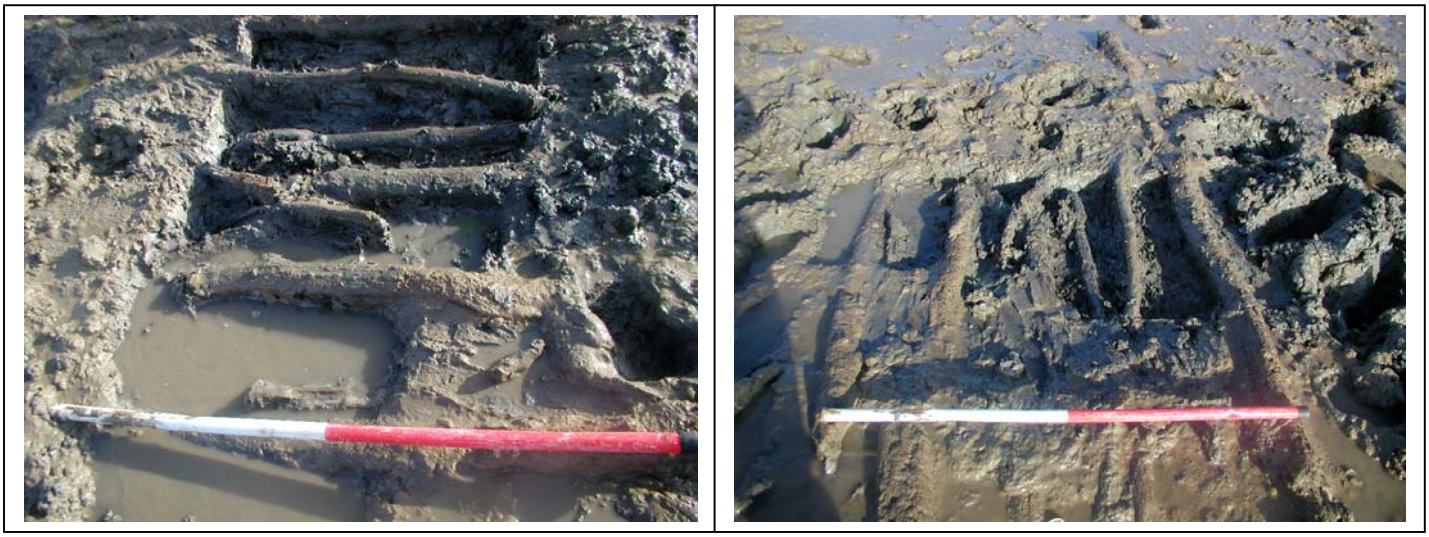


Plate 9: FRS 047 Area 3, looking NE left, looking NW right

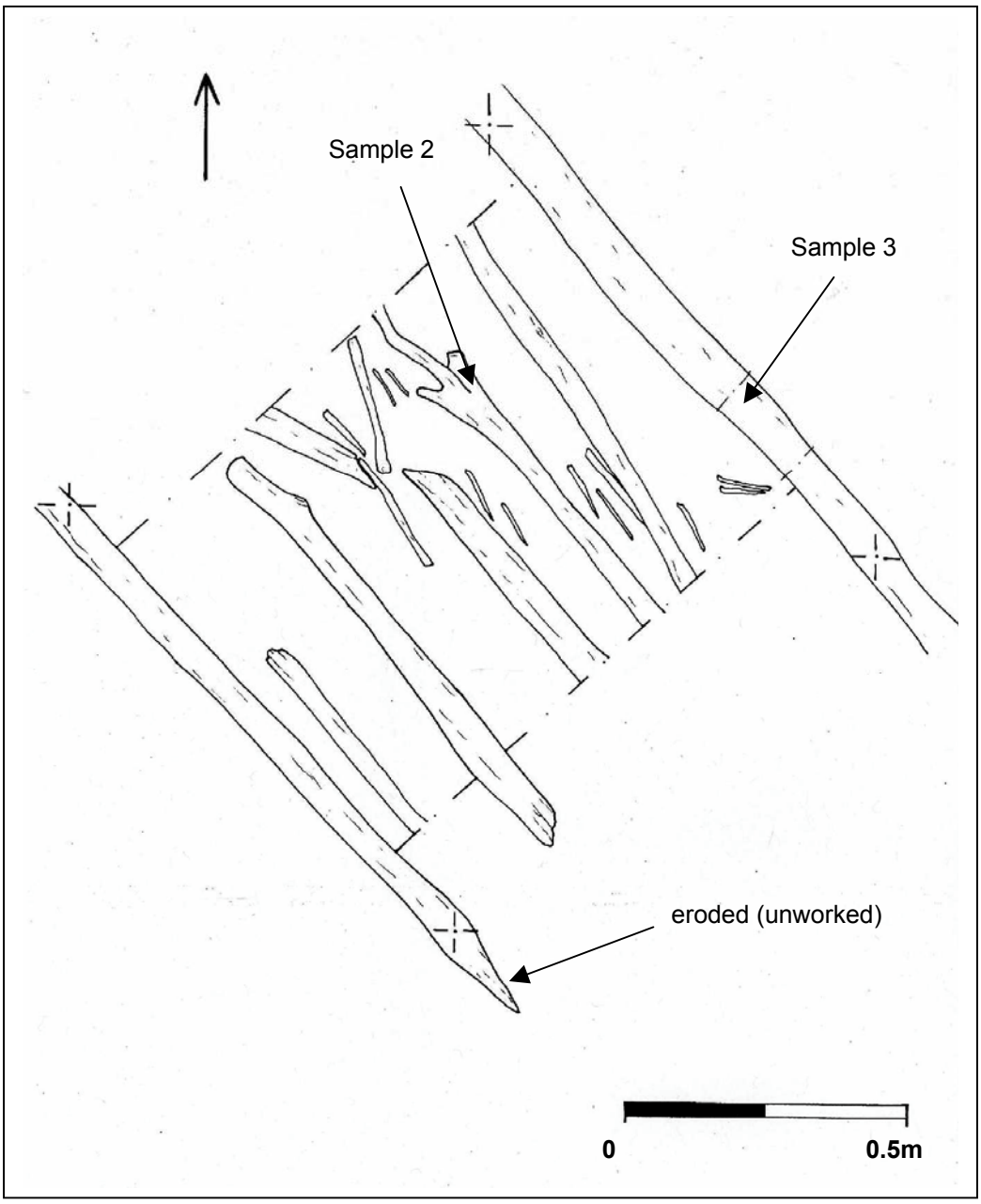


Figure 16: FRS 047 Area 3

Discussion

Holbrook Bay

The form and location of the fish trap in Holbrook Bay suggested a Saxon date for construction and use, based on parallel sites in Essex such as Collins Creek and Sales Point (Heppell, 2003; Murphy and Brown, 1999). Radiocarbon dates have confirmed that this is the case, giving a firm Middle Saxon date to the main body of the structure. The numerous rows of parallel posts that make up the southern arm of the trap suggest several phases of repair or re-use and the trap may therefore have been in use for a lengthy period of time. (Hegarty and Newsome, 2005) The structure includes a secondary line of posts to the south of the main arm which are very distinct from the main post line. They appear, stratigraphically, to represent a different phase of construction. This is supported by radiocarbon dates from two timbers (Lab ID numbers UB-5224 and UB-5225) along this post line point which are significantly later than those from the main structure.

The fish trap is a significant feature in its own right as a surviving Middle Saxon wooden structure. It also has the potential to inform us about the woodland management necessary to supply the thousands of timber components required and about who would have instigated the construction of such a large and complex structure. Whilst fish would have clearly been an important resource, a trap on the scale seen in Holbrook Bay is perhaps more likely to represent a manorial or monastic enterprise than the work of a few individuals.

When they were initially recorded, the post built structures STU 038, 050, 068, 079 and 080 appeared, to be either circular or semi-circular in form. No function for these features was obvious, nor was there any indication of age. They survive on the high tide line where the foreshore is quite beach-like, conditions which are less conducive to the preservation of organic material than the river silts surrounding the fish trap timbers. This would suggest that the timbers were not of any great age, however, STU 079 was visibly eroding out of the salt marsh. If all of these features had been sealed by salt marsh deposits, their potential to be of a significant age was greater. The current radiocarbon dates point towards the former being the case, the post medieval date ruling out any connection between these features and the Saxon fish trap. It is possible that these features represent something as simple as post arrangements used to dry fishing nets. Further dating is being undertaken.

FRS 047

Planning of the timbers at Barber's Point provided no clear plan from which it was possible to identify a specific function, nor is it clear how complete the structure is. There is a suggestion of a series of linear structures, some of which look like simple trackways, the dates of which are all very similar and likely to be contemporary. The Middle Saxon date also ties in with evidence of occupation at FRS 001, which lies within 50m of the timbers (Meredith, 2007). The site is very accessible from the firm, gravel foreshore at low tide, is submerged at high tide and is approximately aligned with the main river channel, all of which is suggestive of a fish trap but could equally point towards a simple quay or wharf.

References

Davidson, A. (ed.), 2002, *The Coastal Archaeology of Wales*, CBA Research Report 131 (Council for British Archaeology, York)

Everett, L. with Allen, D. and Mclannahan, C., 2003, *Rapid Field Survey of the Suffolk Coast and Intertidal Zone May 2002 – March 2003 Assessment Report*, (Suffolk County Council, Ipswich)

Hegarty, C. & Newsome, S., 2005, *The Archaeology of the Suffolk Coast and Inter-tidal Zone. A report for the national mapping programme.* Suffolk County Council and English Heritage.

Heppell, E., 2003, *Greater Thames Estuary, Essex Zone: Monitoring Survey, Interim Report No 2* (unpublished)

Loader, T., 1999, *Rapid Survey of the Suffolk Coast and Intertidal Estuaries: Updated Project Design*, (Suffolk County Council, Ipswich)

Meredith, J., 2007, *Barber's Point, Friston: A Report on the Archaeological Excavations, 2004 and 2006*, (Suffolk County Council, Ipswich)

Murphy, P. and Brown, N., 1999, 'Archaeology of the coastal landscape', in Green, L. S. (ed.)*The Essex landscape: in search of its history*, 11-19 (Essex County Council, Chelmsford)

Radiocarbon Dating: Norfolk/Suffolk Coastal Survey Project
by W Derek Hamilton, Peter Marshall, Johannes van der Plicht, Gerry McCormac

A total of 17 samples of waterlogged wood have been submitted for radiocarbon dating from 3 wooden features in the intertidal zone of the Suffolk coast.

Seven samples from a fishtrap at Holbrook Bay [STU067] were processed by the Palaeoecology Centre at the Queen's University, Belfast. These were prepared using the methods outlined in Stenhouse and Baxter (1983) and measured using liquid scintillation spectrometry (Noakes *et al* 1965).

The other ten samples (six from structures at Barber's Point [FRS047] and four from circular structures at Holbrook Bay [STU079 and 050]) were processed at the Centre for Isotope Studies at the University of Groningen, The Netherlands and were prepared using the methods outlined in Stenhouse and Baxter (1983) and measured using gas proportional counting (Noakes *et al* 1965).

Both laboratories maintain continual programmes of quality assurance procedures, in addition to participation in international intercomparisons (Scott *et al* 2003). These tests indicate no laboratory offsets and demonstrate the validity of the precision quoted.

Aims and objectives
The samples submitted for radiocarbon dating from the Norfolk/Suffolk Coastal Survey Project are aimed at providing absolute dating for archaeological remains of individual structures and to aid in establishing phasing between features located within the intertidal zone along these counties coastlines.

General approach
The Bayesian approach to the interpretation of archaeological chronologies has been described by Buck *et al* (1996). It is based on the principle that although the calibrated age ranges of radiocarbon measurements accurately estimate the calendar ages of the samples themselves, it is the dates of archaeological events associated with those samples that are important. Bayesian techniques can provide realistic estimates of the dates of such events by combining absolute dating evidence, such as radiocarbon results, with relative dating evidence, such as stratigraphic relationships between radiocarbon samples. These 'posterior density estimates', (which, by convention, are always expressed *in italics*) are not absolute. They are interpretative estimates, which will change as additional data become available or as the existing data are modelled from different perspectives.

The technique used is a form of Markov Chain Monte Carlo sampling, and has been applied using the program OxCal v3.10 (http://c14.arch.ox.ac.uk/oxcal.php), which uses a mixture of the Metropolis-Hastings algorithm and the more specific Gibbs sampler (Gilks *et al* 1996; Gelfand and Smith 1990). Details of the algorithms employed by this program are available from the on-line manual or in Bronk Ramsey (1995; 1998; 2001), and fully worked examples are given in the series of papers by Buck *et al* (1991; 1992; 1994a; 1994b). The algorithms used in the models described below can be derived from the structure shown in Figures 1–3.

The Results
The results are given in Table 1, and are quoted in accordance with the international standard known as the Trondheim convention (Stuiver and Kra 1986). They are conventional radiocarbon ages (Stuiver and Polach 1977).

Calibration
The calibrations of these results, relating the radiocarbon measurements directly to calendar dates, are given in Table 1 and in outline in Figures 1–3. All have been calculated using the calibration curve of Reimer *et al* (2004) and the computer program OxCal (v3.10) (Bronk Ramsey 1995; 1998; 2001). The calibrated date ranges cited in the text are those for 95% confidence. They are quoted in the form recommended by Mook (1986), with the end points rounded outwards to 10 years for errors greater than or equal to 25 years, and rounded to 5 years for errors less than 25 years. The ranges in Table 1 have been calculated according to the maximum intercept method (Stuiver and Reimer 1986), while the graphical distributions in Figures 1–3 are derived from the probability method (Stuiver and Reimer 1993).

Analysis and interpretation
There are no stratigraphic relationships between the samples from the identified features/structures and so they have been separated and analysed in unordered phases based upon their spatial association with other samples during the archaeological work.

Holbrook Bay Fishtrap (STU067)
The chronological model for the seven samples from STU067 is given in Figure 1. Two samples, UB-5224 and -5225, have been excluded from the model (denoted by a '?' next to the Lab ID) as they may represent later re-use of the feature. The model has good overall agreement ($A_{overall}$=91.8%).

The probability *end* (Fig 1) provides the best estimate for the construction of this fishtrap in *cal AD 680–850* (*95% probability*; *end*; Fig 1) and probably in *cal AD 630–690* (*68% probability*).

Barber's Point Structures (FRS047)
The chronological model for the six samples from FRS047 are given in Figure 2. The model has good overall agreement ($A_{overall}$=113.9%).

The probability *end* (Fig 2) provides the best estimate for the construction of this feature in *cal AD 650–780* (*95% probability*; *end*; Fig 2) and probably in *cal AD 660–710* (*68% probability*).

Holbrook Bay Circular Structures (STU079 and STU050)
The chronological model for the four samples from STU079 and 050 is given in Figure 3. The model has good overall agreement ($A_{overall}$=91.8%).

The lack of dates and the fact that they are so recent makes it difficult to say much more than this structure is likely post-medieval in date.

Table 1: Radiocarbon determinations from the Norfolk/Suffolk Coastal Survey Project

Lab ID	Sample ID	Material	$\delta^{13}C$ (‰)	Radiocarbon Age (BP)	Calibrated Date (95% confidence)
UB-5224	STU067 <1>	*Alnus glutinosa*, r/w, 110mm dia., no bark	-28.2 ±0.2	1135 ±17	cal AD 880–975
UB-5225	STU067 <3>	*Alnus glutinosa*, r/w, 110mm dia., no bark	-29.1 ±0.2	1029 ±17	cal AD 985–1025
UB-5227	STU067 <5>	*Corylus avellana*, r/w, 45mm dia., no bark	-28.6 ±0.2	1312 ±16	cal AD 660–765
UB-5228	STU067 <6>	*Corylus avellana*, r/w, 30mm dia., no bark	-29.5 ±0.2	1260 ±20	cal AD 675–805
UB-5229	STU067 <7>	*Fraxinus excelsior*, sapwood, no bark	-27.7 ±0.2	1269 ±16	cal AD 675–780
UB-5230	STU067 <8>	*Fraxinus excelsior*, sapwood, no bark	-28.4 ±0.2	1287 ±20	cal AD 665–775
UB-5231	STU067 <9>	*Salix/Populus* sp., r/w, 90mm dia., no bark	-27.2 ±0.2	1323 ±16	cal AD 655–765
GrN-30512	FRS047 <1>	gorse/broom, 20mm dia., 4 rings	-25.6	1455 ±25	cal AD 550–650
GrN-30513	FRS047 <2>	cf. Elder, 30mm dia., <10 rings	-25.7	1370 ±25	cal AD 640–680
GrN-30514	FRS047 <3>	*Quercus* sp., sapwood	-27.3	1310 ±40	cal AD 650–780
GrN-30515	FRS047 <4>	gorse/broom, 15mm dia., 4 rings	-27.9	1360 ±35	cal AD 630–760
GrN-30516	FRS047 <5>	gorse/broom, 25mm dia., <10 rings	-26.6	1435 ±30	cal AD 560–660
GrN-30517	FRS047 <6>	*Quercus* sp., 80mm dia., ~13 rings	-27.5	1350 ±20	cal AD 645–685
GrN-30518	STU079 <A>	*Ulmus* sp., 50mm dia., ~8 rings	-26.3	90 ±25	cal AD 1680–1930
GrN-30519	STU079 <B>	*Quercus* sp., 35mm dia., 5-6 rings	-25.0	80 ±25	cal AD 1690–1930
GrN-30520	STU050 <C>	*Ulmus* sp., 60mm dia., ~10 rings	-26.3	130 ±25	cal AD 1670–1950
GrN-30521	STU050 <D>	*Ulmus* sp., 55mm dia., 6-7 rings	-26.4	175 ±20	cal AD 1660–1950

Figure 1: Bayesian model of Holbrook Bay Fishtrap (STU054). The model structure, which is exactly defined by the square brackets and OxCal keywords at the left of the diagram, assumes only that all the samples belong to the same continuous phase of activity. The distributions in outline represent the calibration of each result by the probability method (Stuiver and Reimer 1993). The solid distributions are *posterior density estimates* for the calendar date for each sample. Two samples, UB-5224 and -5225, have been excluded from the model (denoted by a '?' next to the Lab ID) as they may represent later re-use of the feature.

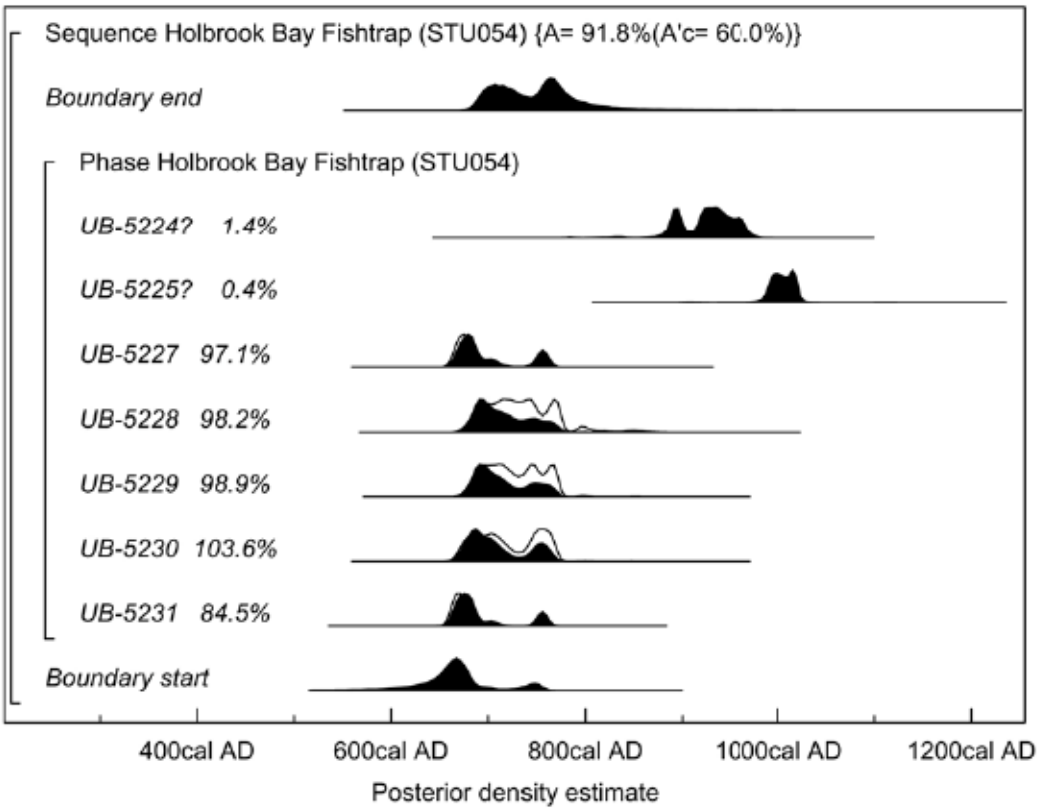


Figure 2: Bayesian model of Barber's Point Fishtrap (FRS047). The model structure is the same as described in Figure 1

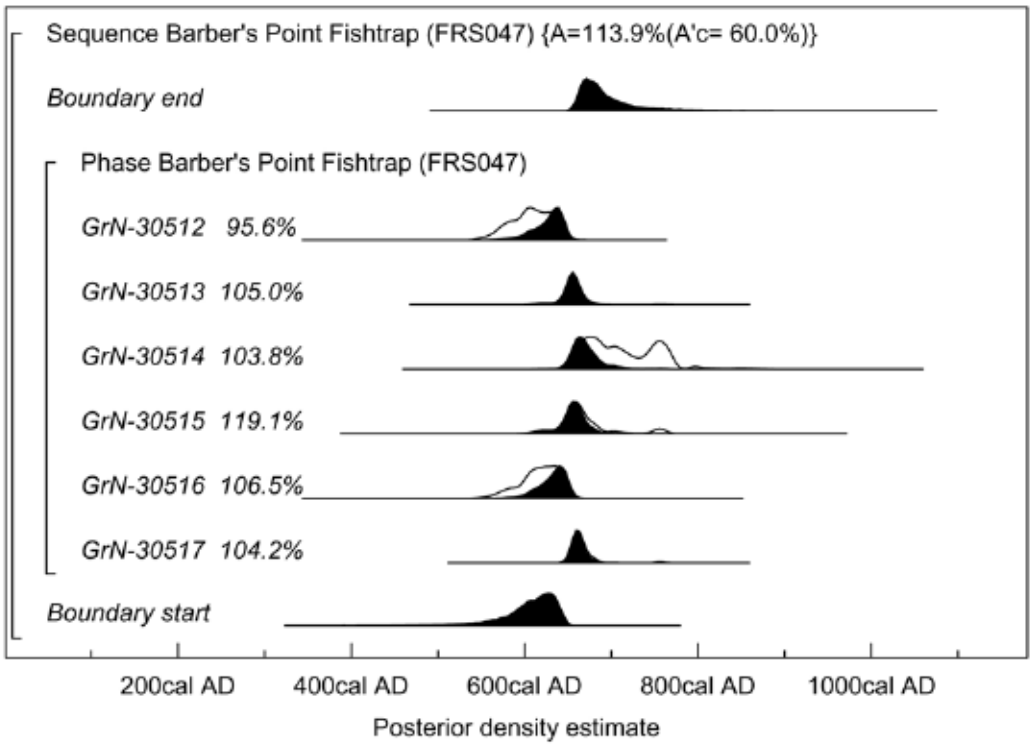
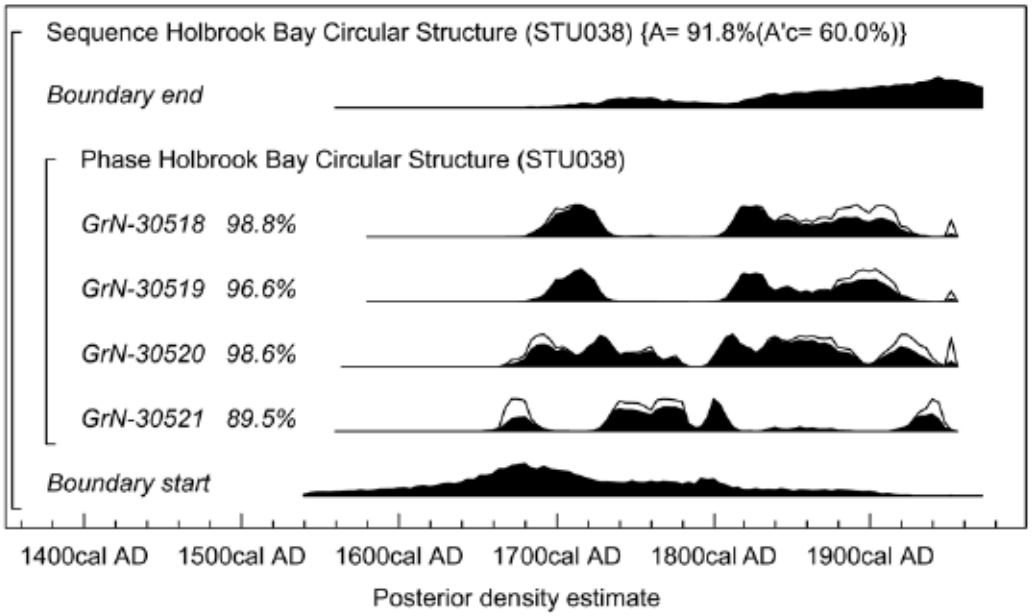


Figure 3: Bayesian model of Holbrook Bay Circular Structures STU 079 and 050 The model structure is the same as described in Figure 1



Works Cited

Bronk Ramsey, C, 1995 Radiocarbon calibration and analysis of stratigraphy, *Radiocarbon*, **36**, 425–30

Bronk Ramsey, C, 1998 Probability and dating, *Radiocarbon*, **40**, 461–74

Bronk Ramsey, C, 2001 Development of the radiocarbon calibration program, *Radiocarbon*, **43**, 355–63

Buck, C E, Cavanagh, W G and Litton, C D 1996 *Bayesian Approach to Interpreting Archaeological Data*, Chichester

Buck, C E, Christen, J A, Kenworthy, J B, and Litton, C D, 1994a Estimating the duration of archaeological activity using ^{14}C determinations, *Oxford Journal of Archaeology*, **13**, 229–40

Buck, C E, Kenworthy, J B, Litton, C D, and Smith, A F M, 1991 Combining archaeological and radiocarbon information: a Bayesian approach to calibration, *Antiquity*, **65**, 808–21

Buck, C E, Litton, C D, and Scott, E M, 1994 Making the most of radiocarbon dating: some statistical considerations, *Antiquity*, **68**, 252–63

Buck, C E, Litton, C D, and Smith, A F M, 1992b Calibration of radiocarbon results pertaining to related archaeological events, *J Archaeol Sci*, **19**, 497–512

Gelfand, A E, and Smith, A F M, 1990 Sampling approaches to calculating marginal densities, *J Amer Stat Assoc,* **85**, 398–409

Gilks, W R, Richardson, S, and Spiegelhalther, D J, 1996 *Markov Chain Monte Carlo in Practice*, London (Chapman and Hall)

Mook, W G, 1986 Business meeting: Recommendations/Resolutions adopted by the Twelfth International Radiocarbon Conference, *Radiocarbon*, **28**, 799

Noakes, J E, Kim, S M, and Stipp, J J, 1965 Chemical and counting advances in Liquid Scintillation Age dating, in *Proceedings of the Sixth International Conference on Radiocarbon and Tritium Dating* (eds E A Olsson and R M Chatters), 68–92, Washington DC

Reimer, P J, Baillie, M G L, Bard, E, Bayliss, A, Beck, J W, Bertrand, C J H, Blackwell, P G, Buck, C E, Burr, G S, Cutler, K B, Damon, P E, Edwards, R L, Fairbanks, R G, Friedrich, M, Guilderson, T P, Hogg, A G, Hughen, K A, Kromer, B, McCormac, G, Manning, S, Bronk Ramsey, C, Reimer, R W, Remmele, S, Southon, J R, Stuiver, M, Talamo, S, Taylor, F W, van der Plicht, J, and Weyhenmeyer, C E, 2004 IntCal04 Terrestrial radiocarbon age calibration, 0–26 Cal Kyr BP, *Radiocarbon*, **46**, 1029–58

Scott, E M (ed), 2003 The Third International Radiocarbon Intercomparison (TIRI) and the Fourth International Radiocarbon Intercomparison (FIRI) 1990–2002: results, analysis, and conclusions, *Radiocarbon*, **45**, 135-408

Stenhouse, M J, and Baxter, M S, 1983 ^{14}C dating reproducibility: evidence from routine dating of archaeological samples, *PACT*, **8**, 147–61

Stuiver, M, and Kra, R S, 1986 Editorial comment, *Radiocarbon*, **28(2B)**, ii

Stuiver, M, and Polach, H A, 1977 Reporting of ^{14}C data, *Radiocarbon*, **19**, 355–63

Stuiver, M, and Reimer, P J, 1986 A computer program for radiocarbon age calculation, *Radiocarbon*, **28**, 1022–30

Stuiver, M, and Reimer, P J, 1993 Extended ^{14}C data base and revised CALIB 3.0 ^{14}C age calibration program, *Radiocarbon*, **35**, 215–30

Ward, G K, and Wilson, S R, 1978 Procedures for comparing and combining radiocarbon age determinations: a critique, *Archaeometry*, **20**, 1931