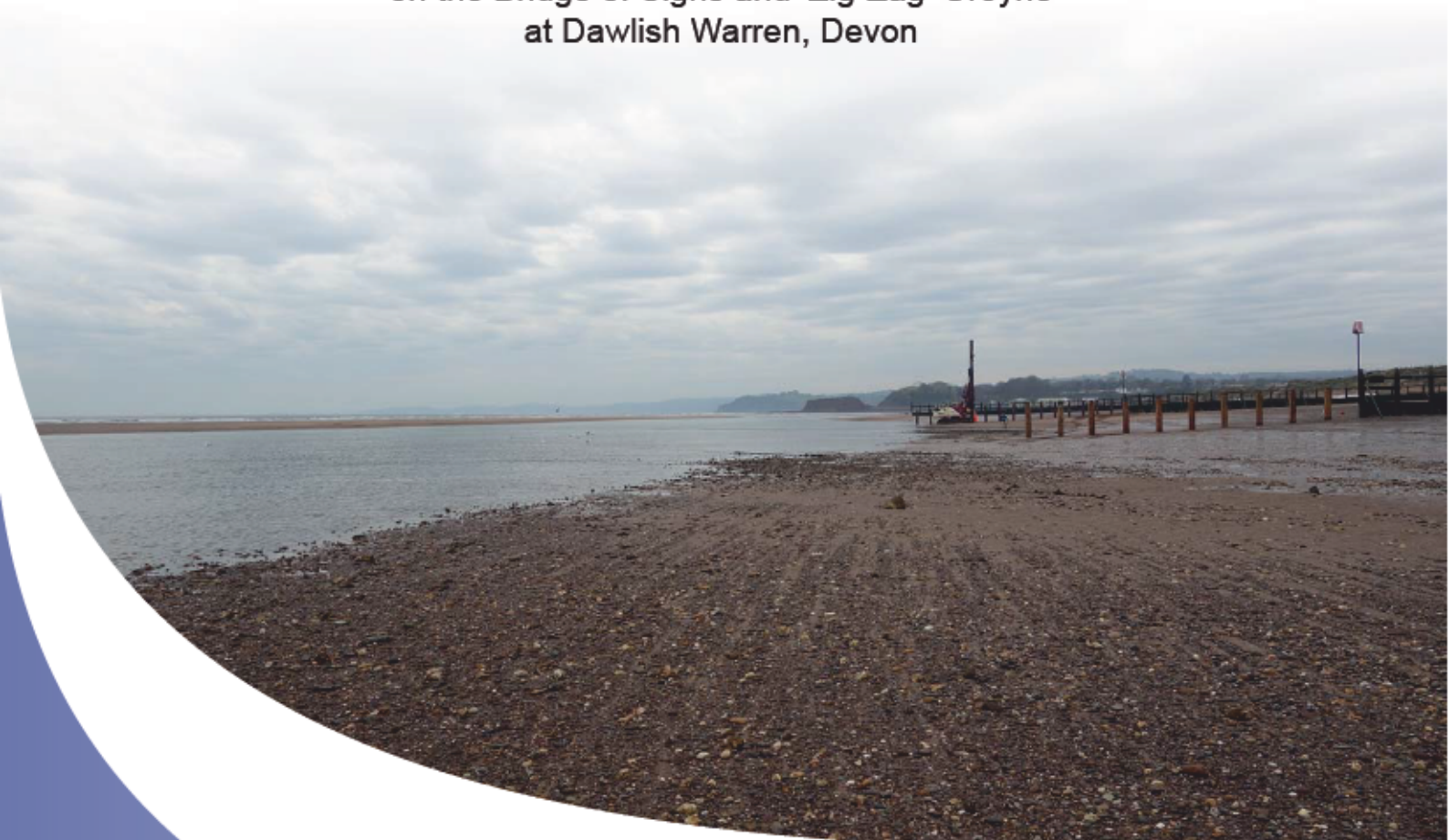




Dawlish Warren Beach Management Scheme, Devon

Archaeological Recording and Watching Brief
on the Bridge of Sighs and 'Zig-Zag' Groyne
at Dawlish Warren, Devon



Ref: 109582.04
June 2017



**Dawlish Warren
Beach Management Scheme,
Devon**

**Archaeological Recording and Watching Brief
on the Bridge of Sighs and 'Zig-Zag' Groyne at Dawlish Warren, Devon**

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Dawlish Warren Beach Management Scheme, Devon

Archaeological Recording and Watching Brief on the Bridge of Sighs and 'Zig-Zag' Groyne at Dawlish Warren, Devon

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Dawlish Warren Beach Management Scheme, Devon

Archaeological Recording and Watching Brief on the Bridge of Sighs and 'Zig-Zag' Groyne at Dawlish Warren, Devon

Summary

Wessex Archaeology was commissioned by BAM Nuttall Ltd. to design and undertake an archaeological survey and watching brief before and during the removing of two historic structures on Dawlish Warren: a 'zig zag' timber groyne; and the extant remains of a causeway type structure, referred to as the 'Bridge of Sighs'. The works comprised an archaeological walkover and recording survey of the site and the subsequent watching brief as the structures were removed.

Wood samples from the 'Bridge of Sighs' were also taken for C14 dating analysis, as the origin and construction period for this structure was unknown.

No significant archaeological discoveries were made during the survey or watching brief. The results, when combined with map regression, show that the 'Bridge of Sighs' was probably constructed sometime after 1819 and before 1887 to link the inner and outer warren. The 'Zig-Zag' groyne is probably as suggested a 1960s experimental groyne design that failed to achieve expectations.

No further recommendations, following the works carried out, are made.



Dawlish Warren Beach Management Scheme, Devon

Archaeological Recording and Watching Brief on the Bridge of Sighs and 'Zig-Zag' Groyne at Dawlish Warren, Devon

Acknowledgements

Wessex Archaeology(WA) would like to thank for their assistance Mark Taylor, Paul Tyler, Lawrence Jones and the site staff of BAM Nuttall Ltd. in facilitating this work.

The watching brief and archaeological recording was carried out by Alistair Byford-Bates and Thomas Harrison. The report was compiled by Alistair Byford-Bates with the assistance of Inés López-Dóriga (radiocarbon dating analysis) and Dana Challinor for the wood identification. Karen Nichols prepared the illustrations. Euan McNeil undertook QA and managed the project on behalf of WA.



Dawlish Warren Beach Management Scheme, Devon

Archaeological Recording and Watching Brief on the Bridge of Sighs and 'Zig-Zag' Groyne at Dawlish Warren, Devon

1 INTRODUCTION

1.1 Project background

- 1.1.1 Wessex Archaeology was commissioned by BAM Nuttall Ltd. to design and undertake an archaeological survey and watching brief before and during the removing of two historic structures. These structures were a 'zig zag' timber groyne adjacent to the current groyne 10 (believed to be an experiment installed by local authority in the 1960s); and the extant posts from a causeway type structure, referred to as the 'Bridge of Sighs' adjacent to the current groyne 13.
- 1.1.2 The works comprised an archaeological walkover and recording survey of the site and the subsequent watching brief as the structures were removed.
- 1.1.3 The requirement for these surveys was raised during email correspondences between BAM Nuttall Ltd. and Wessex Archaeology staff. The surveys comprised a photographic recording of the individual elements of the site and its features, a GPS survey of the site and a drawing record of representative sections of the site and any unique features therein.
- 1.1.4 Wood samples from the 'Bridge of Sighs' were also taken for C14 dating analysis, as the origin and construction period for this structure was unknown. The samples were taken using a handsaw.
- 1.1.5 These survey areas lie within the intertidal zone, within a Site which has a history with regards to military and ordnance activities.

1.2 The Site

- 1.2.1 A detailed description of the site can be found in the marine archaeological desk-based assessment and geophysical survey (Wessex Archaeology 2015), however a brief summary is provided below.
- 1.2.2 The Dawlish Warren Beach Management Scheme is situated in the mouth of the Exe Estuary, Devon (**Figure. 1**).
- 1.2.3 The basement geology within the Study Area comprises Permian and Triassic mudstones, sandstones and breccias, specifically the Watcombe Breccia (Upper Permian) and the Aylesbare Mudstone (Lower Triassic) (Hamblin et al. 1992, British Geological Survey 1983).
- 1.2.4 The Quaternary sediments of the Study Area have been affected by the erosional nature of the English Channel environment during glacial/interglacial cycles, and palaeovalleys generally represent the only surviving Pleistocene deposits within the English Channel. Within the Study Area, there is a relatively small, infilled palaeochannel, likely the offshore extension of the River Exe, which extends from Exmouth, through the Study Area and south to Start Bay.

- 1.2.5 The Study Area today is mainly an intertidal environment, with some areas only exposed at low tide. Seabed sediments comprise two separate deposits. The lower deposit is a lag gravel, probably a reworked remnant of the underlying sediment; and the upper deposit is mobile muddy sand (Hamblin et al. 1992), comprising a combination of offshore (reworked seabed sediment), coastal (deposited from local beaches and longshore drift) and terrestrial (deposited from the River Exe) sources. Pole Sand, located just to the north of the Study Area, is known to be highly mobile, and the depth and distribution of sediment changes regularly.

2 ARCHAEOLOGICAL BACKGROUND

2.1 Introduction

- 2.1.1 An unpublished desk based assessment of the area covering the site was carried out in 2015 by Wessex Archaeology (WA 2015) on behalf of the Environment Agency along with a marine geophysical survey of the area offshore covering Pole Sands.
- 2.1.2 The two features recorded and monitored during the watching brief laid on the southern, seaward side, of Dawlish Warren (**Figure. 1**). No archaeological material was found during the watching brief phase of this project.
- 2.1.3 Known sites and find spots within close proximity of the two features are shown within this earlier study. These, which might be imprecisely located, are predominantly modern in origin, with the remnants of military structures dating to the Second World War, and reclamation programmes from the 1950s onwards.
- 2.1.4 To the north west of the site is the remnants of a medieval rabbit warren now covered by the golf course. To the north east is the remnants of the early 20th century scattered settlement. Remnants of this settlement can also be seen a low tide to the south east of the site.

3 METHODOLOGY

3.1 Aims and objectives

- 3.1.1 The aim of the archaeological recording and watching brief as proposed in the Archaeological Recording and Watching Brief Scope of Works and Commercial Proposal were to mitigate against the effects of the partial or completely removal of the two structures due to health and safety concerns expressed by BAM Nuttall Ltd.

3.2 Recording methodology

- 3.2.1 In total one groyne and the structure known as the 'Bridge of Sighs' were recorded and sampled. Each of the structures was photographed using a Canon Eos 5D Mark III Full Frame digital camera. Hand written notes were made of their type, materials and general condition. The photographic number and location of shot were all recorded onto WA proforma record sheets and marked up on hard copy plans on-site. This information was then uploaded onto the GIS, using ArcGIS 10.2. A GPS survey of the two structures was also carried out, though this was limited by the tide. No other work was carried out.
- 3.2.2 The archaeological watching brief was carried out on the commencement of the groundwork impacting on archaeological features and deposits during the removal of the 'zig zag' groyne and the piles relating to the feature known as the 'Bridge of Sighs'.

3.2.3 All below ground works were monitored by an archaeologist during the excavation of the wooden piles to facilitate their removal. Due to the nature of the beach material and the unsupported excavation, no access to the excavated areas was attempted.

3.2.4 Any artefacts, had they been encountered, were to be retained from excavated contexts, except features or deposits undoubtedly of modern date. In these circumstances, sufficient artefacts were only to be retained to elucidate the date and function of the feature or deposit.

3.3 Recording

3.3.1 The two features were recorded on 30 March 2017 using digital photography (**Plates 1-2**), drawing representative sections of the 'Zig-Zag' groyne (**Figure 2**), and the production of a dimension's plan of the 'Bridge of Sighs' to compliment the GPS survey of the two structures (**Figure 1**).

3.4 Monitoring

3.4.1 The monitoring phase of the removal of the two structures comprised a photographic record of the material being removed with additional images and recording of representative components (**Plates 3-12**).

3.5 Specialist strategies

Dating

3.5.1 Two samples from the external part of two of the posts from the 'Bridge of Sighs' were submitted for radiocarbon dating, after species and anatomy ID. Unfortunately, no compression lines or bark were observed in the samples. To minimise the uncertainty provided by the difference between the age of formation of the preserved external ring and the real external ring of the tree, the external preserved ring was dated.

3.5.2 The samples were submitted to the 14CHRONO Centre, Queen's University, Belfast. The dates have been calculated using the IntCal13 calibration curve (Reimer et al. 2013) and the computer program OxCal (v4.2.3) (Bronk Ramsey and Lee 2013) and cited at 95% confidence. The dates have been first combined and then prior information, such as the terminus ante quem of 1930 provided by historical evidence, have been introduced into the model.

4 ARCHAEOLOGICAL RESULTS

4.1 Introduction

4.1.1 No significant archaeological discoveries were made on the site.

4.1.2 The two structures recorded are modern in origin. The 'Bridge of Sighs' dating to the 19th century and the 'Zig-Zag' groyne to the second half of the 20th century.

4.2 The 'Zig-Zag' Groyne

4.2.1 No significant archaeological discoveries were made on this feature.

4.2.2 This unusual permeable groyne was comprised of a repeating design of closely spaced posts with retaining 'kickboards' or waling on either side, but no other planking. The posts were showing varying degrees of preservation, but were in a general poor state, with no evidence of maintenance or repair in the recent past. A similar design has been in use at Calshot in Hampshire (Perdok 2002).

- 4.2.3 The softwood post comprised of 205 mm (8") square post (**Plate 3**) at either end of the runs with 170 mm (7") round posts filling the space between them (**Figure 2**). There were also random 100 mm (5") posts that appeared to have been used to infill gaps in the runs. At ground level the waling was 3270 x 200 x 50 mm boards were nailed to the square posts with square profiled chisel shaped 130 mm (5") nails. No evidence of shoes was visible on the tapered square posts (**Plate 3 & 4**) and the round post all showed evidence of having been piled (**Plate 5**). The construction sequence appears to be king post first, then the waling, and finally the round piles. The runs at the landward side of the beach had a greater degree of missing or truncated posts. The original post lengths were not clear due to the degree of erosion they had suffered, surviving post were on average buried 3900 mm into the current beach level with 100-2300 mm visible above the current beach level. Due to lack of access, it was not clear how much deeper, if at all, the king posts were driven into the beach, than the remaining piles.
- 4.2.4 The appearance of fishing gear, rope and cable wrapped around some of the post and buried up to 500 mm below the current beach surface and an observed variation in the composition of the beach material from sand, to sand and gravel, and then a sand, shingle and cobbles layer point to the large variations in the beach levels in the recent past (**Plate 6**), a fact confirmed anecdotally.
- 4.2.5 On the east side of eight of the posts were small copper plates with 'WE ARE HERE CLAIMING SANCTUARY FROM THE ELEMENTS'. These stamped plates appear to be a relatively recent addition as one post in the row was missing, but the sentence appears to be complete. They were fixed with short iron tacks (**Plates 7**). Who placed it here is unknown, but it may originate from 'Flight' by Carol Laidler and Pat Jamieson (<http://www.alldaybreakfast.info/albums/flight/> [accessed 09.06.2017]).

4.3 The 'Bridge of Sighs'

- 4.3.1 No significant archaeological discoveries were made on this feature.
- 4.3.2 This structure comprised of the extant stumps of king posts with short sections of boards also present. All show poor levels of preservation above ground level (**Plates 1**). It was not clear from the excavation if all the posts on the landward side were excavated, or whether some may still be buried beneath the sand dunes.
- 4.3.3 The 32 visible posts comprised of 230 mm square pointed stumps, between 1100-1400 mm long, with evidence for iron shoes visible on the tips of some of the posts (**Plates 8 & 9**). Three board stumps were present between two king posts on the westernmost row. These were not attached to the posts and no evidence of cross members, struts or beams were observed during the removal process. The boards were tapered at their ends (**Plate 10**), suggestive of them being piled in, though there was none of the flattening at the ends that would be expected from this process. An additional row of boards on the eastern side of the row of post was also visible (**Plate 11**). The boards comprised of 205 x 70 mm stumps between 560-940 mm long. All but one board appeared to be of softwood origin, the exception being a 205 x 50 mm redwood board (**Plate 12**). Due to the marine fouling this was only visible once the board had been excavated.

4.4 Metalwork

- 4.4.1 Heavily corroded sections of pipe and steel work were observed along with other modern metal debris, including wheel rims and unidentified concretions around the area close to the two structures. There was no evidence that the material was associated with these structures and is probably related to previous work on the beach, either dating to the Second World War or previous beach management schemes.

4.5 Timber Identification

4.5.1 Three pieces of wood were submitted for identification prior to radiocarbon dating. The wood was not waterlogged, but dry and hard. Identification was made by standard sectioning procedures, using a razor blade and mounting onto a glass slide.

Table 1: Timber Identification

Sample code	Identification	Notes
A	<i>Pinus sylvestris</i> (Scot's pine)	
B	<i>Pinus sylvestris</i> (Scot's pine)	
C	<i>Pinus sylvestris</i> (Scot's pine)	Compression lines

4.5.2 The identification of *Pinus* was made on the following criteria: presence of resin canals, uniseriate rays, dentate ray tracheids, fenestriiform pits. The fenestriiform pits were characteristic of the native British species *P. sylvestris* and it is probable that this species is represented. However, pollen evidence has suggested that although *P. sylvestris* grew extensively in southern Britain during the Mesolithic period, it declined and its subsequent geographic distribution was restricted to Scotland (Godwin 1956). In some areas, pine was thought to have been re-introduced in the late medieval period (Rackham 1986) and it may have persisted in rare relict stands. The preservational condition of the wood suggest that it may be relatively recent in age (medieval or post-medieval), which and it should also be noted that the European *P. nigra* (black pine) would have been accessible in those periods and cannot be readily distinguished from *P. sylvestris* on anatomical grounds. The compression lines in Sample C indicate that the piece came from branchwood.

4.6 Scientific dating

4.6.1 The dates have provided imprecise but consistent results. The imprecision is given by two facts related to the characteristics of the radiocarbon curve. On the one hand, the radiocarbon date is near but probably beyond the end of the calibration curve. On the other hand, the dates hit the radiocarbon curve at a modern point in time, in which, due to anthropic activity, the levels of carbon in the atmosphere have experimented unusual oscillations.

Table 2: C14 Analysis Results

Sample ID	Lab. reference	BP date	Calibrated date (2 σ)
109582_A	UBA-34735	94 \pm 24	cal. AD 1690-1925
109582_B	UBA-34736	96 \pm 23	cal. AD 1690-1925

4.6.2 Given the dry and good preservation of the wood, which would have been much decayed if submerged in water for several centuries, and the concentration of most of the probability (68.5%) in a particular area of the curve, it is possible to confirm that the feature was built between the early 19th century (1812) and prior to 1919 (**Figure 3**). Should more precise dates wished to be obtained, wiggle-matching (Bronk-Ramsey et al. 2001) could be undertaken.

5 INTERPRETATION, SIGNIFICANCE AND RECOMMENDATIONS

5.1 Summary

5.1.1 The excavation of the 'Zig-Zag' groyne and the 'Bridge of Sighs' produced no significant archaeological discoveries. The dating of the latter and identification of the timber used in both structures point to a 19th and 20th century origin for them. Map regression suggests that the 'Bridge of Sighs' post-dates 1851 and the 'Zig-Zag' groyne, 1960.

5.2 The 'Bridge of Sighs'

5.2.1 The 'Bridge of Sighs' was originally constructed as a causeway between the Inner and Outer Warren crossing the creek that drained Greenland lake (Kidson, 1950). The retreat and erosion that the Warren has suffered means that this structure, though original centrally located in the Warren, was left redundant on the south-east edge. The extant remains of the foundations of a building to the south-east of the position of the 'Bridge of Sighs' can also be seen in 1890 1:10, 560 Ordnance Survey County Series map of Devon. By the 1933 1:10,560 edition both this structure and the 'Bridge of Sighs' had been lost due to the sea breaking through and the retreat of the warren. The extant remains were indicative of a wooden structure that had fallen out of use and suffered the effects of nearly 100 years of erosion in the dynamic, high-impact, environment of a river estuary.

5.3 The 'Zig-Zag' Groyne

5.3.1 The 'Zig-Zag' groyne was a soft wood, pile row, permeable groyne that was reportedly constructed as an experiment in the 1960s. Due to the inherent inaccuracy of using C14 dating on material post-dating the 1950s, no dating of the timbers occurred. Designed to be used on beaches with sufficient sediment supply, they are designed to give a more uniform beach shape (Perdok 2002), though this appears to have failed, either due to the loss of material or extreme tides eroding away material. This would appear to be confirmed by the lack of maintenance this groyne has received and the construction of a conventional, straight, and impermeable wooden groyne alongside it.

5.4 Conclusions

5.4.1 The archaeological recording and watching brief has shown that both structures were of limited local interest, in terms of the history and the evolution of Dawlish Warren, but not unique in their design or function. As purely functional constructs, once they were of no further use, they were allowed to deteriorate *in-situ* and forgotten about.

5.5 Recommendations

5.5.1 No recommendations for further work arising from the above are made.

6 STORAGE AND CURATION

6.1 Museum

6.1.1 The site archive will be deposited with Royal Albert Memorial Museum and Art Gallery, Exeter following the completion of all phases of the project.

6.2 Archive

6.2.1 The complete Site archive, which will include paper records, photographic records, graphics, and digital data, will be prepared following the standard conditions for the acceptance of archaeological material by the appropriate Museum, and in general following nationally recommended guidelines (Society for Museum Archaeologists (SMA) 1995; Brown 2011; ADS 2013; ClfA 2014).

6.3 Conservation

6.3.1 No active conservation of the samples taken has occurred at this time.

6.4 Storage

6.4.1 All samples are currently stored at the WA site in Salisbury.

6.5 Discard policy

6.5.1 The retained archaeologist will follow the guidelines set out in Selection, Retention and Dispersal of Archaeological Collections (SMA 1993), which allows for the discard of selected artefact and ecofact categories which are not considered to warrant any future analysis. Any discard of artefacts will be fully documented in the project archive.

6.5.2 The discard of environmental remains and samples follows nationally recommended guidelines (SMA 1993 and 1995; English Heritage 2011).

6.6 Copyright

6.6.1 The full copyright of the written/illustrative archive relating to the site will be retained by the retained archaeologist under the Copyright, Designs and Patents Act 1988 with all rights reserved. The Museum, however will be granted an exclusive licence for the use of the archive for educational purposes, including academic research, providing that such use shall be non-profitmaking, and conforms to the Copyright and Related Rights Regulations 2003.

6.7 Security Copy

6.7.1 In line with current best practice (e.g. Brown 2011), on completion of the project a security copy of the written records will be prepared, in the form of a digital PDF/A file. PDF/A is an ISO-standardised version of the Portable Document Format (PDF) designed for the digital preservation of electronic documents through omission of features ill-suited to long-term archiving.

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7.2 Historic Environment Records

Devon Historic Environment Record (DHER)



7.3 Cartographic and documentary sources

OS County Series: Devon 1:10,560 (1890-1891)

OS County Series: Devon 1:10,560 (1933-1934)

7.4 Online Resources

<http://www.alldaybreakfast.info/albums/flight/>

<http://www.old-maps.co.uk/index.html>

<http://maps.nls.uk/geo/find/index.cfm#>

<http://www.pastscape.org.uk/>

<http://oasis.ac.uk/england/>

All URLs Accessed on 12/06/2017



8 APPENDICES

8.1 Appendix 1: OASIS form

OASIS DATA COLLECTION FORM: England

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Project details

Project name	Dawlish Warren Beach Management Scheme, Devon
Short description of the project	Wessex Archaeology was commissioned to design and undertake an archaeological survey and watching brief before and during the removing of two historic structures on Dawlish Warren: a 'zig zag' timber groyne; and the extant remains of a causeway type structure, referred to as the 'Bridge of Sighs'. Wood samples from the 'Bridge of Sighs' were also taken for C14 dating analysis, as the origin and construction period for this structure was unknown. No significant archaeological discoveries were made during the survey or watching brief. The results, when combined with map regression, show that the 'Bridge of Sighs' was probably constructed sometime after 1819 and before 1887.
Project dates	Start: 30-03-2017 End: 14-06-2017
Previous/future work	Yes / Yes
Any associated project reference codes	109582 - Contracting Unit No.
Type of project	Recording project
Site status	None
Current Land use	Coastland 2 - Inter-tidal
Current Land use	Coastland 3 - Above high water
Monument type	BRIDGE Post Medieval
Monument type	GROYNE Post Medieval
Significant Finds	NONE None
Investigation type	"Field observation", "Recorded Observation", "Watching Brief"
Prompt	Health and safety

Project location

Country	England
Site location	DEVON TEIGNBRIDGE DAWLISH Dawlish Warren Beach Management Scheme
Study area	0.1 Hectares
Site coordinates	SX 98930 79370 50.604693459491 -3.428431135974 50 36 16 N 003 25 42 W Point

Project creators

Name of Organisation	Wessex Archaeology
Project brief originator	Wessex Archaeology
Project design originator	Wessex Archaeology
Project director/manager	Euan McNeill
Project supervisor	Alistair Byford-Bates
Type of sponsor/funding body	Developer

Project archives

Physical Archive recipient	Royal Albert Memorial Museum, Exeter
Physical Contents	"other"
Digital Archive recipient	Wessex Archaeology
Digital Contents	"none"
Digital Media available	"GIS","Images raster / digital photography","Survey","Text"
Paper Archive Exists?	No

Project bibliography 1

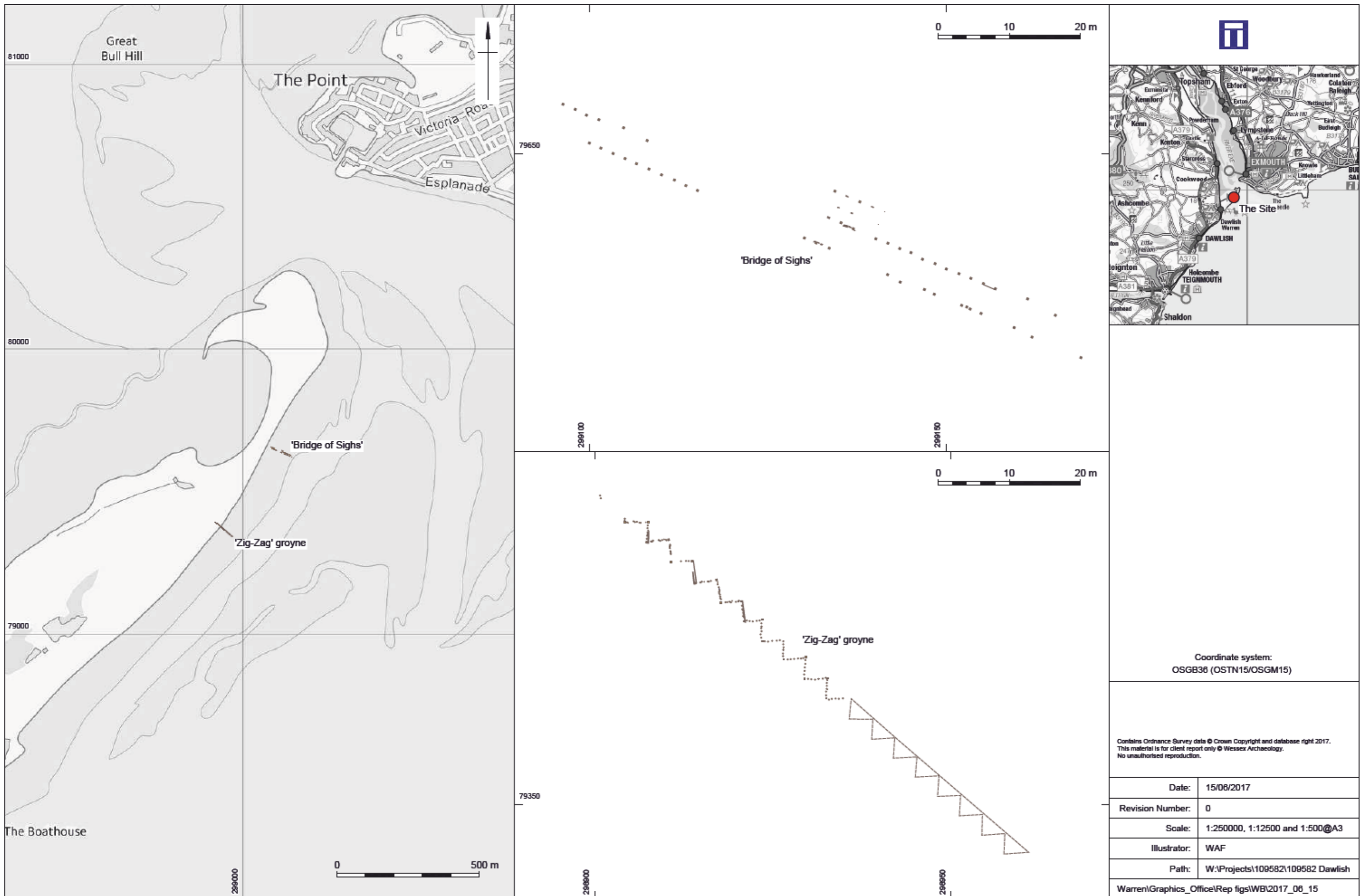
Publication type	Grey literature (unpublished document/manuscript)
Title	Dawlish Warren Beach Management Scheme, Devon: Archaeological Recording and Watching Brief on the Bridge of Sighs and 'Zig-Zag' Groyne at Dawlish Warren, Devon
Author(s)/Editor(s)	Byford-Bates, A., López-Dóriga, I, and Challinor, D.
Other bibliographic details	109582.04
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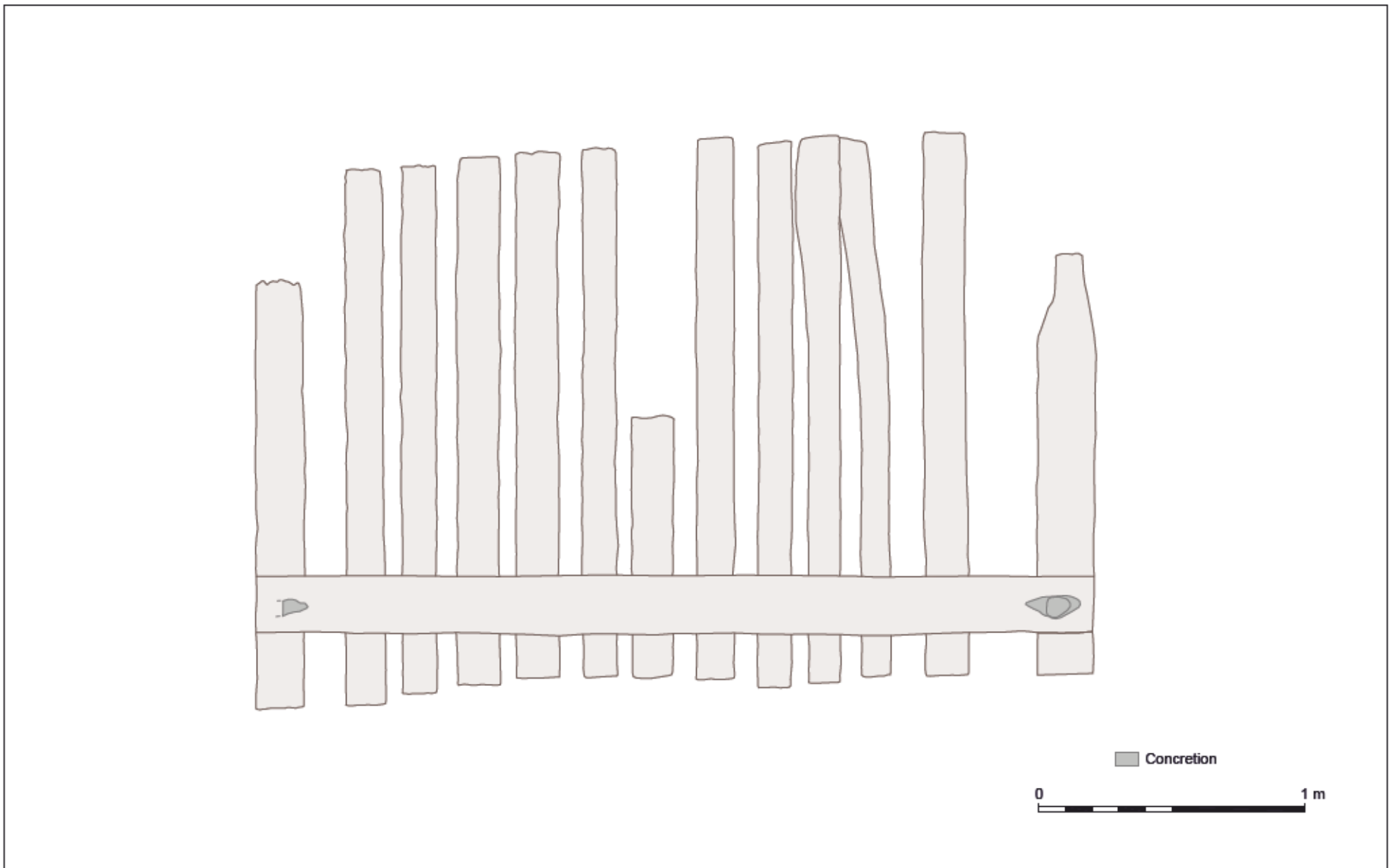
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Site location and plans of 'Bridge of Sighs' and 'Zig-Zag' groyne

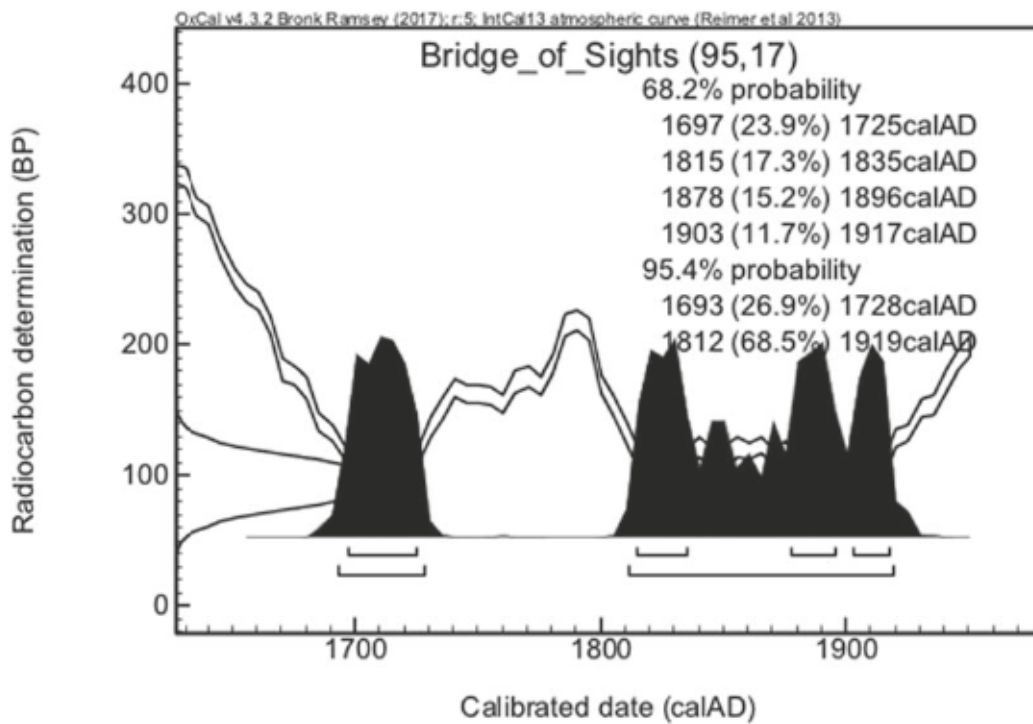
Figure 1




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Representative section 'Zig-Zag' groyne

Figure 2



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'Bridge of Sights' C14 calibration curve

Figure 3



Plate 1: The 'Bridge of Sighs' looking south



Plate 2: The 'Zig-Zag' Groyne


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Plate 3: Softwood king post from the 'Zig-Zag' groyne

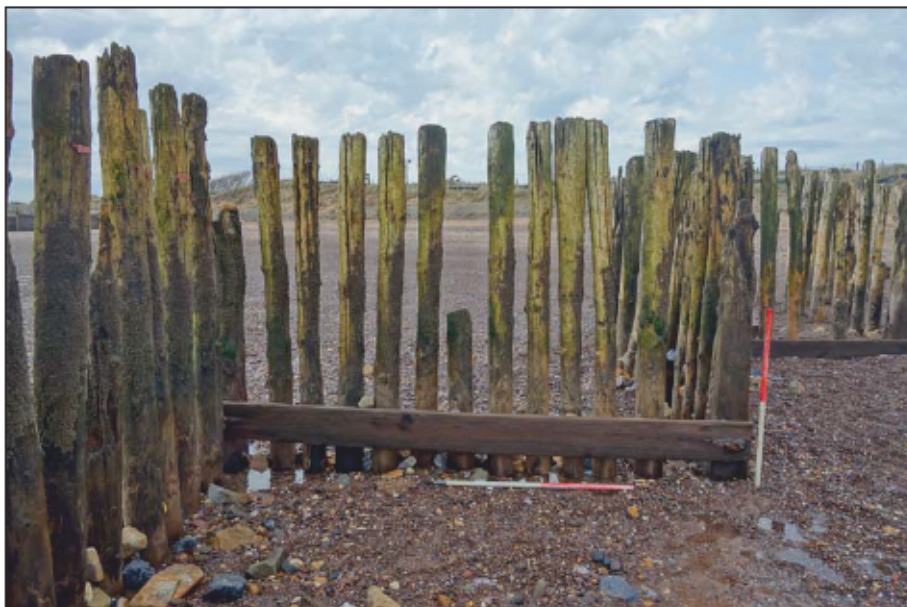


Plate 4: Representative example of waling and post layout


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Plate 5: Softwood round posts from the 'Zig-Zag' groyne with piling damage



Plate 6: Variations in beach composition during removal of the 'Zig-Zag' groyne


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Plate 7: Post with phrase 'WE ARE HERE CLAIMING SANCTUARY FROM THE ELEMENTS'



Plate 8: 'Bridge of Sighs' king post with possibly concreted iron shoe


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Plate 9: Stump of king post from the 'Bridge of Sighs'



Plate 10: Representative example of the extant remains of the boards from the 'Bridge of Sighs'



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Plate 11: Remains of boards in situ from the 'Bridge of Sighs'



Plate 12: Possible hardwood board from the 'Bridge of Sighs'

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