National Importance Programme

Identifying and Mapping Sites of National Importance Within The East Sussex Wetlands

Final Report

Final Report

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February 2015

Client: English Heritage

Issue No: Final
OA Job No: 5990

English Heritage

National Importance Programme, Project Report

Identifying and mapping sites of national importance within the East Sussex Wetlands

7043

OXFORD ARCHAEOLOGY

February 2015

Client Name:	English Heritage
Client Ref No:	**7043**
Document Title:	Identifying and mapping sites of national importance in the East Sussex wetlands
Document Type:	Project Report
Issue Number:	Draft
National Grid Reference:	n/a
Planning Reference:	
OA Job Number	**5990**
Invoice Code:	NHPP WET
Prepared by:	Carl Champness, Liz Stafford, Rebecca Nicholson and Klara Spandl
Date:	20.02.15
Checked and Approved by	Carl Champness
Position:	Senior Project Manager
Date:	20/02/15

Document File Location \\server3\oau2\tenders\Tenders Working Area\hms\national\16826_NHPP 6982 National Importance\project prposals\NHPP-East Sussex Wetlands

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Document Control grid

Title	Identifying and mapping sites of national importance in wetland environments using East Sussex as a case study
Author	Carl Champness, Liz Stafford, Rebecca Nicholson and Klara Spandl
Derivation	Project Report
Origination date	18/12/2014
Revisers	Rebecca Nicholson
Date of last version	23/02/15
Version	Final
Status	Final Report
Summary of changes	
Circulation	Casper Johnson (ESCC) and Jane Corcoran (EH)
Required Action	
File name/location	\\server3\oau2\tenders\Tenders Working Area\hms\national\16826_NHPP 6982 National Importance\project proposals\NHPP-East Sussex Wetlands
Approval	

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Project Report

Summary

In 2014 English Heritage, as part of the National Heritage Protection Plan (NHPP), commissioned a pilot study to examine mechanisms aimed at better identifying, mapping and managing nationally important sites. East Sussex was selected as an appropriate study area, being an example of an area facing new challenges following the discovery of early prehistoric wetland edge sites of national importance but which currently may not be scheduled under the terms of the 1979 Act and are termed 'sites without structures'. Oxford Archaeology submitted a project design for the work in May 2014 and following its approval by English Heritage work on the study was undertaken throughout 2014.

The aim of the project was to utilise existing information in order to better understand the significance, character and extent of sites of national importance and their potential vulnerability to future development and land-use change. A review of palaeoenvironmental evidence was also undertaken to help inform this study. It was envisaged that one of the most significant outcomes of the project would be to enhance the provision of planning advice aimed at the management and preservation of wetland archaeological remains, although the data could also serve as an important research tool.

The project undertakes a review of the current distribution and character of the 318 Scheduled Monuments located within the county and this is considered with regard to the research priorities outlined in the draft South East Research Framework. The study also considers and reviews the existing heritage protection measures and use of constraint/alert heritage mapping used by East Sussex County Council and proposes how these notification areas might change as a result of this project, providing the opportunity for increased protection and consideration of significant wetland heritage assets on a landscape scale.

The project develops various themes and builds on previous work undertaken by OA and others in East Sussex, discussing techniques for identifying, mapping, recording and predicting sites of national importance, specifically relating to wetland sites and sequences within East Sussex. The study advocates a landscape approach to protection rather than the current protection of individual sites.

Many of these wetland sites were found to fall inside areas of existing wetland or former marshes, with the vast majority either being protected as SSSI or under agri-environmental schemes. With one or two notable exceptions, very few of these sites are currently threatened by development pressure but are under increasing risk from changing land-use management strategies, associated with flood risk measures and habitat enhancement schemes. Through greater predictive mapping and understanding of heritage assets within wetland sequences it is hoped to offer better alert heritage mapping to help share and inform land management strategies, which will bring benefits to both the natural and historic environment.

The project findings suggest that scheduling of 'type' sites still have an important role to play in the protection of sites of national importance. However, sites which are not currently eligible for scheduling, such as many early prehistoric sites identified along wetland edges, should be highlighted as nationally important within the HER. When threatened these sites should be evaluated through the planning process, by pre-determination evaluation. A judgement can than be made on the heritage asset's significance to determine if all or part of

the asset is worthy of protection/preservation in situ as a site of national importance or whether loss and recording is acceptable.

ACKNOWLEDGEMENTS

Oxford Archaeological South and East Sussex County Council would like to thank English Heritage for commissioning and funding the project, and in particular Carrie Cowan and Helen Keeley for monitoring the project. The project was undertaken in partnership with East Sussex County Council (ESCC) and we would like to thank Casper Johnson (County Archaeologist) for all his help and contributions during the project, Greg Chuter (Assistant County Archaeologist) and Sophie Unger (ESCC HER officer) for providing the necessary HER data and feedback.

In the course of the project research information and advice was provided by Dr Martin Bates, University of Wales, Lampeter, and Jane Corcoran, Science Advisor for English Heritage. In addition thanks are also owed to Archaeological South East and Hastings Area Archaeological Research Group (HAARG) for providing relevant site information.

Klara Spandl, as the Project Executive, monitored the project. The report was compiled by Carl Champness, who was also the lead author. The environmental and geoarchaeological research was undertaken by Rebecca Nicholson and Elizabeth Stafford respectively. The GIS project was designed and collated by Gary Jones and Matt Bradley. Carl Champness managed the project and Edward Biddulph and Rebecca Nicholson edited the report.

1 INTRODUCTION

1.1 Project background

1.1.1 English Heritage (EH) invited project proposals for pilot studies aimed at better identifying, mapping and managing nationally important sites. The project was undertaken as part of the National Heritage Protection Plan Call for Proposals, Project 6982: National Importance Programme Pilot Projects. The project concerns the assessment of national importance and how to define boundaries in relation to wetland sites, in response to changes land-use management and development pressure. EH is particularly interested in 'how we might help create a shared understanding and mechanism to identify non-scheduled but nationally important archaeological sites'. This relates specifically to sites which can not be designated as Scheduled Monuments because their nature falls outside the current definition of a monument, ie 'they do not satisfy the 1979 Act's definition of a monument, despite potentially being of high significance and national or international importance' (DCMS 2013). The aim is to provide a high-level review of the criteria and methodologies used to collect, collate and manage data on sites of national importance, with relevant case studies within a defined geographical area. The EH National Heritage Protection Programme (NHPP) requires support and action on the protection of significance under a range of themes and places. The background to the NHPP activities is detailed in an EH publication of that name (English Heritage 2013).

1.1.2 The National Heritage Protection Plan (English Heritage 2013) defines how English Heritage and partners will identify and protect significant heritage assets. One of the foci or objectives defined in the plan is concerned with the *Identification of Wetland/Waterlogged Sites* (Measure 3A5), within which is a specific suite of projects relating to the distribution and significance of wetland sites. This builds on work of the Heritage at Risk in English Wetlands project, by the University of Exeter (2004), and more recently NHPP 3A5 Exceptional Wetlands project, which produced an inventory of the nation's most significant wetland and waterlogged heritage sites and landscapes to promote understanding of where and what they are, accompanied by statements about their cultural value. In order to address the issues raised in these projects, EH invited project proposals to investigate, collate and synthesise data on extant and potential sites of national importance within a specific wetland area.

1.1.3 This report outlines the results of a pilot study to apply the national objectives of Measure 5 within a selected geographical region, namely East Sussex. This area was selected as a good example of an area where a local planning authority heritage and archaeological team (ESCC Archaeology) face new challenges following recent discovery of wetland sites of national importance, but which currently may not be scheduled under the terms of the 1979 Act (see DCMS 2013) and which may be termed 'sites without structures'.

1.1.4 East Sussex has a large wetland and coastal landscape rich in heritage resources, including significant early prehistoric sites many associated with former coastal inlets. Coastal areas of the county are already under intense pressure from changing land-use in response to development, flood risk measures and land management policies. The East Sussex County Council (ESCC) Heritage team is keen to develop tools to enable better decision-making about the significance of, and potential impacts to heritage coastal landscapes.

1.1.5 As well as addressing the main Measure 5 in the NHPP, this project also addresses the concerns raised in Measure 2A1 (Development Pressure), 3A4 (The Identification of Terrestrial Assets visa Non-Intrusive Survey), 3A5 (Identification of Wetland/Waterlogged Sites), 6A4 (Decision Making in the Planning Process).

1.2 Project summary

1.2.1 East Sussex is rich in archaeological remains ranging from early prehistoric flint sites, prehistoric monuments, major Roman iron-working centres on the Weald and Napoleonic and Second World War coastal defences. These sites form a unique and fragile record of the past that is increasingly coming under threat from modern commercial development and changes in land management. Many of the best-preserved heritage assets and landscapes are located along the coast, in or overlooking river valleys and former coastal inlets, in or close to wetlands. Following recent discoveries of nationally important sites in the county, the identification, protection and management of these areas have become an increasingly high priority.

1.2.2 For this pilot study, a rapid, high-level assessment was undertaken of the distribution and character of the 318 Scheduled Monuments located within the county to examine how representative the current designation coverage is. This was then compared with the research priorities outlined in the draft South East Research Framework and seminar notes (see Paragraph 3.2.6) to help identify any gaps or biases within scheduling. Specific emphasis was placed on wetland and early prehistoric sites that were previously poorly represented.

1.2.3 A review was also undertaken of whether further scheduling of under-represented sites was the best approach or whether non-designated sites could be adequately be protected in the planning framework. As a result the existing use of constraint/alert mapping used by the ESCC Archaeology Section (known as Archaeological Notification Areas) was examined, providing the opportunity for increased protection and consideration of significant heritage assets at a landscape scale. Priority areas and gaps within the existing strategy have been identified and are compared to the distribution and character of sites which are currently protected in order to explore options for sites which may be difficult to identify, nationally important but are currently unscheduled and 'without structure'. The overall aim is to use the available evidence to provide guidance for the identification and protection of these sites.

1.2.4 The project develops various themes and build on previous work undertaken by Oxford Archaeology (OA) and others in East Sussex, discussing different techniques for identifying, mapping and recording sites of national importance, specifically relating to wetland sites and sequences within East Sussex. This project offers the opportunity to pull together summaries of a range of recent work for which this report provides a basic synthesis. These methods and evaluation techniques have the potential to be applied nationally and recommendations for how this may be achieved form the final part of this report.

1.3 Structure of the report

1.3.1 The report is formed of eight main sections with Tables, Plates and Figures. All of the Plates and Figures, with the exception of Figs 12-18, can be found at the end of the document.

2 AIMS AND OBJECTIVES

2.1 Summary

2.1.1 The aims and objectives of the project are outlined above and were set out in detail in the Project Design (OA 2014). They are presented again here for convenience.

2.1.2 The principal aim of the project was to review techniques and approaches for identifying, mapping and characterising nationally important sites within a wetland context. One of the principal outputs of the work was to develop an approach or mechanism to allow all nationally important wetland sites to be identified, mapped and effectively managed. A predictive GIS model for identifying the location of national important assets within principal wetland areas was developed in order to update the alert mapping. The model is intended to aid planners and curators, as well as the wider archaeological community, both in understanding the factors determining the location of wetland edge sites within the study area, and in assessing their extent and vulnerability.

2.2 Research objectives

2.2.1 The project will address the stated aims of NHPP Measure 5 within a selected geographical area, namely East Sussex. The objectives are as follows with specific reference to wetland sequences and landscapes:

1. To understand the current distribution and character of Scheduled Monuments in East Sussex;
2. To compare the current distribution and character of Scheduled Monuments with the research priorities highlighted in the draft South East Regional Research Framework chapters and seminar notes;
3. To assess the established mechanisms for identifying, mapping, and recording sites considered to be of national importance, with specific reference to wetland/coastal landscapes;
4. Discuss criteria and thresholds for determining if and when a site should/could be considered to be of national importance;
5. To discuss sites of national importance that could not currently be legally scheduled and whether 'national importance' offers an appropriate level of recognition;
6. To discuss how to define boundaries for large-scale wetland landscapes with many monuments in a rural context;
7. To predict the locations of potentially nationally important sites associated with wetland sequences based on the current data and distribution of sites;
8. To consider the management of these environments and the need for continued partnership working in the future with colleagues in ecology and with organisations such as Natural England and the Environment Agency;
9. To discuss how the conditions of the sites should be monitored and managed in order to protect and conserve them;
10. Explore whether the pilot study methodology could be applied elsewhere and/or devise a second phase of works to cover issues that could not be sufficiently explored within the pilot study.

2.2.2 In order to offer a reasonably comprehensive study the project will discuss a range of themes and periods across East Sussex. Each of the key themes and periods are considered individually and particular focus placed on wetland sequences and former coastal areas where significant archaeology has recently been discovered.

2.2.3 A series of case studies are presented, incorporating analysis of historic approaches to coastal and wetland landscapes in East Sussex and a review of the highest priority exemplar assets of the Combe Haven, Pevensey Levels, Willingdon Levels and Eastbourne. The case studies will incorporate cross-disciplinary approaches and outline geophysical and remote sensing techniques that have been used effectively in the county.

3 METHODOLOGY

3.1 Scope

3.1.1 It is proposed that early prehistoric sites and wetland sequences and former coastal inlets are the most urgent and extensive 'Key Theme' for the county, and will receive more comprehensive treatment, resulting in higher resolution data and more enhanced recommendations for this higher priority area.

3.1.2 Consequently more detailed assessment will be undertaken of the wetland and coastal areas of Cuckmere Valley, Eastbourne, Willingdon Levels, Pevensey Levels and Combe Haven with the aim of examining the various associated issues and different approaches. The report will also discuss some of the new approaches that have been successfully used in the county to map and identify wetland site. This may have wider implications for use in other wetland areas.

3.1.3 The project was divided into six main tasks which can be summarised as:

- Discussion of the current distribution and character of nationally important sites within the county.
- A review and comparison of the Scheduled Monuments in relation to the regional research framework.
- Discussion of sites that are non-scheduled but are nationally important.
- Discussion of techniques for identifying, mapping and recording nationally important wetland sites.
- Discussion of tools for management and predicting nationally important sites.
- Production of a report and GIS database in a format suitable for web dissemination.

3.2 Data sources

3.2.1 In accordance with the project design (OA 2014) information relating to the nature of Scheduled Monuments was obtained from the National Record of the Historic Environment (NRHE), based in Swindon.

3.2.2 Three other principal sources were consulted:

3.2.3 **HER data** - As part of the research undertaken for this project, the Historic Environment Record (HER) held at ESCC (East Sussex County Council), Brighton, was consulted in order to define the extent of the recorded lithic findspots, early prehistoric wetland sites and waterlogged remains across East Sussex. Various searches of the HER identified 29 records that were registered as flint scatters and 15 as lithic scatters sites (i.e. specific flint excavations), 60 prehistoric settlements and 325 iron working or bloomery sites. These entries ranged in assemblage size from a handful of flints recorded from fieldworking to sites composed of several thousand pieces. Three main distributions of early prehistoric lithic sites were identified: those associated with settlement or burial mounds, rock shelters and valley edge environments. The recording of the last of these being the least well represented within the HER records.

3.2.4 Only three waterlogged wood or timber structures were initially identified on the HER searches. However, further searches identified at least 523 more, listed under additional terms such as wharf, platform, boat, trackway and causeway.

3.2.5 A number of problems exist with the HER records and the search criteria used to create the individual period or monuments lists. The search criteria used to generate these lists reflect different terminology used to describe the various monuments and findspot types. This undoubtedly reflects the mixed nature of recording both on site and within the HER. In the case of the lithics very few have been scientifically dated and were only broadly related to a period. The remains of wooden or organic structures proved particularly difficult due to the use of the different terminology used in the HER. For examples the prehistoric wooden trackways identified within the Willingdon Levels were identified as trackways, but were not identified in a search for waterlogged or wooden prehistoric structures.

3.2.6 **Unpublished reports –** A significant number of reports that were used in the study were from grey literature reports produced by Oxford Archaeology (OA) over the last ten years between 2004 and 2014, and by other archaeological contractors who have been working within the study area. Reports produced by OA are held in its office in Oxford and are readily available for download from the website (http://library.thehumanjourney.net/). Reports from other contractors were obtained from various sources including the HER, ADS and contractor's online report archives.

3.2.7 Additionally a series of unpublished reports and information from ongoing excavations in Sussex was obtained from various archaeological contractors. This includes some significant current excavations including the Bexhill to Hastings Link Road (OA), Bexhill Gateway (OA) Eastbourne (Archaeology South-East) and evaluations of barrows near Catsfield, near Battle (Archaeology South-East).

3.2.8 **English Heritage South East Draft Research Framework and seminar notes** – Various chapters of the draft research framework, prepared in 2008, were kindly provided by English Heritage outlining the research priorities and key sites for the area. Unfortunately at the time of writing certain key chapters of the framework including those for the Neolithic, Bronze Age and Roman periods, were not available. In their absence, reference was made to the 2007 seminar notes of the same name, and *Archaeology of Sussex to AD2000* (2003) by David Rudling.

3.3 Data analysis and collection

3.3.1 Data analysis and GIS input – A rapid review of the 318 Scheduled Monuments recorded within NRHE records was undertaken in order to assess the effectiveness and coverage of SMs in East Sussex. Information on all the monuments was obtained from the EH website in order to generate basic information on period and monument type. However, not all monuments had detailed descriptions or basic information relating to the periods represented or monument type.

3.4 Dissemination of results

3.4.1 As one of the deliverables of the project the East Sussex Archaeological Notification Areas (ANA) will be reviewed with specific examples and will be updated as one of the GIS outputs of the project. The mapping will be further discussed with ESCC and the updated ANA shapefiles will be submitted to HER with the final project GIS database.

3.4.2 It is also planned that the results of the project will be disseminated to as wide an audience as possible, including specialist and non-specialist users. The project GIS has been designed to be compatible with the East Sussex HER and a dialogue has been maintained with the HER in the course of the project to ensure this; the database and GIS data have been transferred to the HER for long-term curation. The database and report will also be placed online, to allow a wider understanding of the wealth of

remains surviving in East Sussex. A process of dialogue with the Council Planning Department, in particular urban planners, was initiated during the implementation stage of the project and has been continued. The options available to the planners to enable full use of the data to facilitate planning include the provision of a GIS, which will allow interactive interrogation of the dataset, the provision of detailed hard and digital copy of the report mapping, and a seminar to be held specifically for the members of the planning authority to highlight the wealth of wetlands sites in East Sussex.

3.4.3 A talk will be given at the Chartered Institute for Archaeologists (CIfA) conference in 2015, which will be attended by a range of practitioners, curatorial, academic and commercial. The attendees will include members of the East Sussex Council planning department, the archaeological community who have an interest in national important and wetland sites, and also those with a specific interest in the archaeology of Sussex. A copy of the report will also be forwarded to Natural England and Environment Agency archaeological officers for the region to aid further discussion.

4 STUDY AREA

4.1 Study Area

4.1.1 East Sussex was selected as a study area as it provides a suitable area with a range of different heritage assets (Figure 1).

4.1.2 The area was selected for the following reasons:

- Nationally and internationally important early prehistoric landscape have recently been identified around the edges of the Combe Haven and surrounding valley sequences (Bexhill to Hastings Link Road);
- Nationally important Bronze Age flint scatters have been identified at Eastbourne, on the Willingdon Levels;
- Nationally important waterlogged Bronze Age structures have been identified and protected at Shinewater, in the Willingdon Levels;
- Nationally important Second World War remains have been mapped within the Cuckmere Haven.

4.2 Topography of East Sussex

4.2.1 The topography of East Sussex is varied and contrasting (Figure 2). In the west, the coastal strip between Brighton and Eastbourne is occupied by the rolling chalklands of the South Downs. The Downs are predominantly an open landscape, dissected in two places where the valleys of the Rivers Ouse and Cuckmere meet the sea. The highest point on the Downs is Ditchling Beacon (227m OD), and the coast is characterised by a series of vertical chalk cliffs which include the Seven Sisters and Beachy Head (162m OD).

4.2.2 Low-lying, marshy, wetland areas occupy the coast immediately east of Eastbourne – the Willingdon and Pevensey Levels, and further east the Pett Levels and Romney Marsh. The central part of the county is occupied by the clay vale of the Low Weald with numerous rivers and watercourses draining from the High Weald to the north. The High Weald is heavily wood and occupied in part by Ashdown Forest.

4.2.3 The main river catchments in East Sussex comprise the broadly north-south draining Adur and Ouse in the west, the Cuckmere, and further east the west-east draining Rivers Rother. In the north-eastern part of the county lies a section of the River Medway.

4.3 Geology of East Sussex

4.3.1 The geology of East Sussex is dominated by the Weald anticline, a 60km by 100km fold in the Cretaceous geology with later deposits of Eocene and Pleistocene periods. The main anticline ridge cuts across the northern part of Sussex in an east-west direction (Figure 3). Subsequent geological weathering of the weald ridge has created contrasting and complex topography.

4.3.2 The sediments of the Weald were deposited during the early stages of the Cretaceous Period, which formed between 140 and 100 million years ago. These are collectively known as the Wealdon Group and comprise the Purbeck Group, the Hastings Beds, the Wealden Clay, the Lower Green Sand, the Gault and the Upper Greensand. The Wealden Group is overlain by the Chalk Group, which is sub-divided into the White and the Grey Chalk Subgroup.

4.3.3 The oldest sandstone rocks at the centre of the Weald were laid down in the Lower Cretaceous period and outcrop in the north and east of Sussex in the High Weald. At the edge of the Weald is a belt of Wealden Clay, prone to weathering and easily eroded by streams creating the landscape of the Low Weald. Skirting the edges of the Weald is also the Lower and Upper Greensand deposits and Gault Clay laid down in the Lower Cretaceous period, forming the Greensand Ridge in Sussex.

4.3.4 Sedimentary rocks were deposited at the edge of the Weald during the Upper Cretaceous and Eocene periods following the formation of shallow open seas at its edges. The subsequent erosion of these sedimentary deposits has formed the outer ring of hills, which now frame the main heart of the Weald. These seas laid down the vast quantities of Chalk deposits and the pebbly beds sandwiched between layers of clay. During interglacial periods streams flowed across the area cutting the dry valleys that characterise the dip slope of the South Downs.

4.3.5 The Pleistocene period saw the accumulation of drift deposits deriving from river alluvium, glacial deposits, wind-blown deposits and river terrace deposits, which can be found along the valley edges.

4.3.6 The geology of the area can be sub-divided into the following sub-groups:

- **Purbeck Group** – This group is the oldest exposed rocks within the county and is late Jurassic to Early Cretaceous in date. It is composed of bluish grey calcareous mudstone, with seams of limestone, sandstone, siltstone and iron stones throughout the sequence. The beds outcrop at three locations north and north-west of Battle and also near Bushwash.

- **Ashdown Sand Formation (Hastings Beds)** – The beds form the lowermost units of the Hastings Beds and typically comprise siltstone and silty sand stones, sometimes separated by thin pebble beds. These beds are exposed in the cliff section at Hastings and can be followed across the Wealden anticline across the Lee Ness Ledge to its junction with the Wadhurst Clay at Hasting Castle.

- **Wadhurst Clay Formation (Hastings Beds) –** The Wadhurst formation is described as made of soft, dark grey clay thinly bedded mudstone, with sub-ordinate beds of siltstone, sandstone, limestone and ironstone. The surface of the mudstone often degrades in a short period of time and becomes weathered to reddish and greenish grey clays. The Wadhurst Clay contains small nodules of iron ore that form the basis of the Wealden iron industry in this area.

- **Tunbridge Wells Formation –** The formation is the uppermost and youngest formation of the Hastings Beds. The formation is similar to the Ashdown formation and comprises a complex sequence of siltstones and sandstone and clays.

- **Greensands and Gault Clay (Hastings Bed) –** These stiff clay deposits best defines the Weald anticline, outcropping along the bottom of the Downs and northwards into the vale of the Weald. The Greensands are divided into two units – the Lower Greensands and Upper Greensands that sandwich the Gault Clay.

- **Chalk Group** – The Chalk forms the most recognised landscape of East Sussex, forming the Downs and the iconic high white cliffs of the Severn Sisters and the fossil rich cliffs from Brighton to Newhaven. The Chalk is a sedimentary rock that formed in the in warm open biologically rich seas during the Upper Cretaceous period.

4.4 National Character Areas

4.4.1 In order to undertake a countywide study a research framework was required in which to study the landscape of East Sussex. It was decided in discussions with ESCC and EH that the national character areas (NCA) would provide a suitable landscape framework. Further details of the NCA can be found at hhttps://www.gov.uk/government/uploads/system/uploads/attachmentdata/file/378756/nca-profile-case-studies.pdf. This provides the necessary broad-brush approach to the characterisation of the County landscape necessary to provide a starting point for the more detailed archaeological research. It also provides an essential link between the environment and heritage and the value of using NCA to engage a broad range of stake holders.

4.4.2 The geology and topography underpin the historic landscape character of East Sussex (Figures 1-3). The landscape has been divided into six national characterisation areas (Figure 4) and their main physical characteristics are described below:

High Weald

4.4.3 At the heart of the High Weald is an uplifted sandstone core, which has been shaped and dissected by numerous streams creating steep-sided wooded valleys or 'gills' with high ridges in between. Where the rivers and streams of the Combe Haven, Brede and Rother meet the coastline, large flat wetlands, grazing marshes and reclaimed arable occur. The area is a historically wooded landscape with a complex pattern of ridges and stream valleys. The area has a greater amount of ancient woodland than any other area of Outstanding Natural Beauty, representing around 7% of all ancient woodland in England. This consists of both primary and secondary woodland that covers about 25% of the area, a percentage of these woodlands are still coppiced.

4.4.4 The High Weald was the centre of Iron Age and Roman Iron production, which was centred on Beaufort Park, near Hastings. The area consists of small irregular field systems, and areas of open heathland such as that found near Ashdown Forest. Settlement is usually confined to the ridge tops and high ground.

Low Weald

4.4.5 The Low Weald is a broad low-lying clay valley with higher ground occurring where the sandstone and limestone outcrops. This area lies between the High Weald and the South Downs. Various small rivers and streams, tributaries of the Ouse and Cuckmere Rivers, dissect this area.

4.4.6 The landscape of the Low Weald is one of small-scale fields and enclosures of mixed small woodlands with a patchwork of fields and hedgerows. It has a largely rural character with settlement historically concentrated on the higher ridges where the clay soils are ameliorated by the more freely draining substrate.

South Downs

4.4.7 The rolling chalk landscape of the South Downs comprises a line of hills with a steep escarpment running from Eastbourne in the east to the extreme west near Chichester in West Sussex. The Rivers Ouse and Cuckmere breach the escarpment, and where it meets the sea high undulating chalk cliffs form Beachy Head and the Severn Sisters (Plate 1).

4.4.8 The landscape of the Downs is open downland and large arable fields, indented by Combes and dry valleys. The western downs are slightly more wooded than those in the east. Early prehistoric settlement and monuments are widespread on the Downs, dating from the Mesolithic to the late Iron Age.

Pevensey Levels

4.4.9 The Levels are an area of wetland; a former tidal embayment now part of a flat open reclaimed marshland landscape with an irregular network of drainage ditches, grazing marshes, narrow straight roads and widely dispersed settlements.

Romney Marsh

4.4.10 The area is a flat open reclaimed wetland landscape, which was formed by the development of shingle spit behind which mudflats and marshes were formed (Plate 2). The area has a distinctive system of drainage dykes, grazing marshes, arable field systems, narrow straight roads and widely dispersed settlement.

4.4.11 The topography, geology and soils have been a significant influence on human activity, with landscape use dependent on the technology and resources available at the time. The Weald has been heavily exploited for iron production since the Iron Age, utilising the naturally occurring ore and the plentiful woodland resources, the latter for fuel to feed the bloomeries. By contrast, the Chalk Downs were more widely exploited from the Neolithic, with land cleared for cultivation and settlement.

East Sussex Wetlands

4.4.12 East Sussex provides an example of an area with large stretches of reclaimed wetland which were once former tidal inlets, supporting both salt- and freshwater marshland. In this context a wetland is defined as an area where water-levels cover the soil, or are present near to the surface for all or part of the year. This gives rise to particular soil development and conditions which support distinctive flora and fauna. Wetland habitats can support both aquatic and terrestrial species, and also taxa specifically found in these transitional environments.

4.4.13 For this study the boundaries of the wetlands have been defined using the BGS mapping of alluvial deposits (BGS sheets, scale 1:50,000). This was thought to be the most effective way of defining a boundary around potential past and present wetland sites. It also includes former wetland areas, many of which have been extensively reclaimed and drained and are now only partially waterlogged.

4.4.14 The major wetland sequences covered in this study are the Combe Haven, Pevensey Levels, Willingdon Levels, Cuckmere Valley and (covered here in much less detail as these have been well studied) Romney Marsh and Pett Levels. The distribution of these wetlands is shown within Figures 6a-d. These wetlands are covered by case studies that incorporate cross-disciplinary approaches and geophysical and remote sensing techniques which have been used effectively in these environments. Several other smaller tributaries and wetlands are present within the County but are not covered within the scope of this pilot study.

4.4.15 From an archaeological point of view wetlands are highly significant, as they preserve organic remains, palaeoenvironmental and hydrological evidence and potentially wooden structures such as prehistoric trackways or platforms. This type of archaeology is very fragile and vulnerable to environmental change and rarely survives outside wetland environments. Therefore wetland sites have the potential to significantly contribute to our understanding of various archaeological periods and to address key research topics, for example landscape utilisation during the Mesolithic/Neolithic transition.

4.4.16 Two wetland sites of national importance are currently recognised in East Sussex according to a recent list compiled by EH Project 6240 ‘wetland sites of significance’ (EH 2014). These are the Willingdon Levels, which includes the prehistoric

monument of Shinewater, and the Pevensey Levels. Currently, statements of significance are being produced for these sites to an agreed format for dissemination on the EH web-site and subsequent stages of the project will address issues such as resilience to climate change.

5 HERITAGE PROTECTION AND LEGISLATION

5.1 Summary

5.1.1 Sites of national importance are protected through Scheduling or Listing, although this is not always the case and the vast majority of archaeological sites are protected through the planning process using the National Planning Policy Framework and through other non-archaeological statuary protection.

5.1.2 The main polies and legislation involved in the protection of national importance are discussed below:

5.2 Scheduled Monuments and Archaeological Areas

5.2.1 Under the Ancient Monuments and Archaeological Areas Act (1979), certain sites defined as monuments can be designated (or scheduled) if they are of national importance. This protects the monument from:

- any works resulting in the demolition or destruction of or any damage to a scheduled monument;
- any works for the purpose of removing or repairing a scheduled monument or any part of it or of making any alterations or additions thereto;
- any flooding or tipping operations on land in, on or under which there is a scheduled monument.

5.2.2 English Heritage has acknowledged that 'generally, however, scheduling is unsuited to the protection of whole landscapes because of the very stringent controls it imposes, and, as a consequence, many extensive nationally important sites are not scheduled' (EH 2005, 27). Archaeological wetland sites often cover whole landscapes and this comment would therefore be applicable here.

5.2.3 However, the Act also allows archaeological areas to be designated, but where they do not become Scheduled Monuments. Both the Secretary of State and local authorities may by order designate as an area of archaeological importance. These are protected against:

- operations which disturb the ground;
- flooding operations;
- tipping operations.

5.2.4 Archaeological Areas were originally used to protect areas prior to the implementation of PPG16 which when it was introduced in 1990 gave non-scheduled sites greater protection within the planning system than had been previously the case. The pre-1990 designated archaeological areas were mainly applied to historic towns and cities in order that they could be considered within the planning process. They were not often used to protect areas of rural landscape.

5.3 National Importance and Monuments Protection Programme

5.3.1 Since the Ancient Monuments Consolidation Act of 1913 it has been required that ancient monuments that are recommended for protection are of 'national importance'. Until 1986 it was implicitly understood that any monuments had to be first reviewed

and recommended by the Ancient Monuments Board, based on the skills and experience possessed by the members of the panel. By the mid 1980s, it was becoming increasingly apparent that this mechanism was introducing a level of bias within scheduling, and something needed to be done to make it more representative of the range of monuments and periods covered in England.

5.3.2 On the basis of this assessment, English Heritage made the decision that it needed to dramatically increase the number of ancient monuments that were scheduled. It also needed to focus on redressing the balance in terms of the archaeological periods for which the number of scheduled ancient monuments was low and on the areas of England that had fewer scheduled ancient monuments than the average. In order to address this issue, English Heritage instituted the Monuments Protection Programme (commonly called the MPP).

5.3.3 The programme was established in 1986 to run for ten years in the first instance. One of its principal aims was to identify monuments for scheduling on the grounds of importance and conservation need. It was also intended to provide a comprehensive reassessment and a better understanding of the country's archaeological resource, using a new classification system, based on period, rarity, diversity for each monument type, in order to improve conservation, management and public appreciation. In addition each monument was given a score based on a series of criteria that included survival, potential, diversity, value and group value. The criteria used as a basis for designation as a Scheduled Monument are summarised in Section 6.1 (below) from the document Scheduled Monuments & nationally important but non-scheduled monuments (DCMS 2013).

5.3.4 Unfortunately the MPP programme was not fully completed in all of the counties and therefore some of the bias and under-representation of certain periods and monuments that previously existed within designation still exists.

5.4 Sites 'without structures' that are not eligible for scheduling

5.4.1 Many archaeological sites like lithic scatters, early hominid remains, butchery sites and prehistoric footprints, although potentially of national importance, are not eligible for scheduling because of the absence of substantial structures. The relevant legislation defines a monument as ‘any building, structure or work, whether above or below the surface of the land, and any cave or excavation ... [or] any site comprising the remains of any such building, structure or work’. Therefore a site may be of national important but not be eligible for scheduling due to the absence of structural evidence.

5.4.2 Most sites without structures are prehistoric in date, largely pre-dating the emergence of permanent settlements in the mid second millennium BC. Most Palaeolithic and Mesolithic sites fall into the category of ‘sites without structures’, they are inevitably under-represented in the present list of Schedule Monuments. Thus even the globally significant Lower Palaeolithic site of Boxgrove (West Sussex) was ineligible for statutory protection and had to be protected as a SSSI. Currently the schedule has just 50 sites in England with significant Palaeolithic and/or Mesolithic remains (of which 40 are caves or rock-shelters), compared with 1,360 for the Neolithic and 8,961 for the Bronze Age (in some cases multiple sites being combined in a single designation). Even with the larger representation of Neolithic and later sites, however, some of national importance, including the Neolithic axe factories of the central Lake District, falls outside the current criteria for designation for the same reason.

5.4.3 The presence of associated sub-surface features may make sites identified by the presence of surface artefact scatters eligible for scheduling, but such features are

generally traceable only by remote sensing techniques or through excavation. Star Carr (North Yorkshire) is an example of a site where excavation proved the existence of structural remains, leading to its scheduling. A small number of multi-period sites, such as Hengistbury Head, are only protected as part of a multi-phased monument.

5.4.4 The criteria used for establishing the significance of these sites can be found in the English Heritage guidance document Managing Lithic Scatters (http://www.helm.org.uk/upload/pdf/Managing-Lithic-Scatters.pdf1339384880).

5.4.5 The following criteria are used to establish whether surface artefact scatter may be considered of national importance, if:

- Sufficient information is available to define a boundary, making it recognisable as a discrete site with a significant concentration of material;
- The quality of the lithic artefacts (fresh condition, sharp edges, etc.) and/or the presence of less durable artefacts such as pottery suggest buried deposits have only recently been disturbed;
- Additional evidence suggests the presence of buried structural remains with which the artefacts are believed to be associated;
- There is evidence for part of the site being undisturbed it has been dated or interpreted with confidence;
- The artefacts suggest diversity within the scatter, either terms of repeated occupation over a long period (for instance, where diagnostic artefacts of more than one period are present), or if evidence exists for particular tasks.

5.4.6 However, nationally important sites without structures are given protection in the planning system via the National Planning Policy Framework (2012).

5.4.7 Many wetland sites are often 'sites without structures' as deep alluvial deposits often bury them and therefore structure remains can only be confirmed through excavation. They also have the potential overlap with sites of SSSI. Some of the known wetland archaeological sites in East Sussex fall inside areas of existing wetland, whilst almost all of the rest lie in areas of future wetland potential. There is significant parity between heritage and habitat issues, the management of which is usually complementary. However, there are sometimes areas of contention for example new habitat recreation schemes and ditch cleaning. Other potential conflicts are from new flood protection schemes and floodplain modification schemes.

5.5 National Planning Policy Framework

5.5.1 The National Planning Policy Framework identifies two categories of non-designated sites of archaeological interest. Those that are demonstrably of equivalent significance to scheduled monuments and are therefore considered subject to the same policies as those for designated heritage assets (National Planning Policy Framework Paragraph 139), and the vast majority of other non-designated sites that have regional/local significance.

5.5.2 The national important non-designated sites are of three types:

- Those that have yet to be formally assessed for designation;
- Those that have been assessed as being nationally important and therefore, capable of designation, but which the Secretary of State has exercised her

discretion not to designate usually because they are given the appropriate level of protection under national planning policy;

- Those that are incapable of being designated by virtue of being outside the scope of the Ancient Monuments and Archaeological Areas Act 1979 because of their physical nature.

5.5.3 The reason why many nationally important monuments which have been positively identified by English Heritage are not scheduled is set out in the document 'Scheduled Monuments and nationally important but non-scheduled monuments', published by the Department for Culture, Media and Sport (DCMS 2013). In that document it is stated that: '*By default, sites that comprise only groups of objects (artefacts or ecofacts) or other deposits that provide evidence of human activity during early prehistory can not usually be designated as Scheduled Monuments because they do not satisfy the 1979 Act's definition of a monument, despite being of high significance and national or international importance*'.

5.5.4 The issue of preservation *in situ* of the archaeological resource is an essential component of heritage management through the planning process, and therefore is the main purpose of the legislation. Where sites cannot be preserved a mitigation strategy which includes recording is the next option. One of its core principles is that planning should conserve heritage assets in a manner appropriate to their significance (NPPF para 17). It further states that non-designated sites of demonstrable equivalent significance to scheduled monuments should be treated as designated heritage assets (NPPF para 139).

5.6 Archaeological Notification Areas

5.6.1 East Sussex has designated its own Archaeological Notification Areas (ANA). The ANAs are designed to alert applicants and planning teams to potential impacts on heritage that would need to be addressed in line with the National Planning Policy Framework. Their identification does not imply any enhanced management or protection over these areas, just that they should be considered within the planning process if threatened. As part of the HER a series of areas containing recorded archaeological remains have been defined for East Sussex and Brighton & Hove. These sites include both scheduled and a selection of significant non-scheduled sites that have been used to define Archaeological Notification Areas (ANA). These areas are defined based on the current HER information and preservation at particular sites.

5.6.2 The current maps for the study area can be reviewed at http://data.gov.uk/dataset/archaeological-notification-areas-anas-for-east-sussex-and-brighton-and-hove1. Their primary purpose of the ANAs is to trigger consultation with the ESCC Archaeology Section and the HER, to ensure that suitable archaeological mitigation strategy can be developed for any proposed impacts.

5.6.3 There are a number of other possible ways to protect archaeological sites, some specifically for archaeological monuments and some designed primarily for the protection of species and ecology in wetland areas. In both types of scheme potential problems and/ or shortcomings may arise with regard to the preservation of the combined resource of archaeology and wetlands. East Sussex also contains, Agri-environment schemes, SSSIs, RAMSAR, SAC and SPA sites (Figure 5).

5.6.4 These are all discussed below in relation to their effectiveness in protecting areas which include both archaeological sites and wetland habitats.

5.7 EIA Regulations

5.7.1 Also within the planning system, areas of wetland could be protected under the EIA Regulations: Unimproved pasture EIA for Uncultivated Land and Semi-natural Areas, 2006. This is meant to protect areas from projects to increase agricultural production of uncultivated land or semi-natural areas by physical or chemical means, and includes protection from land drainage.

5.7.2 The effectiveness of these Regulations in protecting the historic environment has recently been assessed by English Nature (EN 2004). This report's key findings include the conclusion that the Regulations are difficult to enforce, as they apply to land which is often far from public view and to activities which may be gradual, such as fertilisation and oversowing. It also reports that the initial screening test for grassland habitats (less than 25-30% improved pasture species) should be supplemented with other tests as it excludes sites, which should be properly assessed under the Regulations. In particular, the screening process should also test for the presence of BAP animal species and for valued archaeological and landscape features. This implies that a sites archaeological and historic potential, including its potential to contain waterlogged archaeological remains, is not necessarily taken into account within the protection offered by the regulations.

5.8 Environmental Stewardship

5.8.1 Environmental Stewardship is a voluntary agri-environment scheme open to farmers across England, as part of the Rural Development Programme for England, which forms part of the European funding received via the Common Agricultural Policy. Regulation of this scheme comes via the EU. This funding covers sites that form part of our 'farmed environment' and which contribute to securing public goods and services that relate to biodiversity and landscape.

5.8.2 In the design and implementation of agri-environment schemes, a balance is struck between wildlife, landscape, historic elements, public access, practical land management and agricultural factors. There are however, are common principles:

- Farmers and landowners can enter voluntary, ten-year agreements to undertake certain farming practices and capital works to maintain and enhance the rural environment;
- Agreement holders are compensated for undertaking the work by payments calculated on the basis of the income foregone (into which can be included a small incentive element, up to 20% of the total);
- Capital works are grant-aided up to a maximum of 80% of the total costs.

5.8.3 Some agri-environment schemes can be specifically damaging to wetlands, including the promotion of the supposedly 'environmentally friendly schemes' such as the promotion of the growing energy crops, promoted under the England Rural development programme.

5.8.4 Usually, under the scheme, the historic environment is protected in two ways: by cross-compliance and proactive works. Under cross-compliance, all agreement holders are obliged to prevent damage to environmental assets such as historic and archaeological features. The scheme also places an emphasis on adherence to the Code of Good Agricultural Practice and the Code of Good Farming Practice in order to ensure that agreement holders in breach of environmental legislation, including the Ancient Monuments and Archaeological Areas Act 1979, may have their management agreements curtailed. The effectiveness of cross-compliance is assessed through monitoring.

5.8.5 Avoidance of damage to historic features across the entire holding is a requirement of the scheme, even if the historic features are not specifically entered into the scheme.

These features are identified through the SHINE database for the Entry Level Schemes. All records in the SHINE database (which originally came from the Selected National Heritage Dataset, a sub-set of English Heritage's AMiE database) have been verified by county Historic Environment Records (HER) record staff, and in many cases have been supplemented by additional records drawn from the HER.

5.8.6 The Higher Level Stewardship scheme identifies and addresses undesignated archaeology through consultations with HERs and the production of a Farm Environment Plan. In practice, undesignated sites are not targeted under HLS, but addressed where a holding was entering into an agreement, and where these sites were highlighted as a priority or of high significance by the local authority archaeologist (as one of their "Top 30" sites).

5.8.7 Payments are made to farmers to help protect historic environment sites because of the fundamental role they play in the landscape and not because the site are intrinsically valuable in themselves, etc. Therefore, whilst some 'invisible sites' in terms of landscape are covered by the scheme, for example cropmark sites which are composed of a series of below-ground archaeological deposits (i.e. an invisible but potentially tangible asset), archaeological wetland sites are not always unless they have some above ground landscape evidence. Lack of above ground evidence can make them difficult to include within SHINE records, as they could fall within the definition 'sites without structures'. If they are not identified by SHINE or HERs they can not be flagged as a consideration within the schemes when appropriate management and cross compliance are considered.

5.8.8 Within HLS, four options directly address the protection of wetland archaeology where they do have associated landscape features, namely:

- maintaining high water levels to protect archaeology (HD8)
- maintenance of designed/engineered water bodies (HD9)
- maintenance of traditional water meadows (HD10)
- restoration of traditional water meadows (HD11)

5.8.9 However, EH in a strategy document on wetland heritage (EH 2012a) states:

'*However, these options have low take-up across all regions with only one agreement currently signed for maintaining high water levels to protect archaeology. There has been some increase in uptake over the past five years but it is clear that they are not popular and it would be useful to investigate the reasons for this more closely to determine whether anything can be done to improve the situation'. Equally useful would be an examination of those situations where successful agreements for HD8, 10 and 11 have been made, and to assess whether there are any commonalities. As the new HLS round has recently started and requires targeting priority places, this presents a good opportunity to re-examine the potential use of HLS options to protect wetland assets and to identify and promote candidate places. Particular challenges include how we identify appropriate places when we have limited tools available to flag up either wetland archaeology sites (see Objective 1.2) or water meadows (Objective 3.2), both of which have very limited designated examples. Improvements to existing mechanisms are also needed (i.e. improving the presence of wetland heritage assets on Historic Environment Records as well as the increased use of designation for wetland sites) to ensure others are aware of the places we value for wetland archaeology*'.

5.8.10 It should also be stressed that HLS has not always delivered a consistent methodology for archaeological monitoring of impacts on sites, like ditch clearance. Preliminary archaeological investigations of impacts have been undertaken on these schemes; but

in general terms Natural England does not always implement or fully support mitigation based on the results of such investigations.

5.9 SSSIs

5.9.1 SSSIs are legally protected under the Wildlife and Countryside Act 1981, as amended by the Countryside and Rights of Way Act 2000 and the Natural Environment and Rural Communities Act 2006. Natural England has powers to ensure farmers and landowners protect and manage their land SSSI effectively so that the special wildlife and geological features are conserved. This may mean grazing animals at particular times of year, controlling water levels and clearing scrub. Those managing SSSIs must meet all relevant cross compliance requirements. These requirements are split into two types:

- Statutory Management Requirements (SMRs)
- requirements to keep your land in Good Agricultural and Environmental Condition (GAECs)

5.9.2 GAEC7 covers preserving scheduled monuments and the requirement that if works are proposed on a monument - both above and below ground level, EH must be contacted for consent.

5.9.3 Whilst there is no imperative to identify non-scheduled heritage sites Defra's code of practice 2003 states:

'*Where recreational activities take place on SSSIs, English Nature should liaise with managers to ensure that these can continue in ways that are compatible with the conservation interest. It should agree Memoranda of Understanding with bodies representing users. It should also acknowledge the value of sites to local communities, increasing understanding and awareness of conservation importance, and take account of the cultural/archaeological/industrial heritage on individual sites. It should also liaise closely with English Heritage on the management of sites with features of archaeological or historical importance'* (9).

5.9.4 Given that there is no actual requirement to identify and manage non-scheduled sites appropriately the location of a site within a SSSI does not automatically convey protection on a heritage asset. It is possible therefore that management options in wetland areas which may improve its wetland ecological and wildlife potential may adversely affect its waterlogged archaeological potential, eg introducing ponds, wildlife scrapes and the seasonal raising and lowering of the water table to benefit certain species.

5.9.5 The English Heritage's funded wetland vision project identified c 200 key and important wetland areas, some which lie within existing wetland areas and some in areas of potential future wetland. It states that 'nearly 25% of the wetland archaeological sites fall within the boundaries of wetland SSSIs; 32% within all types of SSSI. The website makes the important point that the archaeological potential of these sites should be flagged early so that damaging management processes such as ditch re-profiling, pond or scrape creation and within upland areas grip blocking with locally borrowed peat, are proposed.

5.9.6 The importance of effective liaison between the relevant national bodies is also recognised in a recent EH document entitled Landscape Advice Note: Sites of Special Scientific Interest and Other Nature Conservation Designations (2014). It states that:

'*Natural England needs to know of archaeological sites and take them into account. Joint undertakings to that effect are the subject of the Memorandum of Understanding agreed between the two organisations. This memorandum provides the basis for discussion between the two organisations for the conservation of the natural and historic environment. Natural England teams receive updates on Scheduled Monuments and the Register of Historic Parks and Gardens. They have undertaken to consult English Heritage before agreeing any activity on an SSSI that might affect Scheduled Monuments or Registered Parks and Gardens'*. (EH 2014, 5).

However, it is not clear from this how this would benefit non-designated wetland sites, especially if they are not recognised/recorded in the HER.

5.9.7 Olivier states that:

5.9.8 '*Of the surviving wetlands, less than 1% constitute areas of semi-natural land or are under active nature conservation management (although much larger areas are subject to schemes that benefit from land management and conservation regulations and subsidies that recognise and enhance wetland habitats). In most cases, such measures help protect the archaeological resource by discouraging the conversion of pasture into arable land. Nevertheless, the use of fertilisers on permanent pasture and the variable water-table that exists in such schemes (high in the winter but lower in the summer) poses a serious threat to the waterlogged archaeological resource. Despite the conclusions of the Wetland Management Project, close co-operation between nature conservation agencies and the archaeological community has been slow to develop*' (Olivier 2002, 42).

This was still identified as both a priority and concern in EHs Wetland Strategy document dated to 2012 (9).

5.10 International designations

5.10.1 There are three main international designations. These are Ramsar sites, Special Protection Areas for birds (SPA) and Special Areas of Conservation (SAC). Ramsar sites are covered by the Convention on Wetlands of International Importance especially as waterfowl habitat (Ramsar, Iran 1971). These areas are often coastal mudflats or marshes, or large inland marsh areas of international significance for their breeding and over-wintering birds. Special Protection Areas (SPAs) conserve the habitat of certain rare or vulnerable birds and regularly occurring migratory birds. SPAs are designated under the European Community Directive on the Conservation of Wild Birds (1979). Special Areas of Conservation (SACs) are designated under the European Community Habitats and Species Directive (1994). SACs conserve natural habitats and wild fauna and flora. These areas form a series across Europe known as Natura 2000 sites. All designated SPAs, SACs and Ramsar sites are also Sites of Special Scientific Interest (SSSI). Some sites qualify for more than one designation. Obligations on owners and managers are similar to the requirements for SSSI.

5.10.2 The Head of English Heritage Archaeological Policy states that:

'*Ramsar sites are designated for their significance in terms of ecology, botany, zoology, limnology and hydrology. Much of Europe's wealth of archaeological and cultural heritage is closely associated with the great natural richness of our wetlands, and many peoples throughout the world continue to depend on wetland resources for water, food and other materials, as well as for safeguarding human health. However, despite a clear recognition of the importance of the cultural heritage (physical structures and artefacts of the past, palaeontological records of environmental and climate change, traditional water and land-use management practices, religious significance, and 'sense of place' for these often mysterious places and their wildlife),*

*the Convention does not allow for site designation under specifically cultural terms. Because Ramsar sites contain an enormous wealth of cultural and archaeological material, it is vitally important that the cultural heritage of these sites is properly identified, documented and incorporated in management plans. Only in this way will the archaeological heritage gain any advantage from the undoubted benefits of sympathetic management regimes that ultimately derive from Ramsar designation' (*Olivier 2002, 44).

5.10.3 This suggests that once again, archaeologically valuable wetland sites would still potentially be at risk from unsuitable management within these internationally designated areas.

6 DISTRIBUTION OF NATIONALLY IMPORTANT SITES AND WETLAND COVERAGE

6.1 Introduction

6.1.1 The principles of selection for Scheduled Monuments (SMs) are laid down in the document 'Scheduled Monuments & nationally important but non-scheduled monuments' (DCMS 2013). In this document the following principles are set out for use by the Secretary of State in deciding whether to designate as Scheduled Monuments:

- Period: All classes of monument that characterise a category or period.
- Rarity: those monuments which best portray the typical or commonplace as well as the rare, taking account distribution in a regional and in a national context.
- Documentation/finds: the presence of documentary records or previous investigations, or conversely the absence of documentation may make the monument more important as the only way of developing understanding.
- Group value: association with related contemporary monuments and/or those of different periods.
- Survival/condition: both above and below ground or underwater.
- Fragility/vulnerability
- Diversity: a combination of high quality features or a single important attribute.
- Potential: anticipating the existence and importance of high archaeological or historic interest.

6.1.2 A review of all the SMs within England identified that only 2% of archaeological sites (estimated at 635,000) were scheduled, and this was found to be unrepresentative (England's Archaeological Resource 1984). In particular it was found to be heavily skewed in terms of certain periods, monument types and areas covered. The MPP programme was developed in order to address many of these concerns and to develop a mechanism for a more comprehensive and measurable system of designation. However, the issues and recommendations identified with heritage protection have yet to be fully implemented in all areas of the country.

6.1.3 By reviewing the SMs within a specific geographic location of East Sussex it is possible to test the current representation and distribution of nationally importance sites protected by designated. In particular to examine the representation of wetland sites and early prehistoric sites that were previously under-represented when compared to terrestrial sites. Both terrestrial and wetland sites must be examined together in order to form part of a wider more comprehensive strategy of heritage protection. The SMs are therefore discussed by periods and monument types to help identify gaps and under-representation within the current protection strategy.

6.1.4 Whilst the report focuses on wetland sites, there are many ways in which the general philosophy of the approach set out here is valid with regard to the archaeological potential of other buried environments like the relatively poorly understood woodland and pasture landscapes of the High and Low Weald.

6.2 Distribution and character of Scheduled Monuments in East Sussex

A total of 318 scheduled monuments are listed within the National Record of the Historic Environment (NRHE) records for East Sussex and Brighton and Hove. The distribution of the different periods and monument types are plotted here against the NCA, and their spatial distribution is shown in Figures 7-11.

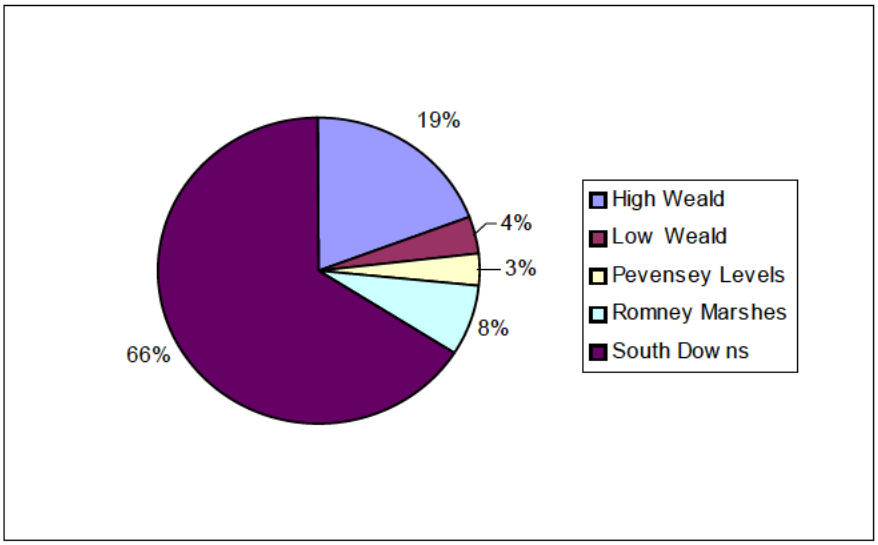

Figure 12: The distribution of SMs over the different landscape areas

6.2.1 The listing reveals an uneven distribution of monuments across the county and NCA (Figure 12). The largest number (209) of SMs are located in the lowlands of the South Downs, 62 monuments are located in the High Weald, 24 in Romney Marsh, 12 in the Low Weald and 11 in the Pevensey Levels. When we take into account the different size catchment areas of the NCA, the density (number of SMs divided by hectare) still shows the South Downs as having the greatest concentration of monuments, even though the Downs covers just over 18% of the total land area. This is then followed by Romney Marsh, the High Weald, Pevensey Levels and the Low Weald respectively in terms of density of SMs. The Low Weald has the lowest density of SMs.

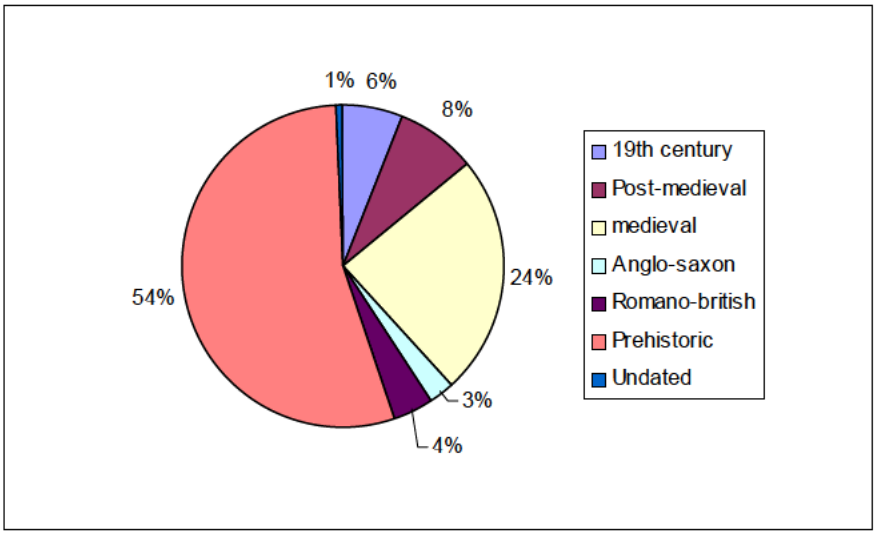

Figure 13: A breakdown of SMs in East Sussex by period

6.2.2 If we breakdown SMs in terms of periods represented (Figure 13), over half of monuments are prehistoric in date (174 sites). In total 78.5% of these prehistoric monuments are located in the archaeologically rich landscape of the South Downs. This is compared to only 7 prehistoric monuments recorded in the High Weald. Of the 164 scheduled prehistoric monuments within the South Downs, 143 are barrows, 3 are causewayed camps and the remainder are settlements/enclosures.

6.2.3 Particular concentrations of iron working sites are located on the High Weald, dating from the Romano-British through to post-medieval periods. This reflects the location of the essential raw material and a plenty supply of fuel wood is located in this area.

6.2.4 The distribution and types of monument that have been scheduled partly reflects concentrations of specific types of activity, in particular the Bronze Age monuments and settlements of the South Downs and the iron working sites of the High Weald. However, scheduling has been clearly influenced by the focus of past researchers, for example in the case of the South Downs, by visible upstanding remains such as barrows, and by monuments clearly identifiable from aerial photographs. Many of the NRHE records are of historical sites scheduled shortly after the Second World War. In many cases the dataset which exists is incomplete or inaccessible, making it difficult to ascertain the exact nature of many of these monuments.

6.2.5 Of the entire SMs only one monument is defined as a waterlogged wetland site, although at least 12 SMs are located within wetland areas. These sites are located on the Willingdon and Pevensey Levels.

6.2.6 The 'Heritage Management of England's Wetlands Projects' (3476 and 3610) were designed to provide a categorisation system for archaeological sites in wetland areas, based on their value (see below, Section 7.1). In the first of these (HMEW Project 3476) the significance of wetland sites was categorised as either A, B and C based on their contribution to the archaeological record, palaeoenvironmental potential and overall significance in terms of wetland landscape (EH 2012b). Subsequently a revised list has been proposed (NHPP 3A5, Project 6240, Exceptional Waterlogged Heritage), with potential candidate sites assessed using criteria including period, rarity, documentation (evidential and/or historical), group value, survival and condition, diversity and research potential (Heathcote and Campbell 2013). Those sites in East Sussex listed as exceptionally (A) or nationally (B) important are discussed further below (see 6.3.45 and 7.1).

6.3 Comparison of the distribution and character of Scheduled Monuments with the draft South-East Regional Research Framework

6.3.1 In order to undertake an effective review of the current distribution and coverage of SMs in the county in relation to the aim of protecting sites of national importance, the SMs have been compared, where possible, to sites and themes highlighted in the draft regional research strategy and seminar notes. This has also been discussed with officers from East Sussex County Council to identify key sites that might not be represented within the current available published literature. The distribution and character of the SMs are discussed in more detail below by period.

Palaeolithic period (40,000 – 11,000 years BP)

6.3.2 No Palaeolithic SMs are recorded within the East Sussex NRHE. There is a sparse distribution of at least 30 Palaeolithic findspots recorded within the HER but more significant activity in the region is confined to a small number of notable sites. Only one significant Lower Palaeolithic site has been identified, at Newhaven (Bell 1976). The investigation in the 1970s of six sites by the Brighton and Hove Archaeological

Society (Bell 1976) identified potential *in-situ* and refitting worked flints within soft grained sediments preserved within peri-glacial landforms. The recorded assemblage identified a series of refitting artefacts directly associated with a refitting bi-facial core.

6.3.3 The Upper Palaeolithic record for the south-east region as a whole is small, the number of sites which have been assigned even to broad chronological phases comprises fewer than twenty and of these only three have been subject to modern, multidisciplinary investigations. The absence of Early Upper Palaeolithic finds dating to before the Late Glacial Maximum in the wider region attests to the lack of established occupation in an area which may have been only marginally accessible from the continent.

6.3.4 More recent excavations around the wetland margins of the Combe Haven, as part of the Bexhill to Hasting Link Road (BHLR), has identified an *in-situ* lithic scatter with over 3000 Upper Palaeolithic worked flints, representing a potential hunting camp. Potential Upper Palaeolithic long blades have also been identified amongst several other early Mesolithic flint scatters. Based on the density of flints recovered around the Combe Haven it is likely that more lithic scatters of this potential await discovery.

6.3.5 English Heritage guidelines (EH 2008) for early prehistoric sites state that 'any sites of more than stray finds should be considered nationally important'. The Weald is highlighted as a priority area, needing considerably more focused study and understanding, particularly in relation to Upper Palaeolithic sites.

6.3.6 The draft EH research framework does not identify any key Palaeolithic sites that would qualify or warrant scheduling or a designation as nationally important. East Sussex lacks the raised beach deposits of the West Sussex coastal plain, which contains the internationally important Lower Palaeolithic site of Boxgrove. However, there is considerable potential for future Upper Palaeolithic sites from both rock shelters and wetland edge locations to be discovered in the future. Any new *in-situ* sites discovered that represent more than just reworked finds should be considered nationally important and would require protection as 'sites without structures'.

Mesolithic period (10,000 - 4,000 –years BC)

6.3.7 Fieldwork and excavation in Sussex, particularly in the Weald, has contributed significantly to Upper Palaeolithic and Mesolithic studies. The pioneering work by Graham Clarke in the 1930s and Roger Jacobi in the 1970s identified a wealth of material. Most of these assemblages were recovered from surface material and were therefore mostly unstratified finds. But the similarity in terms of form and source material from Late Mesolithic sites at Seaford (Clark 1930) and the Horsham area (Clark 1934) allowed the development of a detailed classification of microlith forms. The uniformity in terms of microlith forms within one narrowly distributed collection of sites allowed Clark (1934) to further suggest a specific culture, 'Horsham Culture', which is specific to Sussex.

6.3.8 Jacobi undertook review of all the Mesolithic assemblages and subjected them to statistical analysis, identifying three main groups of assemblages: The first group included microlithic assemblages characterised by mainly obliquely-blunted points and convex-edge scrapers being the most significant (Jacobi 1978, 16-17; Jacobi and Tebbutt 1981, 10). These assemblages mostly occur on the Lower Greensands and date from the 10th and 9th millennium BC. The second group consisted of Horsham points - obliquely-blunted points, predominantly isosceles triangles, mainly confined to the Weald (Jacobi 1978, 20; Jacobi and Tebbutt 1981, 11-12); the third group were assemblages of mainly geometric microliths dominated by scalene triangles and

narrow straight-backed bladelets (Jacobi 1978, 19; Jacobi and Tebbutt 1981, 13). These occur throughout the Weald and South Downs.

6.3.9 It is therefore surprising, considering the wealth of important Mesolithic sites identified, that only one Mesolithic monument is listed or scheduled within the NRHE. This is classified as a rock sheltered dwelling, High Rock, with evidence of Mesolithic and Neolithic occupation and an Iron Age multi-vallate hillfort. It is situated on a hilltop, with a rocky promontory on the north-west side, overlooking the valley of the River Grom. The site lies a short distance to the west of Royal Tunbridge Wells and straddles the East Sussex and Kent border and was first scheduled in 1959. The rock shelter survives as below-ground archaeological remains, situated in gullies between the projecting High Rocks. A variety of Mesolithic and Neolithic materials were recovered, including numerous flint implements and waste material, sandstone hearths, charcoal, Neolithic pottery sherds and arrowheads. The flints included micro-cores, micro-blades, microliths, blade cores, blades and blade tools. Apart from High Rock, a range of similar rock shelters have been identified on the High Weald.

6.3.10 There are a number of important sites located on the sandy deposits of the Low Weald and High Weald. These principally comprise sites associated with distinctive outcrops of hard Tunbridge Wells Sandstone. There are two main areas of interest, landscapes of the Horsham area (St Leonard's Forest to the east, and the Southwater-Nutley to the south). These include High Rocks (Money 1968), the Hermitage (Jacobi and Tebbutt 1981), Rock Fields (Hemingway 1980 bib; 1981), Withyam (Harding and Ostoja-Zagórski 1987) and Eridge (Greatorex and Seager Thomas 2000). Not only have large lithic assemblages been uncovered (for example over 10,000 pieces at Uckfield and 4,000 at the Hermitage) but hearths have been located with associated preserved charcoal, sealed within *in-situ* soil horizons. The Hermitage and High Rocks have both provided material suitable for radiocarbon dating and post-holes which may be associated with temporary shelters. These sites offer valuable potential in providing lithic material in datable sealed contexts and future discoveries of this type could be eligible for designation as sites of national importance.

6.3.11 A growing number of Mesolithic sites are classified on the HER as coming from the Weald and these tend to fall into two distinct types of site. In the centre and eastern parts of the Weald there are numerous rock-shelter (described above) sites associated with microliths and microlith production, which can probably be interpreted as short-stay hunting camps. The second type of site is found in streamside or wetland valley locations across the Weald, and they appear to be associated with a broader range of implements, including both microliths (frequently Horsham Points) and tranchet adzes (wood cutting tools); which have been suggested as representing longer-stay camps by Chris Butler (2007).

6.3.12 This second and larger group of sites from valley edges and stream locations are currently less archaeologically visible and often lack the structural evidence that make scheduling of sites possible. This partly reflects the fact that they are often buried by later alluvial and colluvial deposits and are therefore rarely detected by non-intrusive prospection methods like fieldworking and geophysics; their presence can only be confirmed through excavation. Some of these sites are found in association with depressions or collections of post-holes and hearths which may be the remains of temporary shelters or wind breaks, but this can often only be confirmed through destructive excavation techniques.

6.3.13 More recent and ongoing excavations along the BHLR, located around the edges of the Combe Haven and its tributary valleys, are starting to reveal the potential of stream-side and wetland interface locations. This is described in more detail in the case studies section. The combined value of these sites have the potential to

significantly contribute to the understanding of Mesolithic–Neolithic transition and therefore identify further sites of potential national importance.

6.3.14 A concentration of sites has also been noted on the Lower Greensand ridge immediately north of the South Downs, of which Lodge Hill (Garrett 1976) and Streat Lane (Butler 2007) are noteworthy. Streat Lane is of particular interest because of the excavation of an oval depression defined by worked flints with a single post hole in the middle, pointing to the possible existence of a simple hide shelter. It is also one of the few Sussex open-air Mesolithic sites to have been radiocarbon dated (*c* 7500 +/- 40BP). The single shelter and 3,226 worked flint assemblage have been interpreted as a short-stay hunting camp used for the production and repair of hunting equipment. However, four large 'cooking' pits and large quantities of burnt flint would seem to point to intense or longer term activity.

6.3.15 In the South Downs, Selmeston is one of the earliest and best known sites after Clark (1934) located three "pit-dwellings" cut into the Lower Greensand (sadly no further settlement traces were uncovered in more recent excavations (Rudling 1985)). It benefits from access to springs and views over the Cuckmere Valley and is also located on the boundary of the Lower Greensand and Gault Clay, which therefore may have afforded easy access to different, but complementary, ecological habitats.

6.3.16 There is still considerable potential in East Sussex to contribute to the understanding of Upper Palaeolithic and Mesolithic studies, particularly in relation to the identification of further undisturbed sites and those that preserve environmental remains (eg bones, palaeoenvironmental evidence and other organic remains). The difficulty is that many of these sites may qualify as sites of national importance based on EH guidelines (2012) but would be deemed as 'site without structures' and potentially lack the necessary structural evidence to be eligible for scheduling. Also many of these sites appear to be inter-related and form part of a wider Mesolithic landscape. Their value comes not only from what they represent individually but from how they collectively contribute to our understanding of a much wider prehistoric landscape. A different mechanism for protecting and managing these sites may therefore be required.

6.3.17 Any wooden structures or sites with organic remains of this period would be nationally important and should be protected and managed by scheduling or other mechanism, as above. The draft SE England research framework (Pope *et al*. 2012.) notes that the presence of palaeoenvironmental evidence is of enormous significance to the study of Palaeolithic archaeology and should be considered as part of the archaeological resource. It is also noted that 'the regional archaeology of the Mesolithic has largely developed with reference to sites with abundant lithic finds but generally lacking high quality palaeo-environmental records or associated faunal material' (ibid.). Consequently any sites of this date with associated high quality palaeoenvironmental and/or faunal evidence should be considered of national importance. In the same draft research framework it is noted that there is significant potential held by deeply buried alluvial contexts, which have not yet been subject to systematic research. While some coastal deposits of early Mesolithic date survive within valleys around Romney Marsh (Waller and Long 2003), more remains to be discovered by geoarchaeologically led research, as recent discoveries in the Combe Haven have demonstrated (see below).

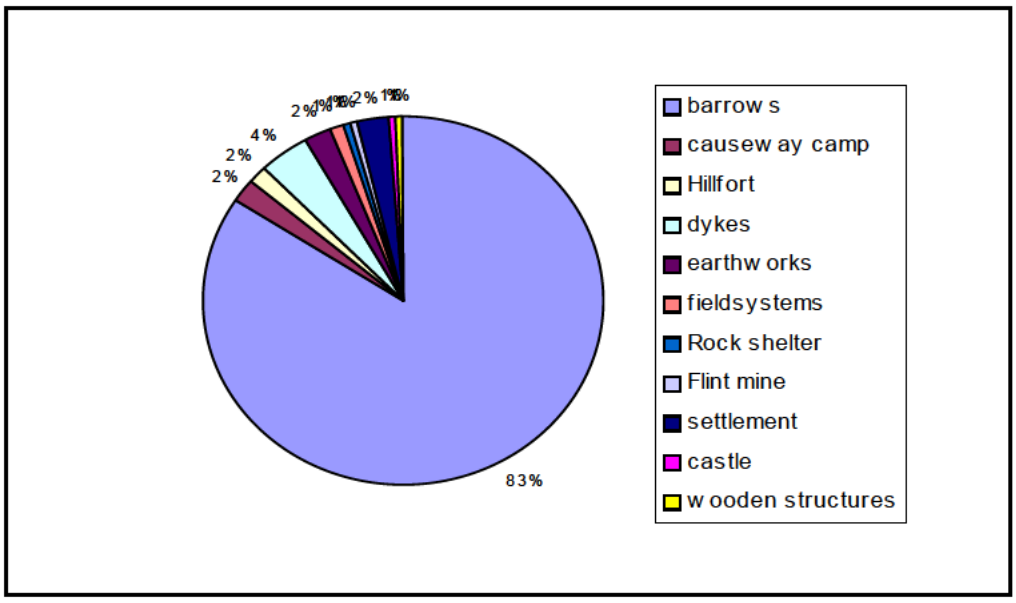

Figure 14: The prehistoric SMs by monument type

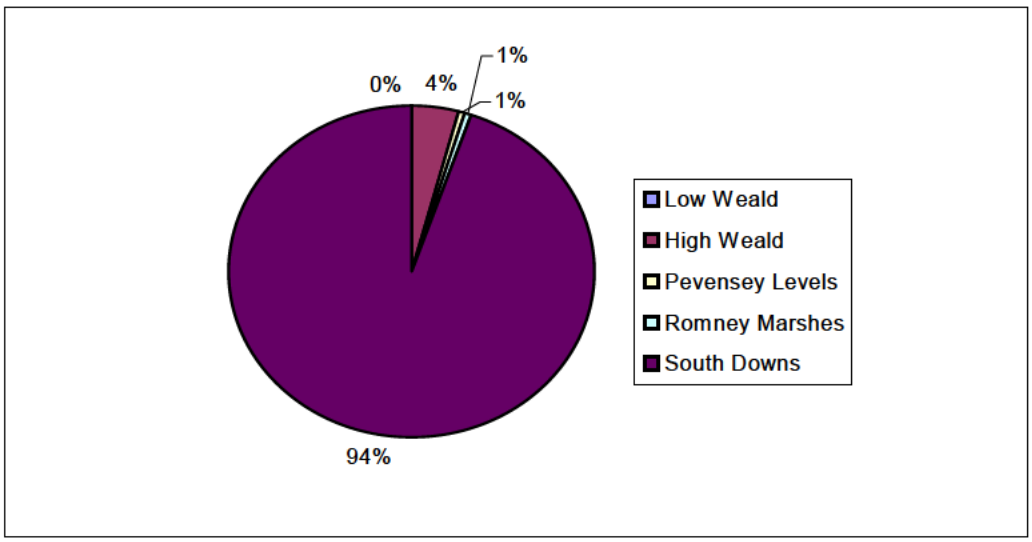

Figure 15: Distribution of prehistoric SMs across the NCA

Neolithic and Bronze Age (4000-800BC)

6.3.18 Only five Neolithic SMs are recorded in the NRHE, represented by three causewayed camps, one flint mine and a potential long barrow. All of these monuments are recorded within the South Downs. In addition there are a significant number of round barrows that potentially date from the Late Neolithic to Early Bronze Age. The key Neolithic monument types, causeway camps, long barrows and flint mines are all represented in the SMs in the South Downs.

6.3.19 As above, the vast majority of the Neolithic and Bronze Age SMs are located on the South Downs, a trend highlighted by Sue Hamilton during the South East England research agenda seminar: 'Middle Bronze Age studies in Sussex suffer from a very localised focus of knowledge, both spatially (the Downland focus) and thematically' (Hamilton 2012). It has been estimated that over 90% of barrows were constructed on the Chalk. Many of these were constructed on the high chalk ridgeways. In comparison, very few round barrows have been identified on the High Weald and only four of these have been scheduled. However, recent excavations near to Battle (Archaeology South East) and BHLR (OA) have identified a further six ploughed flat barrows, suggesting that visibility in The High Weald has unfairly skewed this distribution in comparison with the South Downs.

6.3.20 Only one prehistoric waterlogged monument is recorded from a wetland sequence. Nationally important waterlogged remains were excavated at Shinewater, in the Willingdon Levels, including a large wooden platform and trackway running east-west towards Willingdon. This is the only wetland site with an SM in East Sussex which is classified as A+ in the exceptional Waterlogged Heritage Inventory (EH Project 6240). The platform, estimated to cover an area of *c* 2000m^2, was associated with the upper peat surface and was overlain by marine silty clays. On the platform surface a 0.20m thick accumulation of cultural material was identified dating to the late Bronze Age. Finds included several bronze axe heads and a sickle reaping hook with its wooden handle intact. Human remains were also recorded, deliberately placed on to the platform (Greatorex 2000; Jennings *et al.* 2003). The waterlogged conditions at the site provided excellent conditions for the preservation of wooden artefacts and ecofactal remains. The site was interpreted as a harbour or quay site, perhaps used by boats crossing the Channel. The site was first identified by accident in 1995 during the creation of the Shinewater Park, at which time at least 50m of the platform was dug away. Even with the exceptional remains preserved at the site and the presence of a clear wooden prehistoric structure, the site was not scheduled until 2012.

6.3.21 Excavation of a new nearby bypass revealed a trackway surface and triple row alignment of vertical timbers within the peat further to the north of the monument. The trackway would have provided safe access across the wetland zone, connecting the platform to higher dry ground. Further evidence for trackways has also been found at Ditton, to the northwest of Shinewater (Jennings *et al.* 2003). These trackways are not currently protected under the Scheduled site of Shinewater, but are covered by the ANA of ESSC. The area still has considerable potential to preserve further nationally important significant palaeoenvironmental and structural remains and evidence of early prehistoric activity.

6.3.22 As iterated in the draft SE England Research Framework resource assessment seminar, occupation sites in this region have: '*enormous research potential, especially in valley situations where they have been protected from erosion and ploughing by colluvium. Moreover, it would be very surprising if similar sites did not exist also beneath alluvium in river valleys within the region. Although it should come as no surprise, this evidence does suggest that we should be looking for settlement and other kinds of occupation sites mostly in sheltered valley locations where there was access to freshwater sources*' (Garwood nd). Furthermore, '*the presence throughout the region of extensive alluviated areas in river valleys and colluvial deposits, and the demonstrable presence of well-preserved prehistoric sites in such contexts, demands the development of more effective predictive modelling techniques and new site prospection and excavation methods*' (ibid.). Key research themes which could be investigated include the relationship between Neolithic and Bronze Age populations to changing environments, particularly with regard to sea level change, and to the nature and utilization of woodlands and marshes. Any settlement sites, timber

structures or henge monuments found in the study region would be of national importance and warrant protection, ideally through scheduling where possible.

Iron Age and Roman Periods 800 BC- AD 410)

6.3.23 A total of twelve SMs are recorded within the NRHE as Romano-British. Seven out of the twelve are located on the High Weald associated with the iron industry that developed in this area due to the abundant outcrops of iron ore. These range from various bloomery and furnace sites associated with the processing of the ore. The area contains the essential raw materials that are required for iron smelting, including a plentiful supply of fuel wood. The resulting forest clearance may have resulted in the deposition of colluvium recorded on the valley slopes.

6.3.24 The Iron Age iron-working industry that developed in the area was greatly expanded by the Romans, who exploited the exceptionally rich sources of iron ore in the Wealden clays on an industrial scale. These iron-working sites indicate the importance of the iron-working industry in this area and may account for the apparent paucity of known settlement in the Weald. A number of sites have produced Roman roofing tiles stamped CLBR (Classis Britannica), the insignia of the Roman fleet. This suggests that some of these sites were owned by the military and the wider area may have been officially controlled by an imperial estate designed to control the valuable ironworks which, between the 1st and 2nd centuries AD, was the most important industry in Roman Sussex (Leslie and Short 1999, 25).

6.3.25 The remains of a major Romano-British iron-working site at Beauport Park are also scheduled. Here, the features associated with iron-working were found together with a military type bath house and possibly pre-Roman roundhouses (CBA 1994; Cleere 1974). Also noteworthy is the Romano-British iron-working site of Oaklands Park. Unfortunately many of these large sites have been largely destroyed owing to the popularity of using slag in the construction of turnpike roads in the 19th century. However, smaller bloomery sites are very numerous and it is likely that many still await discovery in the area (Brandon 1974, 57).

6.3.26 There are few settlement villa sites in the Weald, which appears largely devoid of farmsteads or settlement activity. This was previously believed to be due to the heavy, difficult to work, soils of the area or because the area was still heavily wooded. However, prehistoric peoples certainly utilised the area (see above) and the paucity of evidence is more likely to be linked with the lack of archaeological fieldwork and the difficulty of identifying archaeological sites on clay. The results of HAARG and recent developer-funded projects such as the BHLR and Gateway Road there is growing evidence for widespread Romano-British rural settlement on the ridges and higher ground associated with a complex network of routeways.

6.3.27 The remaining SMs include the Iron Age hill fort and associated Romano-British temple at Hollingbury, villa and iron works at Garden Hill and a section of Roman road at Holtye Common. More recently a major Roman town has been identified at the Bridge farm, near to Barcombe Mills. The results of a magnetometer survey by the Culver Archaeological Project in 2011, at Bridge Farm in the Upper Ouse Valley, revealed evidence of an unknown extensive Roman settlement and defensive enclosure (Mullin 2014). The geophysical survey results have been substantiated by finds from metal detecting and by sample excavation in 2013. This site would certainly qualify as nationally important and could be scheduled.

6.3.28 There is potential for nationally important Iron Age and Roman salt-working sites to be discovered in the coastal wetlands; medieval salt-working sites are known from the

Pevensey Marshes and earlier mounds are known to the east, from Romney Marsh in Kent (Johnson 2010).

Anglo-Saxon and medieval periods (AD 410 -1540)

6.3.29 The NRHE records only eight Anglo-Saxon SMs: four cemeteries, three barrows and the remains of the Saxon shore fort at Pevensey Castle. After the final withdrawal of the Roman army from England in the early 5th century AD the history of the area is largely unknown until the region was settled by 'the Haestingas', a group of Saxons.

6.3.30 The later part of this period is better understood, mainly due to the larger number of documentary sources available. In the 10th century a mint was recorded in Hastings, which became a burh (fortified town) in the early 10th century.

6.3.31 In the 9th and 10th centuries a pattern of dispersed settlements and manors existed, using focal points for gatherings, trade, religion and administration. Parishes were created, served by a parish church. These administrative units of late Saxon Sussex, were referred to as rapes. As the Saxon lords provided the earliest parish churches, it is likely that the boundaries of their agricultural estates were used as the boundaries of the parishes (Friar 1991, 278) and the boundaries of these estates are likely to have been based on even earlier land divisions. In the later medieval and post medieval periods these focal points may have evolved into nucleated villages and it is this settlement pattern which forms the basis of land organisation still recognisable today (Brandon 1974).

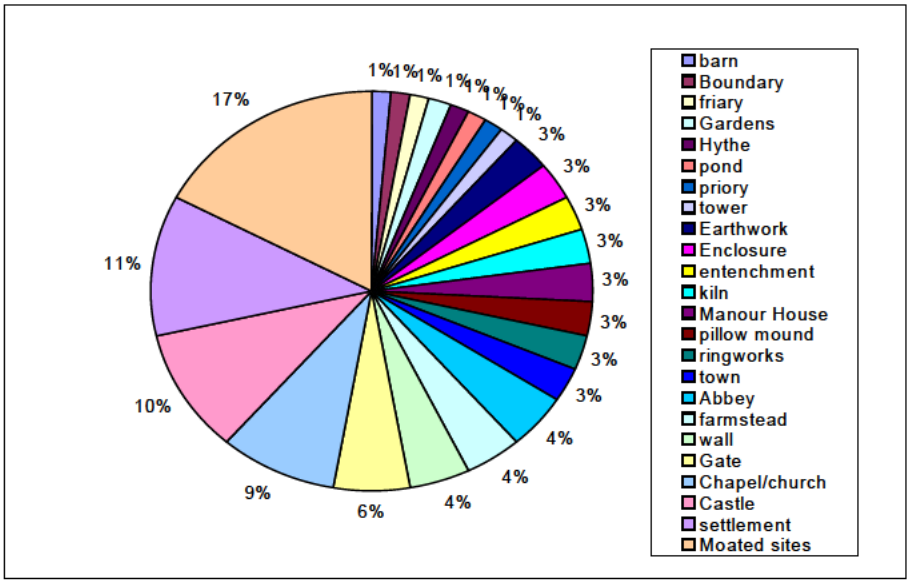

Figure 16: Distribution of medieval SM types

6.3.32 A total of 77 medieval SMs are recorded across the NCA. There are numerous sites known of this date in the region including Deserted Medieval Villages (DMVs) such as the Scheduled village at Northeye on the Pevensey Levels; moated sites; castles and religious establishments including churches. The land in the vicinity of these settlements may have been farmed in a traditional, open field system. Drainage channels on the Pevensey Marshes evidence reclamation work started by religious houses. While the SE England medieval research framework has not yet been produced, some areas of significance were flagged up at the Research Framework

seminar, eg. '*Much interdisciplinary research into "moated sites" is required, preferably targeting sites for which there is good documentary evidence. The research questions on which excavation should be based are primarily the need to define variant and probably not mutually exclusive functions and relative chronologies, and to obtain comparative material culture and environmental data*'(Weeks 2012).

6.3.33 In the 200 years after the Norman Conquest, in which Hastings and the region played a crucial role, the population of the area continued to expand. A number of secondary settlements were formed within each parish and these new settlements often lay in the downland and river valleys, with any upland waste and woodland remaining as common land and for hunting (Leslie and Short 1999, 34). In areas like Bexhill this process of secondary settlement is by the division of the parish into the tithings of east, middle and west Bexhill during the 13th century (VCH, 1937, XI: 115).

6.3.34 With the start of the later medieval period the main administration unit was extensively reorganised and divided into 'hundreds', with land holdings, districts and a main town, that in this region had its own castle and port. These urban areas offered an opportunity for goods to be bought and sold, allowing markets to develop (Leslie and Short 1999, 30).

6.3.35 In addition to the agricultural economy, the iron industry in the Weald continued to grow and has been flagged in the SE England Research Framework seminar as a significant area requiring future research (Weeks 2012). By the 15th century the Weald was the main iron production area of England. This industry led to the removal of large blocks of woodland that had possibly survived since the post-glacial period to supply the industry with the fuel and timber it required. Bellpits in Monkham Wood indicate later medieval iron-working (Blandford Assoc. 2004; AR 89). There are other examples of the later medieval iron-working industry within the study area, including the site of a possible medieval bloomery, located in an area known as Cinder Banks (Blandford Assoc. 2004; AR 13). After the introduction of blast furnaces into the High Weald in c. 1496, many of the bloomeries began to move into the valleys as the bellows used in these devices were driven by water wheels supplied by the rivers running down the valleys (Leslie and Short 1999, 63).

6.3.36 The Pevensey Levels was an important location for salt-making from at least the 11th century and low mounds are often remnants of this nationally important industry; six low mounds probably connected with salt-working are located close to the moated site and scheduled DMV of Manxey.

Post-Medieval Period (1540-1800 AD)

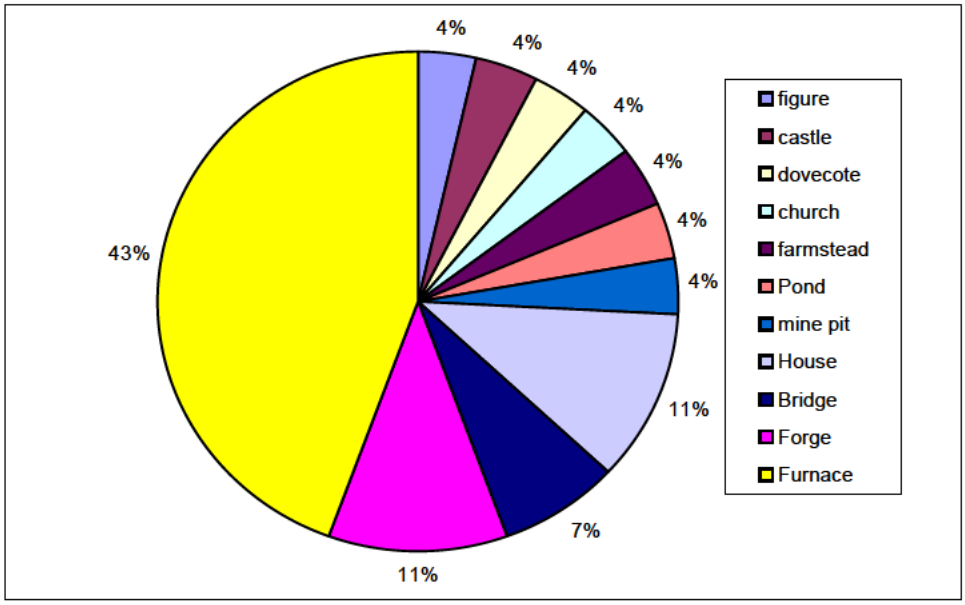

Figure 17: Distribution of post-medieval SM types.

6.3.37 A total of 27 SMs are recorded within the NRHE from the post-medieval period. Just over half of the SMs from this period are related to the continuation and intensification of the iron industry in the area. Again there is a significant concentration of monuments in the High Weald over the other NCA.

6.3.38 The post medieval period saw the concentration of iron working in the Weald and the continuing exploitation of forest locally. The use of the area for iron working is attested to in a number of today's field names shown on the mid-19th century tithe maps. Unfortunately, it was during this period that many of the large mounds of slag, left over from Roman iron production, were destroyed, as the residue was highly prized for turnpike road construction and many such sites were quarried to virtual extinction in the early/mid-19th century (Armstrong 1995, 30; Brandon 1974, 57).

6.3.39 The pattern of settlement comprises a scatter of densely packed small towns and hamlets, along with strip settlement along the road systems. The other SMs reflect a small sample of monuments such as bridges, houses, dovecoats, castles, and ponds.

6.3.40 Large areas of the county retain a rural character, consisting of the dispersed later medieval settlement pattern that is likely to have been lain down in the Anglo-Saxon period. A considerable amount of ancient woodland remains and it is possible a large number of field boundaries have remained unchanged in the landscape for 200 or more years. Manorial surveys show that much of the local road network in this area is likely to have been established by the mid 16th century, if not earlier (CBA 1994). In the study area a number of the road lines shown on this map still survive in the modern road system. This road and trackway system would have been essential to the exploitation and development of the area and its industries and settlements.

18th and 19th century defences

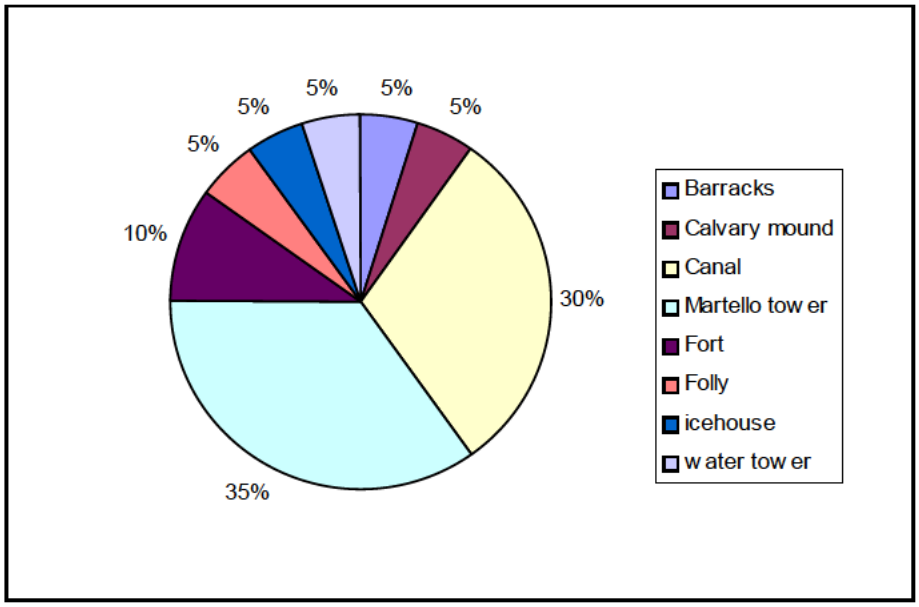

Figure 18. Distribution of 18th and 19th century SM types.

6.3.41 In total 19 SMs are listed with the NRHE dating from the 18th to 19th century. These are predominantly (85%) Napoleonic defences spread along the East Sussex Coast. They include coastal Martello Towers (Clements 1999; Sutcliffe 1972; Telling 1997), barracks, forts, batteries and the Royal Military Canal (Clements 1999: 17; Vine 1972). Generally archaeological work on sites of this period has been limited, even on distinctive major features such as the Royal Military Canal (Greatorex 1995). The physical nature of these monuments and their upstanding nature have meant that it has been much easier to schedule these monuments and to develop a coherent strategy for their protection and management.

6.3.42 The research framework identified the importance of investigating the successive defensive stop-lines behind the region's coasts to establish location, related infrastructure of supply and any surviving archaeology, with particular importance placed upon the pre-Martello and Royal Military Canal. Another key focus is the undated apparently temporary solider camping sites, such as those recorded in the Ashdown Forest (Butler 2007), on the High Weald. The temporary camp is not currently scheduled but is identified on the HER.

6.3.43 It is of particular note that no WWI or WWII remains are listed within the NRHE for East Sussex. The surviving WWII defences are important heritage assets in that they document one of the most significant periods in recent British history. It is worth noting that there are structures such as the tank traps at Cuckmere which are listed and not scheduled. So there is something of a bias with more modern heritage assets away from scheduling in favour of listing, which is not covered within this study. As a group they are very significant assets to future tourism in the area, particularly in relation to educational visits.

6.3.44 The particular value of this group of heritage assets is that despite the removal of some individual elements, the defensive landscape still retains a high degree of coherency (it can be understood as a collective whole and as a series of individual features) and visibility (it can be easily seen without specialist understanding or interpretative assistance). A nationally important landscape of WWII remains has been identified at the Cuckmere Haven (OA 2010).

Wetland sites and sequences of National importance

6.3.45 East Sussex has only two sites that made a recent list of key wetland sites the Heritage Management of England's Wetlands (HMEW). As part of this project, lists of key / types wetland sites (list A), and sites of national importance (list B) were drawn up, containing around 200 sites. Those in the study area comprise the historic landscape of the Pevensey Levels, a low-lying area between Eastbourne and Bexhill, and the prehistoric wooden platform at Shinewater within the Willingden Levels, described previously (Section 6.2.21).

6.3.46 The prehistoric platform of Shinewater is the only Scheduled wetland/waterlogged site. The Pevensey Levels are designated "Wetlands of International Importance" as defined by the RAMSAR Convention for the conservation of historical wetlands, especially connected with the preservation of bird habitats. Within the defined RAMSAR area are located 13 scheduled monuments including Northeye deserted medieval village, Manxey moated site, deserted medieval village and possible saltworking site, and Pevensey Castle.

6.3.47 The HER identifies only 3 specific wetland or waterlogged sites: the prehistoric remains of Shinewater; a drainage ditch at Bridge Inn, Romney Marsh which produced wooden remains; and the remains of a late medieval boat found in Romney Marsh. Other waterlogged sites are present but are listed in the HER as specific sites or structures like boats, trackways, harbours and piers. The absence of more extensive or significant wetland sites is partly due to the lack of archaeological investigation within these areas, which in turn reflects the unsuitability of many of these areas for commercial development.

6.3.48 For a more detailed account of the archaeology of Sussex see Rudling 2003 and also the South East Research Framework (English Heritage, forthcoming).

6.4 Distribution and character of wetland sequences in East Sussex

6.4.1 The review of SMs in the previous section has demonstrated that gaps exist within the current representation of early prehistoric archaeology and in particular wetland sites and sequences. The following section discusses the potential of the various wetland sequences in East Sussex to preserve archaeological deposits of potential national importance. Many of these wetland areas are under agriculture or long-term pasture and have not been disturbed by development.

6.4.2 The sediment sequence identified along the East Sussex coastal and adjacent valleys has been divided into three main lithological units which broadly relate to changing sea-levels (transgressions and regressions) following Long *et al* (2000) (see below, section 6.5.2). The sequence broadly consists of estuarine and marine sands deposited during the earlier Holocene, overlain by silty clay and peat layers and subsequently covered by estuarine silty clays. The present landscape developed following the medieval and post-medieval reclamation of many former low-lying wetland areas.

6.4.3 These stratified prehistoric alluvial sequences have significant potential to provide information about changes in the wetland/dryland interface zone in river valleys and floodplains within the area. Organic sediments include woody and reedswamp peats which have been seasonally or permanently waterlogged, resulting in the often excellent preservation of organic remains and palaeoenvironmental indicators such as pollen, insects, plant macrofossils including seeds and wood, diatoms, ostracods, foraminifera and, in some locations, bone. The organic-rich deposits correspond to periods of marine regression, when coastal plains would have provided a mosaic of freshwater habitats, with a rich flora and fauna. Higher 'islands' within this

environment would have provided favourable locations for human settlement. The formation of these organic deposits has been radiocarbon dated to the late Mesolithic and early-middle Bronze Age in East Sussex. At the scheduled site of Shinewater, in the Willingdon Levels, the Bronze Age wooden trackways and platform are located within peat sequences while recent excavations at Combe Haven have revealed extensive areas of prehistoric activity associated with peat sequences at the wetland edge. It is likely that other wetland sites of at least national significance will lie under alluvium in similar but less well investigated coastal and valley edge locations.

6.4.4 Elsewhere, evidence from the Thames floodplain, east of London indicates that construction of timber trackways and associated activities broadly coincides with rising water-levels and a change from predominantly alder carr to a more open environment of sedge fen, reedswamp and marsh. A reduction in post-glacial woodland, or changes to it, may be a result of human activity or directly affect it by providing rich and biodiverse habitats for human exploitation. Information on vegetation changes and patterns can be gleaned from palynology and the analysis of plant macrofossil and insect assemblages, the last two providing a very local picture of conditions at the site under investigation. Palaeoenvironmental analyses can therefore potentially be used as a tool for predicting where sites may be found or areas utilised as well as providing evidence for environmental and landscape change for sites and areas of human activity (see Section 7.4).

6.4.5 Peat sequences on the Willingdon Levels near Eastbourne show clear structural evidence of human activity and this is also reflected in the pollen record, which documents landscape changes, which would be unrecognisable on a dryland site. The pollen record shows that the nationally important and scheduled site at Shinewater was located at the edge of a freshwater lagoon by the early Bronze Age. A sequence of three peat deposits at the site record the transition from saltmarsh to alder carr and finally to freshwater reedswamp and sedge fen. This peat (the Willingdon Peat) accumulated during the Bronze Age and produced evidence of a wooden platform and associated trackways in its upper facies; this thin organic deposit has been dated from 3610-3250 cal. BP to 2730-2360 cal. BP (1660-1300 cal. BC to 780-410 cal. BC), when palaeoenvironmental evidence demonstrates a transition from reedswamp to sedge fen. Pollen from directly under the platform includes occasional cereal grains as well as umbellifers and plantain (*Plantago lanceolata*) attesting to human activity in the vicinity. Pollen evidence from peat directly overlying the platform also indicates a possible short-lived phase of woodland, dominated by alder and willow, which relate to coppicing or deliberate woodland clearance (Jennings *et al*. 2003). Following the construction of the platform and trackway at around 830-800 cal. BC (weighted mean), estuarine flooding returned burying the site and associated organic sequences under c. 0.8m of estuarine silty clay, so preserving the site (Jennings *et al*. 2003).

6.4.6 This pattern was also evident at Hydeneye, an island on the western margins of the Willingdon Levels, where saltmarsh during the early Bronze Age, indicated by pollen from goosefoot (Chenopodiaceae) with open water indicated by pondweed (*Potamogeton*) gave way to a drier habitat with evidence for alder and willow carr woodland and cereal cultivation, following marine regression (ibid). Opening up of the woodland was indicated at around the time of trackway construction (prior to 805-410 cal. BC) with an increase in herbs and ferns, before a return to saltmarsh in the Iron Age (Jennings *et al* 2003).

6.4.7 Similarly, Morning Mills farm at the northern end of the Willingdon Levels about 2km from the Shinewater platform and close to Dittons Trackways, evidence illustrates a change from an open fen habitat with sedges and grasses skirted by trees including oak, and lime to a carr woodland (willow then alder) at around 1500-1120

cal. BC, shortly followed by a reduction in trees and expansion of herbaceous taxa including cereals.

6.4.8 Peat sequences with high potential for palaeoenvironmental reconstruction have also been recorded further east, at Northeye in the Pevensey Levels, although to date archaeological remains pre-dating the Anglo-Saxon salt workings are absent in this area. Assessment of the peat sequences indicated that the middle Bronze Age landscape comprised mixed deciduous fen carr woodland initially dominated by birch, with alder, hazel, willow, oak, beech, alder buckthorn and a fern understorey, surrounding marsh inhabited by plants such as sedges, gypsywort, rushes and celery-leaved buttercup, with areas of open water and pondweed (OA 2009). Waterlogged seeds from this peat have been dated to 1670-1430 cal BC at 95.4% (SUERC-23950: 3270±50BP; 3610-3380 cal. BP) and small quantities of microscopic charcoal may hint at human activity locally.

6.4.9 As alder became more important in the fen carr both the proportion and diversity of the herbaceous pollen increased. Although still largely wooded, microscopic charcoal and cereal-type pollen was recovered from peat dating to the early Iron Age, 820-530 cal BC at 95.4% (SUERC-23949: 2565±45BP; 2770-2490 cal. BP), possibly an indication of cultivation and human activity higher up the valley, although it should be noted that it is difficult to distinguish cereal-type pollen from that of some wild grasses such as couch grass (*Agropyron*), often to be found close to the sea, or from the aquatic taxon *Glyceria* (sweet grasses) (Andersen 1979; OA 2009). Subsequently, increasing amounts of pollen from the goosefoot family and from seathrift and several other taxa, together with brackish foraminifera, indicates the return of saltmarsh, reflecting marine inundation in the late Iron Age and Roman periods.

6.4.10 Elsewhere at New Bridge on the Pevensey Levels, a peat deposit, 1.8m thick preserved evidence of alder carr woodland and sedge dominated fen during the early-middle Bronze Age, between 4250-3750 cal. BP (c. 2300-1800 cal. BC) (Waller and Long 2010). At Langney Point, at the western point of Pevensey Bay, a basal organic deposit has been dated to the early Holocene.

6.4.11 Archaeological evidence for flint working and other activity at the floodplain edge has been found in recent excavations around the Combe Valley, Watermill and Powdermill Streams in the Combe Haven, dating from the Late Upper Palaeolithic to the Bronze Age. An early Mesolithic buried land surface has been identified, dating to 8280-7980 cal. BC at 95.4% (SUERC-50825: 8970 ± 27; 10230-9930 cal. BP), with pollen and plant macrofossil evidence indicating a dry woodland landscape dominated by scrubby trees including hazel, pine and dogwood. As the North Sea basin flooded and sea level rose, this was sealed by estuarine silts and sands. Following this major marine transgression, during a brief episode in the late Mesolithic when marine influence declined, an alder and willow carr fen environment developed in both valleys, radiocarbon dated to 4450 - 4330 cal. BC at 95.4% (SUERC 17363: 5530 +/-35 BP; 6399-6284 cal. BP), with a significant rise in oak pollen at the Watermill Stream site suggesting mixed deciduous woodland on the drier land above the valley floor, possibly with partial opening up of the woodland canopy at the wetland edge. By the middle Neolithic, at 3520-3340 cal. BC (95.4%) (SUERC 17952: 4620 +/-35 BP; 5470-5290 cal. BP) following marine regression, reedswamp developed, followed by alder carr during what is likely to be the natural the hydroseral development of the floodplain. At the Watermill Stream, a rise in oak and plantain pollen and also in fern spores suggests a partial opening up of the woodland canopy, which could potentially reflect natural clearings resulting from (for example) the activity of large herbivores (Vera 2000; Mitchell 2005). A subsequent return to freshwater reedswamp and alder carr woodland in the late Neolithic-early Bronze Age, at 3835-3640 cal. BC or 1890-1690 cal. BC (95.4%) (SUERC-17364: 3460+/-35BP) was accompanied by charcoal

and cereal-type pollen. Abundant worked flints attest to human activity around the wetland edge at this time and a possible Bronze Age timber platform and burnt mounds at a channel edge demonstrate the continuing importance of this waterside environment. The Combe Haven Valley was subsequently inundated in the early Iron Age, with salt marsh and reed swamp environments replacing areas of former alder and willow woodland.

6.4.12 Further downstream, at the interface between peat and silty clay a decline in tree pollen, especially of alder, together with rise in herbaceous pollen has been interpreted as possible evidence for woodland clearance (Waller and Long 2010). However, generally at Combe Haven the natural succession from saltmarsh to reedswamp to carr woodland does not appear to have been as clearly disturbed by natural activity as seems to have been the case in the Willingdon Levels.

6.4.13 Valley sequences at Cuckmere include a buried land surface at –21.1m OD, composed of bluish grey silty clay with a few shells and inter-bedded peats overlying chalk bedrock and probably solifluction deposits (OA 2011). The interface between this surface and those above represents the transition from freshwater to brackish conditions, as evidenced by preliminary assessment of the ostracods and foraminifera. The top of the buried surface has been dated to the late Mesolithic at 7070-6820 cal. BC at 95.4% (SUERC-33111: 8030±30 BP; 9020-8770 cal. BP). It was overlain by sequential laminated sands, silty clays and clays representing brackish, tidal mudflats giving way to mid-high saltmarsh (OA 2011). This sequence is discussed further below, with regard to sea level change (section 6.5.5), but it suggests that the lower Cuckmere Valley sequence may have limited palaeoenvironmental and archaeological potential.

6.4.14 Although outside the main study area, significant floodplain sequences including dated peat sequences have been recorded in the Ouse-Glynde valley system. At the Vale of the Brooks and Lewes, pollen sequences from a thick deposit of greyish clays with interbedded peats show a landscape dominated by alder dating from about 7200 cal. BP (at Lewes I in the Glynde Valley) to 6500 cal. BP (Lewes II) and 5800 cal. BP (Vale of Brooks) (Thorley 1981; Waller and Hamilton 2000). The top of this peat deposit has been dated to c. 3350 cal BP (Lewes II) indicating that alder carr persisted in the valley for much of the prehistoric period, with no clear evidence of any environmental change which could be attributed to human activity. However, a pollen sequence taken from a sequence of silty clays and peat from the nearby Caburn valley seems to indicate human influence possibly from the early Neolithic, with an expansion of herbs followed by a period of high lime and oak values and the appearance of cereal-type pollen (Waller and Hamilton 2000). It has tentatively been suggested that the increase in lime pollen may reflect woodland management practices such as coppicing, pollarding or shredding (ibid.), although coppicing could in fact have the opposite effect. Here, from the primary elm decline at c. 5700 cal. BP) there is evidence suggesting some limited clearance and the expansion of grassland accompanied by cereal cultivation. An expansion of yew *Taxus baccata* in the pollen sequence from c. 5400 cal. BP (c. 3450 cal. BC) has been linked to an abandonment of cultivation (ibid.). Yew seems to have been a major component of coastal woodland around south eastern Britain during the Bronze Age (Stafford *et al*. 2012) and was a wood utilised in the timber trackways and platform structures at the Woolwich Manor Way and Golf Driving Range sites (ibid.).

6.4.15 From this summary it should be evident that the wetland sequences, particularly those of coastal plains and valleys between Eastbourne and Hastings, are a significant palaeoenvironmental national resource, with high potential to preserve direct occupation evidence around the margins, within the upper layers of peat and at the interface between bedrock and alluvial sands and silty clays. Undoubtedly the

material and sites recorded in this area to date provide only a glimpse of its true potential. The preservation of late Mesolithic-Iron Age pollen, plant macrofossils and insects (Coleoptera) within the peat sequences demonstrates that they have excellent potential for local landscape reconstruction. Together with evidence from ostracods, foraminifera and diatoms, the sequences can also provide information pertaining to Holocene sea level change.

6.4.16 Basal peat layers and submerged forests with the potential to address research questions relating to the terrestrial heritage resource are also present within and below the tidal zone. During the late Upper Palaeolithic and Mesolithic, prior to the flooding of the North Sea basin, freshwater conditions in the river valleys would have encouraged peat growth. Where present, these organic sequences are indicative of a landscape where early populations existed and adapted. An early Holocene land surface containing freshwater molluscs and hazelnuts has been recorded at Langney Point, at the Western point of Pevensey Bay, dating to between 10150-9540 cal. BP and 11150-10570 cal. BP (Harkness and Wilson in Waller and Long 2010) and similar deposits could be anticipated at other locations along the coast where later peats survive.

6.4.17 Pieces of submerged forest with high potential for palaeoenvironmental investigation found offshore and within the intertidal zone are listed in the English Heritage intertidal and coastal peat database (http://www.english-heritage.org.uk/content/imported-docs/p-t/peat-database-east-sussex.pdf). These include Bronze Age submerged forests and land surfaces at Bulverhythe, Little Galley Hill and off the coast at Hastings. Occasional finds including harpoon points and flint axes have been dredged from the sea bed in these areas (Rudling 2003). Further east, at the Pett Levels around 11m of organic sediments have been recorded offshore representing some 10,000 years, and Neolithic and Bronze Age peats are also recorded at Hooe, near Pevensey. The submerged forests at Bulverhythe and Hastings have recently been included in a list of coastal and marine sites of the highest potential to inform on coastal change (http://www.archmanche-geoportal.eu/). These sites represent a fragile and threatened resource with considerable potential to include structural remains such as trackways, fish traps and buildings as well as long sequences of palaeoenvironmental data relating to changing coastal environments, woodland composition, sea level change and human adaptation to it.

6.5 Wetland sedimentation and sea-level change

6.5.1 There has been significant debate over the degree of stratigraphic uniformity between sites along the South Coast and how much these can be compared to other coastal sequences. Jennings and Smyth (1982a; 1982b) emphasise the differences between sequences and highlight the importance of local factors like the breaching of gravel bars, while Burrin (1983; 1991) considers the similarities between sequences and advocates a more uniform stratigraphic model. Waller and Long (2010) have recently reviewed all of the available river valley data for Sussex and concludes that no one model explains the development of all these sequences. This debate is further complicated by the current limited level of detailed sampling of many of these valley sequences and the lateral sediment variation that can exist within such fluvially active environments.

6.5.2 Long *et al* (2000) proposed a more general tri-partite model of estuarine development, based on regional sea-level changes, which is often applied to southern England. This provides at least a baseline model that a sequence can be compared to. This model suggests that the lower sequence consists of estuarine and marine sands that would have been deposited during estuarine expansion during the early Holocene. This lower sequence consists of sand deposits overlying freshwater silty clays and

peats. The middle part is characterized by silty clay alluvium and wetland peats/organic silts reflecting a phase of estuarine contraction. The upper minerogenic deposits represent a return to estuarine expansion in the late Holocene.

6.5.3 At Langney Point the transgressive contact was recorded by Jennings (1985) at a depth of -24.7m O.D. at c. 9850 cal BP. This generally consistent with the lower Cuckmere Valley date of 8030±30BP (SUERC-33111) 9020-8770 cal. BC (95.4%), where similar deeply buried organic rich silts are present within a more recent borehole survey (OA 2010). The organic silty clay deposits identified at a depth of 22.00m (-21.10m OD) may represent one such drowned floodplain surface that was caused by the backing-up of these partially freshwater river systems. Rising water-levels within the valley would have helped to create a mosaic of different wetland environments, providing a range of resources for exploitation by local communities.

6.5.4 A major phase of clayey silt/sand deposition is recorded above 21.50m, potentially associated with brackish water incursion. These deposits may have been deposited in low saltmarsh or tidal mudflat environments. The ostrocods indicate that this environment was protected from a wholly marine influence, possibly due to the presence of a shingle barrier. Mesolithic communities would have had to adjust to the changing floodplain conditions. More permanent activity may have moved away from the valley floor to the edges and islands that surrounded the tidal flats. Exploitation of the tidal environment would have probably been on a more seasonal basis, although the flats may have provided easy access to the Weald.

6.5.5 No thick units of freshwater organic deposits have been identified in the Cuckmere Haven (Hunter and Pine 2004). Burrin (1983) records the basal gravels at Cuckmere overlain at c. 28m by silty clays to c. 20m, then sands up to 3m, overlain by an upper silty clay. A similar estuarine sand dominated lower sequence is recorded within the Lower Ouse and Adur Valleys (Waller and Long 2010). In contrast freshwater peat formation is extensively recorded from the valley sequence to the east of Beachy Head, and from the middle Ouse valley during the mid Holocene which began at Lewes c. 7200 cal. BP in the Glynde valley (Waller and Hamilton 2000). Other sequences also record a phase of peat accumulation during the mid Holocene associated with a phase of estuarine contraction. These peats are consistently described as comprising a basal woody peat and an upper detrital peat, overlain by brackish/marine silts. The upper surface of these mid Holocene peat sequences have previously produced evidence of Bronze Age activity, most notably at the site of Shinewater, in the Willingdon Levels, East Sussex (Greatorex *et al* 2003) and evidence of woodland clearance within Combe Haven (Jennings 1985; OA 2008).

6.5.6 The absence of any thick peat deposits within the sequence may simply reflect the currently limited scope of the sampling within the valley, highlighting the need for further deep sampling. Certainly the evidence of re-deposited peat lumps recorded between 13.20m (-12.3m OD) and 11.40m (-10.5m OD), hint that peat deposits may be preserved around the edges of valley. However, if the absence of peat or freshwater deposits is found to be a true reflection of the lower Cuckmere Valley sequence than this may limit its archaeological potential. Certainly very local factors, such as the presence of gravel bars as suggested by Jennings and Smyth (1982a; 1982b) at sites such as the Combe Haven, may be one of many determining factors. Waller *et a.l* (2010) also attributes the absence of mid Holocene peats to more exposed marine conditions and limited gravel supply to the west of Beachy Head.

6.5.7 The thick upper deposits of inter-digitating silts and sands mark a major phase of marine incursion and channel migration. Preliminary studies of the ostrocods contained within the upper sequence suggest the establishment of mid to upper saltmarsh followed by tidal mudflats conditions on the valley floor. Similar major

incursions by the sea at this time are recorded at Combe Haven and Romney Marsh, and a number of other locations along the coast of England. It is often referred to as the 'Romano-British Transgression', with a number of potential causes cited for the rapid rise in sea level. It is widely believed that large-scale deforestation and sediment availability may have also played a significant role in the increased flooding and rising water-levels in valleys during this period.

6.6 Case Studies of wetland sites in East Sussex

6.6.1 A number of recent geoarchaeological investigations undertaken in East Sussex demonstrate the potential of many of these wetland sequences. The following is a series of examples where a range of evaluation and excavation techniques have been employed as part of a staged approach to investigate potential national important sites. All of the following projects were instigated by briefs and recommendations from the ESCC Archaeology Team. A range of geophysical, geoarchaeological and palaeoenvironmental specialist formed part of the multi-disciplinary teams that undertook this work.

6.6.2 These examples have been undertaken on a range of scale, which reflect both small and large scale commercial-led investigations to broader landscape research led studies funded. Each of these investigations are reviewed in terms of the use of the techniques applied and how effective they were in fulfilling the aims of the project.

Cuckmere Haven, Seaford

6.6.3 Until recently only limited data was available about the historic environment of the valley at Cuckmere Haven, its geomorphology and its archaeological interest. The Haven (also known as the Cuckmere Estuary) occupies the mouth of a small valley in East Sussex, where the River Cuckmere meets the English Channel between Eastbourne and Seaford. The Haven comprises a series of reclaimed coastal marshes, relict tidal creeks surrounded by rolling valley hills (Plate 3). The beach at the mouth of the Haven is next to the famous chalk cliffs named the Seven Sisters.

6.6.4 A staged geoarchaeological investigation was undertake as part of a wider study of the valley funded by Defra as part of the Pathfinder programme, designed to help local communities develop an enhanced understanding of the potential effects of coastal change and new tidal management.

6.6.5 The first phase of the investigation September 2010 a conductivity survey was undertaken to help map the subsurface geomorphological features and deposit sequences (Bates 2010a). The results of survey indicated that the sediment architecture varies significantly across the valley floor. Topographic features (now buried) have been inferred in places and potential landscape differences associated with changing lateral and temporal sequences may well exist relatively close to the surface across the site. This has allowed the upper valley sequence to be divided into four key sedimentary zones (Bates 2010a; Figure 19). The conductivity survey was followed up by a geophysical resistivity survey (Bates 2010b; Figures 20 and 21), which was designed to examine the deeper floodplain sequence and help map the buried palaeotopography. This work was able to penetrate to depths greater than the 6m achieved in the conductivity survey. The results clearly show the profile of subsurface features, with good contrast identified within the geo-electric sections.

6.6.6 In December 2010, a series of boreholes using a Commachio drilling rig were undertaken (OA 2010), to help ground truth the two phases of geophysical sediment mapping (Plate 4). The fieldwork aimed to identify the base of the bedrock surface

and provide samples for lithological and palaeoenvironmental assessment. The fieldwork successfully sampled the sequence to a depth of 30m within the valley to help ground truth the geo-electric sections. The base of the alluvium was encountered at a depth of 24m below ground surface and solid chalk was encountered at 27.5m in depth. The Holocene sequence comprised basal silty clays and peats overlain by thick laminated clayey sands. Inter-stratified sand and clay deposits were identified between 11.40m and 5.60m in depth, and these were sealed by overlying homogeneous clays and silty clays.

6.6.7 Preliminary assessments of the ostracod and foraminifera assemblages suggest a transition from freshwater to brackish conditions at the base of the sequence. The marine incursion of the valley was dated to 8030±30 BP (SUERC-33111) 7070-6820 cal. BC at 95.4%. Thick deposits of overlying laminated sands appear to represent brackish conditions within tidal mudflats. There is a gradual transition into mid/high salt marsh conditions further up the sequence, with an increasing marine influence around 8.50m, possibly reflecting tidal surges. Brackish tidal mudflat conditions return with the deposition of the upper silty clays. The present-day predominantly freshwater environment of the Haven is therefore a relatively recent development.

6.6.8 The relationship between the geophysical profile and the drill log at the site indicated that the base of the Holocene alluvial surface coincides with the 6.38ohm/m contour (light to dark green) and consequently was used to infer the shape of the topographical template along all four transects. The revealed valley profile shows abrupt steep valley sides on to a moderately smooth slightly concave base, possible as the result of erosion by continuous migrating channels.

6.6.9 The works has confirmed the presence of significant lateral and vertical variation within the sedimentary sequence and palaeotopography across the valley. The absence of thick peat and the presence of marine indicators recorded from an early Mesolithic date were used to infer a very exposed estuarine environment that may have been less favourable for human activity. A similar sand dominated sequence has been recorded within the Lower Ouse, but this sequence appears to lack the thick freshwater organic and peat deposits present within the valleys recorded to the east, such as those found in the Combe Haven, Pevensey Levels and Willingdon Levels. Evidence of early prehistoric activity appears to be concentrated in more sheltered wetland sequence with thick accumulations of freshwater peat. It is possible that these more sheltered and resource rich environments may have be further upstream within the Cuckmere and Ouse valleys.

Northeye, Pevensey Levels

6.6.10 In 2009 Oxford Archaeology was commissioned by Natural England on behalf of the landowners of Northeye Scheduled Monument (SM MES93) to undertake a geoarchaeological assessment as part of their Higher Level Stewardship Agreement (AG 00246947). The site is located in the Pevensey Levels, which is at the edge of a former coastal lagoon that has been reclaimed from the sea, and deep sequences of Holocene alluvium, consisting of peat and clayey sand and silt deposits, have been identified previously within the area (Jennings and Symth 1982). The site is dominated by an outcrop of Wadhurst Clay lying at approximately 5 metres OD, forming an island 10 metres above the surrounding area of drained marsh. The bedrock island is occupied by the Northeye DMV.

6.6.11 The aim of the investigation was to provide baseline geoarchaeological and palaeoenvironmental data on the sub-surface sedimentary sequence and to assess the likely impacts of proposed ditch clearance and other land management practices. The

assessment consisted of a field survey to record the sequence of deposits and recover samples for palaeoenvironmental assessment in the low-lying marsh area that surrounds the scheduled monument. A transect of five boreholes and two auger holes were taken through the marsh sediments (Plate 5).

6.6.12 The sequences of deposits were relatively consistent (Figure 22). Two main phases of rising sea level (marine transgression) and one phase of lower sea-level (regression) were identified (Plate 6). The main period of regression is characterised by the accumulation of peats and organic deposits that represent a mosaic of different wetland environments. These deposits are prehistoric in date and have been radiocarbon dated to between *c* 1670-1430 cal BC (Middle Bronze Age) and *c* 820-530 cal BC (Early Iron Age).

6.6.13 Palaeoenvironmental assessment for pollen, waterlogged plant remains and insects was undertaken for one representative sequence. The assessment identified good potential for preservation of organic remains below a depth of 1.40m (+1.05 m OD), associated with the accumulation of the prehistoric peats. This sequence was considered therefore to have the potential to provide detailed information on vegetation and sea-level change from the late Mesolithic period onwards.

6.6.14 Previous studies have noted that early prehistoric utilisation of the Pevensey Levels is associated with episodes of marine regression. The organic deposits identified during this assessment therefore have the potential to contain evidence of prehistoric activity in the form of artefacts, wooden trackways or platforms and boats. It was considered that the organic deposits and any archaeological remains therein were vulnerable to both direct impacts through the digging of drainage ditches to depths greater than 1.40m, and secondary impacts such as the lowering of the water-table in the area.

6.6.15 The natural shallow embayments of the island were probably a significant factor in the growth of salt working in this area. The abandonment of the village was most likely partly due to a decline in the salt works within the area. This may in part be due to the declining economy and the spread of disease in the late 13th to 14th centuries but was probably significantly exacerbated at Northeye by the storms of the late 13th century which probably in-filled most of the embayments which were used in salt production. The village never appeared to recover from these events and was subsequently abandoned.

6.6.16 The site is still semi-waterlogged around its low-lying reaches and there is the potential for significant early salt working sites and other medieval features such as jetties or boats to be found around the edges of the Northeye Island. Such discoveries could help inform about the activities associated with the medieval village. The peat deposits and wetland interface zones around the island have the potential to also preserve evidence of early prehistoric activity in form of lithic scatters and possibly the remains of wooden structures associated with the prehistoric peat. Within the area immediately surrounding the bedrock island these deposits are less than 1 metre from the surface and would therefore be vulnerable to direct impacts associated with the digging or cleaning of drainage ditches or creation of new habitat ponds.

Combe Haven, Bexhill to Hasting Link Road

6.6.17 Recent and on-going investigations undertaken along the Bexhill to Hasting Link Road (BHLR) have identified an extremely rich early prehistoric landscape of late Mesolithic/early Neolithic activity in form of lithic scatters around the wetland margins of the Combe Haven and its tributaries (Oxford Archaeology 2013). Evidence of Neolithic and Bronze Age activity has also been identified on the

surrounding ridges that are crossed by the Scheme. A regionally important Roman bloomery and settlement site has also been identified at Upper Wilting Farm, near Crowhurst.

6.6.18 The scheme provides an example of a large infra-structure project that involved a multi-phase approach, because it skirts around the edges of a major wetland sequence. This area was largely undisturbed and had been protected from major development impacts. An initial geoarchaeology desk-based assessment was undertaken for the Scheme as part of the environmental impact assessment (OA 2007a) and incorporated geotechnical borehole and test pitting information. This identified that there was significant potential in the valley bottom and wetland margins, to preserve early prehistoric archaeology, including waterlogged remains.

6.6.19 The assessment identified deep Holocene sediments, up to 10m in depth, which now fill the valleys. It was recognised that these may have potentially buried early archaeological deposits or horizons. Thick peat deposits (c 1.00m to 5.60m in depth; between -5m to +3m aOD) were identified within the geotechnical boreholes in three of the four valleys, and it was realised that these could have exceptional palaeoenvironmental and archaeological potential. This evidence could include deposits relating to the early prehistoric exploitation of the wetland environment and the use of the valleys for transport (e.g. wooden platforms, boats and trackways), as well as palaeoenvironmental material dating from the Mesolithic period onwards. The valley edges and wetland interface zones were identified as providing an attractive location for early hunter-gather activity, associated with the exploitation of the lower valley wetland environment, and therefore as having significant archaeological potential. The assessment noted that without suitable mitigation, the valley sequences and any associated archaeological or palaeoenvironmental deposits could be particularly vulnerable to impacts of the proposed scheme and further phases of field investigation might be required.

6.6.20 The initial stages of the project involved fieldworking (OA 2006a), gradiometry geophysical survey (OA 2006b) LiDAR survey (OA 2007b) and geoarchaeological field investigation (OA 2007a; 2007c; 2008a; 2008b). The fieldwalking retrieved very little except a series of worked Mesolithic worked flints from the ploughsoil from the surrounding ridges, but much of the wetland areas were under pasture. The fieldwalking therefore gave the impression of early prehistoric activity focused on the higher ground rather than at the wetland edge. The gradiometry survey recorded the presence of a series of geophysical anomalies, which may have archaeological origins, but failed to pick out any clear areas for targeting.

6.6.21 The early prehistoric potential of the site was first identified during a geoarchaeological field investigation (OA 2007c; 2008b), which consisted a series of targeted boreholes and test pits in order to provide more detailed information about the archaeological and palaeoenvironmental potential of the wetland interface. The investigation identified a typical tripartite system of sedimentation, consistent with the model proposed by Long (2001) and Jennings and Symth (1988; 1990). Two main phases of rising sea-level (marine transgression) and one phase of falling sea-level (regression) were identified associated with the accumulation of the main Combe Haven peat sequence. This sequence could be broadly divided into three main organic units within the Watermill Stream where more detailed further study was undertaken. A basal peat unit between -1m aOD and 0m aOD, comprised a compacted blackish brown wood peat with occasional clay lens. A top peat unit, between +1m aOD and +2m aOD, consists of wood peat and clayey peats. A third deposit, of humic silty clays and peaty clays, separates the two. This sequence represents the main phase of marine regression, which is characterised by phases of peat accumulation and humic silty clays.

6.6.22 Previous studies have noted that early prehistoric utilisation of the Levels was dependent on episodes of marine regression (see above). The main period of regression was characterised by the accumulation of Combe Haven peats and organic deposits that represent a mosaic of different wetland environments. The formation of these deposits was radiocarbon dated to between the Late Mesolithic 5530±35 BP (SUERC-17363), 4450-4330 cal. BC (95.4%) and the early Bronze Age 3460±35 BP (SUERC- 17364) 1890-1690 cal. BC (95.4%).

6.6.23 A palaeoenvironmental assessment of pollen, plant remains and diatoms was undertaken on the borehole samples taken from the deep alluvial sequence. The first sign of direct human impact within the assessed sequence was identified at -3.12 m depth (-0.80 m aOD) associated with the upper peat sequence. The pollen assessment provides evidence of small clearings within the valley bottoms radiocarbon dated to the early-middle Neolithic (see above, Section 6.4.11), which coincided with an increase in charcoal and other anthropogenic indicators.

6.6.24 A small number of test pits were targeted at the edges of the valley sequences to assess the nature of the transitional zones and to look for signs of human activity. Two of these test pits produced archaeological material associated with a potential buried prehistoric soil sealed beneath the peat. A Late Neolithic / Early Bronze Age lithic scatter, burnt flint and charcoal, were recovered from a buried land surface sealed beneath peat within a test pit at the edge of the Watermill Stream Valley, which had also produced the environmental evidence noted above. A second test pit on the edge of the Combe Haven Stream Valley identified an archaeological deposit buried beneath the topsoil, which produced a quantity of fired clay and sandstone and was thought to represent industrial or burning waste. The assessment concluded that the Combe Haven peat sequence and valley edges had high potential to produce significant evidence of early prehistoric exploitation and occupation associated with buried land surfaces preserved underneath peat and alluvial deposits at the valley edges. These areas were identified as having the potential to contain nationally important remains.

6.6.25 As part of the recommendations of this work, further mapping of the different sedimentary zones was undertaken. An electric conductivity survey (Bates in OA 2008a) was carried out in order to map the different sedimentary and interface zones present across the valley bottoms. The survey aimed to identify areas of high ground or submerged islands that may have enhanced archaeological potential. The survey identified a complex sequence of buried topographic features that included floodplain islands, palaeochannels, bedrock promontories, and areas of thick peat deposits (Figure 23). The mapping was used to help inform the strategy and location of the boreholes, trenches and test pits proposed within the further mitigation stages of the project.

6.6.26 A geoarchaeological watching brief was maintained on the initial ground investigations of the proposed scheme (OA 2010). The monitoring identified a total of four potential archaeological features: Two ditches and two pits were identified during the watching brief along the valley edges of Watermill Stream and Decoy Pond Stream. A sequence of colluvial deposits was also noted near to the base of the valley edges. No significant dating material was recovered from these features, although charcoal and small quantities of burnt flint were noted in their fills. The sterile nature of these fills and absence of finds may indicate a prehistoric rather than later date. In addition worked flint of predominantly Mesolithic date was recovered from several test pits. This material included a scraper and evidence of blade manufacture. Numerous pieces of worked flint were also recovered from the topsoil in and around a number of test pits indicating general activity on the higher valley ridges.

6.6.27 A field evaluation was undertaken in 2013 across the scheme (OA 2013). Fifty eight boreholes, followed by 181 trial trenches and 24 test pits were undertaken across the area as part of the initial phase of mitigation of the scheme. A large percentage of the trenches were targeted on the wetland edge based on the geophysical results (Plate 7).

6.6.28 The archaeology revealed during the evaluation was consistent with low-level activity predicted within the desk-based assessment for the Scheme. No significant amounts of pottery, building material, worked wood, precious or domestic objects were identified along the route. However, the discovery of a potentially well preserved late Mesolithic/early Neolithic hunting landscape with *in-situ* lithic scatters was considered of regional importance, with the potential to be nationally important if associated with organic remains or worked wood. Also the evidence of Iron Age and Roman features and deposits associated with metal working, can provide regionally important information on the bloomery sites of this period.

6.6.29 The Late Mesolithic to Neolithic remains were primarily *in-situ* lithic scatters, sometimes associated with buried land surfaces and peat deposits, around the wetland periphery zones of the Combe Haven, Watermill and Powdermill Stream Valleys. The scatters represented a series of temporary hunting camps and one probable base camp located between +1.0m and +2.0m aOD. These camps were focused on particular topographic locations that potentially provided good vantage points and easy access to the valley bottoms. The potential base camp produced over 120 pieces of worked flint from just a 1m squared sample test pit (Plate 8) and the hunting camps between 1-15 flints each. Flint artefacts from the Mesolithic to early Neolithic were also found as residual finds in many of the later features.

6.6.30 Areas of Late Iron Age to Roman activity was also recorded during the evaluation, focused on two main areas, at near to known Roman bloomery sites. The evidence may indicate that there was occupation at these two sites, as well as metal working. Signs of woodland clearance in the form of colluvial deposits, supported by pollen evidence and potential dumps of bloomery and metalworking waste, were also identified on these slopes. A small amount of Saxon to Medieval activity and a large slag dumps was identified at Upper Wilting Farm and corresponds to the domestic occupation seen in the earlier Wessex evaluation of 1996.

6.6.31 The main excavation of the scheme was undertaken between 2012 and 2014. Evidence of early prehistoric activity in the form of over 200 individual lithic scatters, pits and ditches was identified during the excavation phase associated with BHLR. This activity has been predominately concentrated along the wetland edges of the Combe Haven, Watermill Stream and Powdermill valley sequences. This activity is associated with the accumulation of the main Combe Haven Peat Sequence within the Haven. Further environmental remains from the peat deposits produced evidence of small clearings within the valley floor (OA 2008b).

6.6.32 Even though the evaluation identified a total of 11 potential lithic scatters, only 205 flints were recovered from the evaluation (Figure 24). This is compared to nearly 500,000 recovered from the excavations of over nearly 200 scatters, many in the same locations as the evaluation trenches. The reason for the discrepancy between the two data-sets is the sampling methodology and the fact that the majority of the flints had been vertically deflated below the surface of the weathered natural sands. This is a reflection of the fact that evaluations tend only to penetrate to the top of the weathered geological surface and generally halt there to look for negative features like ditch and pits. What was represented on this surface was only just a handful of flints, which just 0.5-0.30m below the surface was represented by many thousands of worked flints (Plates 9 and 10).

6.6.33 It is noteworthy that significantly more lithics (120 pieces) were recovered from the geoarchaeological testpits and boreholes that penetrated through the weathered surface rather than from the evaluation trenching. Future evaluation work on similar sandy wetland interface zones will need to take this into account: flints can be vertically conflated to a reasonable depth (0.60m) beyond the level of the weathered natural surface. A combination of both trenching and deep testpitting through the natural sequence is therefore recommended in order to establish the potential of these deposits to contain early prehistoric flint scatters. Hand excavation of potential flint scatters is the key using a suitable grid system, and the early involvement of recognised specialists in worked flint and geoarchaeology.

6.6.34 The recovery of early prehistoric lithic scatters, burnt mounds and Bronze Age field-systems within the western end of scheme indicate the potential of the higher valley ridges, above the wetland areas, to contain early prehistoric activity and dispersed settlement, especially to the south west of the BHLR Scheme. These ridges would have constituted a significant landscape feature, overlooking the Combe Haven basin, which would have been experiencing flooding during this time. Higher elevations may have been favoured to provide good vantage points to monitor the movement of animals.

6.6.35 A probable Upper Palaeolithic scatter has also been identified to the north of the scheme on the lower slopes of the Combe Haven valley as well as early Mesolithic sites comprising lithic scatters, possible structural evidence and pits, indicating significant prehistoric activity within the area. Evidence of one potential Neolithic wooden structure was also identified at the edge of the wetland edge associated with a possible channel edge environment that contained various flint scatters (Plate 11). Early indications suggest that the wooden structure may represent the remains of a platform or jetty, but confirmation awaits further detailed analysis.

6.6.36 During the course of the BHLR excavations it became possible to define sites of national importance through open area excavation. This has led to the requirement for (a) high quality recording of what will be lost and (b) preservation *in situ* of areas that do not need to be disturbed.

6.6.37 In the following an asterisk denotes those criteria which were present in the Link Road lithic scatters, showing that the majority of the lithic scatters identified during the BHRL excavations could be defined as of national importance:

6.6.38 '… a lithic scatter will have particular importance if: (1) clear boundaries have been identified, making it recognisable as a discrete site (*), (2) The high quality of artefacts recorded from a recent collection episode; sharp edges; unusually large quantities of small chips and debitage) suggest buried archaeological deposits have only recently been disturbed; such scatters are more likely to be discrete, and other less durable artefacts such as pottery may be present (*), (3) Additional evidence (from excavation, geophysical survey or aerial photography) suggests the presence of buried structural remains with which artefacts are believed to be associated (*), (4) There is evidence for part of the site not having been disturbed at all (*), (5) A scatter has been either dated or interpreted with confidence (*), (6) The artefacts recorded suggest diversity within the scatter, whether in terms of repeated occupation over centuries or even millennia (for example, where diagnostic artefacts of more than one period are present); or if evidence exists for various tasks having been performed (*).

6.6.39 In general terms, sites meeting any three of these criteria are sufficiently rare in England to be considered of national importance and should be treated accordingly under the terms of planning policy guidance. In view of their national rarity, exceptions will include discrete and securely dated scatters of Palaeolithic, Mesolithic

and Early Neolithic date, for which criterion 5 (above) and one other will be sufficient to demonstrate national importance'. Some of these scatters would have been eligible for scheduling whilst others would not have the met the qualifying criteria.

6.6.40 On the surrounding ridges of the Combe Haven, at Hillcroft Farm five possible burnt mounds, droveways and a circular enclosure dated to the Bronze Age (and possibly Neolithic) have also been recorded on the valley slopes and at the interface with the wetland zone. This suggests that there may have been a Bronze Age farming settlement/ritual centre located on the higher ground overlooking the Combe Haven and Watermill Stream.

6.6.41 The excavations of the BHLR represented a rare and unique opportunity to investigate a major wetland edge sequence and landscape within East Sussex. The project has identified a hugely significant focus of early prehistoric activity, including some sites which would be considered of nationally important based on EH guidelines, and some that would have been eligible for scheduling if they could have been preserved in situ. In fact four areas of the scheme have been preserved in-situ in order to protect these potentially nationally important sites. With the large number of significant sites surrounding a major wetland sequence, the area potentially represents an internationally important early prehistoric wetland landscape.

7 DEFINING AND PREDICTING NATIONAL IMPORTANT SITES IN WETLAND SEQUENCES

7.1 Defining national importance in wetland sites

7.1.1 In 2000, English Heritage commissioned a project called Monuments at Risk in England's Wetlands (MAREW; 3476). The report highlighted that a change in approach was needed for wetland archaeology. In particular it sought to move away from a 'seek and record' methodology favoured by the large wetland surveys, to one of understanding and resource management. This initial project was followed by a series of management-themed projects which included the development of a wetland GIS resource (3054), the Heritage Management of England's Wetlands (HMEW) Inventory (3476) and this has been followed by the Exceptional Wetlands Project (6240). The HMEW projects were developed under the guidance of Prof. Robert van de Noort at the Department of Archaeology, Exeter University in 2002 and funded by English Heritage. They set out to develop a robust categorisation system for archaeological sites in wetlands and wetland landscapes based on their demonstrated or potential evidence value.

7.1.2 The first project, HMEW Inventory (3476), developed three categories of wetland sites (Lists A, B and C), which were noted for their contribution to the archaeological record; for their palaeoenvironmental potential or which were part of an important wetland landscape. Three categories were identified:

- List A - Type sites and landscapes: a selective group of exceptional monuments, sites of human activity and palaeoenvironmental resources in England's wetlands, representing a range of type sites and landscapes from the prehistoric and historic periods which may be considered representative for the wetland archaeological resource in this country.

- List B - Sites and landscapes of national importance: an extended list of monuments, sites of human activity and palaeoenvironmental resources in England's wetlands that are of national importance, for which enhanced protection, including schuelding, may be considered for their future *in situ* preservation.

- List C - Sites and landscapes of potential national importance: a list containing monuments, sites of human activity and palaeoenvironmental resources that are likely to be of national importance, but for which sufficient data is absent; this includes wetland landscape.

7.1.3 Nationally important sites (List A) contains sites which were defined as having made a major contribution to the archaeological record or have the most value in terms of their potential to do so. These are considered 'beacon' sites and a management plan is being drafted as a separate project (HMEW Management Plans 3610). Each plan is focused on the known 'site', its research history (academic record), its potential, and management issues.

7.1.4 The Willingdon Levels and Pevensey Levels are both included within List A sites, classed as either a "type site" or a landscape of cultural importance containing a number of Scheduled Monuments. The Willingdon Levels are listed due to the Bronze Age wetland site of Shinewater, which unquestionable represents a "type site" for wetland wooden structures and organic remains. The identification of prehistoric wooden trackways crossing the levels and Bronze Age settlement activity in Eastbourne is further justification for its importance.

7.1.5 Following the identification of sites of national importance along the BHLR, the Combe Haven has potential to be included within List A in the future. Reviewing the archaeological process it seems clear that the *in situ* lithic scatters revealed during the programme of excavations for the Bexhill to Hastings Link Road are of national importance, because of their date, condition, number, range of artefact types, environmental context and association with features such as hearths and structural remains. The density of sites identified around the margins are comparable to the better known wetland sites like the Kennet Valley, Berkshire and Star Carr, North Yorkshire.

7.1.6 Romney Marsh is currently being considered for inclusion in List A.

7.1.7 At present the Cuckemere and Ouse Valley are not considered to be nationally important wetland sequences.

7.2 Evaluating sites of national importance

7.2.1 One of the key questions is how much and what type of evaluation data would be required in order to be able to predict sites of national importance within a wetland sequence. Sites like the BHLR have demonstrated the difficulties in trying to identify and define lithic scatters during evaluations. Studies on the process of evaluation indicate where linear boundaries, substantial features and clustered remains survive, and Roman sites are obvious examples, a 3%- 5% would be required to expect a moderately good assessment (Hey and Lacey 2001). However, more scattered and ephemeral remains, such as lithic scatters and Bronze Age and early medieval settlement sites, could be missed entirely by these sampling levels. When we factor in the vertical conflation of the flints down through the weathered bedrock surface as recorded on the BHLR, the use of evaluation trenching alone is likely to miss evidence of less densely occupied landscapes than that present at Combe Haven.

7.2.2 In the following an (x) has been placed against those criteria that could not be clearly defined by the relatively comprehensive set of evaluation methodologies employed for the BHLR and (*) against those that could be:

7.2.3 '… a lithic scatter will have particular importance if: (1) clear boundaries have been identified, making it recognisable as a discrete site (x); (2) The high quality of artefacts recorded from a recent collection episode; sharp edges; unusually large quantities of small chips and debitage) suggest buried archaeological deposits have only recently been disturbed; such scatters are more likely to be discrete, and other less durable artefacts such as pottery may be present (*) ; (3) Additional evidence (from excavation, geophysical survey or aerial photography) suggests the presence of buried structural remains with which artefacts are believed to be associated (x), (4) There is evidence for part of the site not having been disturbed at all (*) ; (5) A scatter has been either dated or interpreted with confidence (x); (6) The artefacts recorded suggest diversity within the scatter, whether in terms of repeated occupation over centuries or even millennia (for example, where diagnostic artefacts of more than one period are present); or if evidence exists for various tasks having been performed (x).

7.2.4 In general terms, sites meeting any three of these criteria are sufficiently rare in England to be considered of national importance and should be treated accordingly under the terms of planning policy guidance. In view of their national rarity, exceptions will include discrete and securely dated scatters of Palaeolithic, Mesolithic and Early Neolithic date, for which criterion 5 (above) and one other will be sufficient to demonstrate national importance'.

7.2.5 At the evaluation stage it could be seen from the geoarchaeological test pits that well preserved and largely undisturbed sites might exist (criteria 2 and 4). However, the

evaluation data could not determine (1) boundaries, (3) structural association, (5) confident dating or (6) definition of activity and diversity. Whilst the potential for wetland archaeology of national importance was clearly recognised at the planning application, EIA and CPO Public Inquiry stages, the techniques used could never be sufficiently comprehensive to specifically define any 'sites of national importance'. Nor were the existing data sets for the surrounding area and region sufficient to make site specific predictions about national importance using the evidence from the Link Road evaluations.

7.2.6 The BHLR development and programme of archaeological work therefore had to proceed on a precautionary basis with a worst case scenario that important wetland archaeology (buried land surfaces and organic remains) might be revealed. In the event extensive but very subtle prehistoric archaeological remains were revealed. Where potential nationally important site could be preserved *in-situ*, was where it was possible to redesign certain aspects of the scheme to prevent impact in these areas.

7.2.7 Based on the results of the BHLR the following criteria could be used in the future at the evaluation stage to help identify and protect sites of national importance:

- Two or more Palaeolithic lithic material like upper Palaeolithic long blades from an *in situ* scatter or buried landsurface.
- Any *in situ* lithic scatters associated with structural, organic or faunal remains.
- Well preserved prehistoric or historical landsurfaces buried by alluvium or colluvium that are associated with areas of dense archaeological activity.
- Deeply stratified palaeoenvironmental or hydrological sequences that cover periods or particular areas that are not represent elsewhere.

7.2.8 The BHLR has highlighted some of the difficulties of identified and defining national importance at the evaluation stage. Even on a scheme where the potential for nationally important sites was clearly recognised early on, there was still insufficient detail at the evaluation to confirm the significance of these sites.

7.3 Techniques for investigating, mapping and recording wetland sequences

7.3.1 The identification and characterisation of prehistoric sites in areas of extensive sedimentation (alluvium and colluvium) is difficult and requires the development of more effective site prospection, excavation and predictive modelling techniques. Investigation of deeply stratified sedimentary sequences from lowland wetland sites can be problematic because of the often excessive depth of the deposits and the invisibility of the buried archaeology, the associated high level of the water table and ground instability. In urban or industrial areas visibility and access can be hampered further by the depth of modern makeup and ground contamination. In such situations conventional archaeological survey techniques are often inappropriate and alternative methodologies are required (see for example Bates 1998, 2003; Bates and Bates 2000). General guidelines for carrying out geoarchaeological investigations were published by English Heritage in 2007, and geophysics in 2008, although a recent review of strategies and methods specific to wetland archaeology was presented in a series of essays in the *Oxford Handbook of Wetland Archaeology* published in 2012 (Menotti and O'Sullivan 2013).

Previous wetland landscape studies

7.3.2 The investigation of lowland wetland areas within the UK (Coles and Coles 1996) can be traced back into the 19th century (eg, the discovery of the Brigg Raft –

McGrail 1990) but it was only in the 1960s that wetland archaeology as a specialist area of study was first recognised (Van de Noort and O'Sullivan 2006). Since then nearly 50 years of archaeological research into wetland regions have been undertaken in the UK and foremost amongst these are research studies funded by English Heritage, focusing on the large well-preserved prehistoric landscapes of the Somerset Wetlands (Coles and Coles 1986), the Fenland (Hall and Coles 1994), the North West Wetlands (Cowell and Innes 1994; Hall *et al.* 1995a; Hodgkinson *et al*. 2001; Innes *et al.* 1998; Leah *et al.* 1997, 1998; Middleton *et al.* 1995) and the Humber Wetlands (Van de Noort 2002; Van de Noort and Ellis 1995, 1997, 1998, 1999, 2000; Van de Noort and Davies 1993). Later studies of relevance include the Severn Levels (http://www.selrc.org.uk/publications.html), Romney Marsh (http://rmrt.org.uk/; Eddison and Gardiner 1995; Eddison and Green 1989; Eddison *et al.* 1998; Long *et al.* 2002; Waller *et al*. 2010) and areas surrounding the Thames Estuary (eg. Corcoran *et al*. 2011; Devoy 1979, 1980, 1982, 2000; Milne *et al.* 1997; Sidell 2003, Sidell *et al.* 2000, 2002; Bates and Stafford 2013; Powell 2012, Stafford *et al.* 2012).

7.3.3 Traditional methods of investigation, pioneered and developed during the four large EH funded landscape studies focused on fieldwalking and the recording of archaeology and sediment sequences exposed during peat cutting or in drainage dykes. Mapping through aerial photographs was also an important part of some of the surveys, as was integrating borehole, auger and testpit stratigraphies with palaeoenvironmental data and radiocarbon dating. Developing technologies such as geophysical survey, GIS and the use of GPS is apparent in the range methods used during the later surveys such as the Humber Wetlands Project (Table 1).

Method	Somerset Levels Project (1973-1988)	Fenland Project (1982-1988)	NW Wetlands Survey (1988-1997)	Humber Wetlands Project (1992-2001)
Historical data	0	0	10	0
Aerial photo analysis	0	15	10	5
Fieldwalking	20	65	20	35
Dyke survey	40	10	0	5
Excavation	20	0	0	10
Palaeoenvironmental research	20	10	50	30
Geophysical survey	0	0	0	5
GIS	0	0	10	5
GPS	0	0	0	5

Table 1: Percentage of field-based methods and techniques for the four English Heritage commissioned wetland surveys (estimates rounded to the nearest 5%, from Van de Noort 2002)

7.3.4 Fieldwalking and dyke survey was carried out extensively during the course of the Fenland Project. The main drawback to fieldwalking, however, is that it primarily records evidence brought to the surface by the plough, often where Holocene sediments are relatively shallow, at wetland margins or where significant wastage has occurred. In some areas opportunities for fieldwalking may be limited by the prevalence of pasture farming for example, as in the Somerset Levels Project or the NW Wetlands Project.

7.3.5 Mapping through aerial imagery has commonly been used in landscape studies in rural areas and in the Fenland Project was used to successfully plot relic drainage systems, observable as sinuous lines of silt or clay 'roddons' that were raised above the compressed and shrunken peatland around them.

7.3.6 Common to all of the wetland surveys was the integration of archaeological and palaeoenvironmental studies, particularly during the North West Wetlands Survey where palynology and plant macrofossil analysis was combined with high resolution radiocarbon dating.

7.3.7 As Van de Noort (2002, 92) states, ‘Its role has been portrayed as an 'archaeological survey tool in its own right'. The (palaeo-)environmental archives contained within the peatlands were considered as 'sites' and their state of preservation and any light they might shed on past people's activity, either within or outside the wetlands, were assessed as part of the survey’.

7.3.8 The use of geophysical survey as an archaeological evaluation technique is now well established, particularly in the UK. There are a number of guidance documents that provide detailed information on the variety of techniques available, what types of archaeological (and other) features they can locate and their suitability for different geologies. However, geophysical techniques commonly used on dryland sites can have problems when used in waterlogged alluvial and wetland areas where archaeological features are buried beneath >1m of sediment. Current guidelines (EH 2008) suggests magnetometer survey should be the method of choice to target shallow marginal areas at wetland edges and that alkali-vapour magnetometers have increased sensitivity over fluxgate instruments. Earth resistance survey may also provide some data regarding structural remains although can be costly. Pilot studies, informed by sub-surface coring and test-pitting data, are recommended to test the suitability of method at a site specific level. In the Humber Wetlands project the use of geophysical survey, both fluxgate magnetometry and resistivity, was successful on the sandy islands, within the wetlands, but more notably on Roman period sites sealed within the alluvium as well. The mapping of the very extensive riverside-settlement at Trent Falls, at the confluence of the rivers Trent, Don and Ouse, showed the potential of this survey technique for wetlands (Fenwick *et al.* 1998 cited in Van de Nort 2002). However, the identification of features was dependent on the presence of industrial waste, dumped in the ditches. The application of this technique on prehistoric sites was, in general, less successful (Van de Noort 2002).

7.3.9 Recent successful magnetometer surveys in coastal estuarine situations includes the detection of Iron Age and Roman salt-making activity at Stanford Wharf in the Thames estuary, buried beneath *c* 0.5-1m of sediment (Biddulph *et al.* 2012). Such techniques have been successfully used in the Thames and Somerset Levels to identify Roman archaeology buried within shallow alluvial deposits (up 1m in depth). This techniques has been used in shallow wetland sequences within East Sussex but was less successful in identify burnt mound deposits and early prehistoric features around the Combe Haven (OA 2006b). It is clear that selection of geophysical techniques and equipment must not only be selected based on geology and soil conditions, but also the potential nature and depth of the buried archaeology.

Recent developments

7.3.10 Recent technological advances, however, particularly the development and availability of remote sensing data such as LiDAR and satellite imagery, together with developing geophysical techniques capable of imaging buried sediment bodies (eg. ground penetrating radar (GPR), Electromagnetic survey (EM, see Plate 12) and Electrical Resistivity Ground Imaging (ERGI, see Plate 13), can provide additional datasets that can aid in the understanding of the geomorphology of site or region. In addition advances in computer technology and development of various modelling software (eg. ArcGIS, Fledermaus, GS13D, Rockworks, Rhino) now allows several complex datasets to be integrated, analysed, modelled and visualised in a manner previously not possible.

7.3.11 Over the past 15 years or so in the UK, cost efficient 'mixed-method' geoarchaeological approaches to the site specific investigation and mapping of lowland peat, alluvial and estuarine wetlands employing developing non-intrusive technologies, has been much advocated, particularly in the sphere of developer-funded archaeology but also in the research environment. Site evaluation techniques commonly use GIS to integrate LiDAR data, borehole data, geophysical survey and sub-surface deposit modelling with more traditional trenching to aid in the overarching objective - the prediction of zones or areas of (geo)archaeological potential.

7.3.12 Examples from around the Thames Estuary associated with large construction projects illustrate the range of work being undertaken in both urban and more rural locations– eg. High Speed 1, the Olympic Park, the Jubilee Line Extension, London Gateway port (Shellhaven), Thameslink and the A13 Road Scheme (Bates 1998; Bates and Bates 2000; Bates *et al* 2007; Bates and Stafford 2013; Bates and Whittaker 2004; Biddulph *et al.* 2012; Powell 2012; Sidell *et al.* 2000; Stafford *et al.* 2012).

7.3.13 Electrical geophysical techniques have been used extensively prior to the construction of the London Gateway Port in Essex, opened in 2013 (Bates *et al.* 2012). The site is located in the Thames Estuary where over 20m of Holocene alluvial and estuarine deposits overlie Pleistocene river terraces. Several phases of subsurface deposit modelling have been carried out during the lifetime of the project, beginning with work for the Environmental Statement in 2002. The initial phases of modelling utilized data from historical BGS boreholes, ground-truthed with targeted boreholes. In this case cable-percussion drilling was used to ensure successful drilling through the Pleistocene terraces gravels to bedrock, although in later stages hydraulic piston coring was used to extract 1m long cores from soft Holocene deposits to minimize compression of sediments during drilling. Pilot EM surveys were also undertaken, along with a programme of range-finding radiocarbon dating and palaeoenvironmental assessment to provide preliminary data on levels of preservation and environments of deposition associated with key stratigraphic units. The result was a model showing the pre-inundation landsurface (late Pleistocene/early Holocene landsurface) with a clear topographic high at the eastern end of the site.

7.3.14 The deposit model was updated several times to incorporate additional subsurface data from ongoing geotechnical investigations, but also from archaeological test pits and trenches. By 2008 the port model had incorporated data from 715 specific locations averaging 72 points per km2 over c 10km² (Stafford 2008). However, only 38% of those data locations were of sufficient depth to reach the deeply buried Pleistocene terrace gravels i.e. averaging only 27 per km². In order to provide sufficient data to model the early palaeolandscapes of the port site, an extensive multi-transect resistivity survey was carried out (Figure 25), providing in the order of 10,000s of additional points that could be used to generate pseudo- 3d models of the early Holocene surface as well as indicating lateral variation in likely composition of the overlying fine grained Holocene sediments (Figure 26). The resistivity survey for London Gateway was one of the most extensive and intensive surveys of this type ever carried out for archaeological (or geotechnical) purposes in the UK. Significantly the model was different to that produced through only using the boreholes and this reflects the sampling density and distribution of the initial data set. Unfortunately, not all projects have the resources to conduct these surveys on such a massive scale - resistivity can be quite costly and time consuming. However, recent developments in the more rapid and cost efficient EM survey, are promising with current research focused on profiling subsurface sediments at different depths (Bates pers. comm.).

7.3.15 Between 2003 and 2005 a collaborative European venture was carried out as part of the Planarch 2 project (Action 2A), concerned with developing improved methods for

the archaeological evaluation of wetlands. Work was undertaken by Planarch partners in Essex, Kent, Flanders and the Netherlands along with six weeks of joint fieldwork where teams from the partner regions worked together. Fieldwork was carried out in three areas - the Stumble, Blackwater Estuary, Essex (ECC), the Flemish Polders (VIOE) and the North Kent Coast (KCC). The evaluation methods reported on include walkover survey, field walking, auger survey, test pitting, geophysical survey (EM and ERGI), deposit modelling, and deposit monitoring (physical and chemical properties) applied to a range of wetland environments. The resulting report considered the European context for managing the heritage component of wetlands, the value of the wetland resource and the threats upon it. In conclusion it considered how the work of the Planarch partners has developed methods for evaluating wetlands and where future priorities lay (Dyson *et al.* 2006).

7.3.16 Other recent developments in both desk-based and field methodologies have been much facilitated by research funded by the Aggregates Levy Sustainability Fund (ALSF, http://archaeologydataservice.ac.uk/archives/view/alsf/; see Ward 2012 for a recent review). Predictive mapping and sub-surface deposit modelling to aid in landscape characterisation with GIS analysis was carried out in several river valleys such as the Lower Lea (Corcoran *et al.* 2011), the Swale-Ure Washlands (Bridgland *et al.* 2010), the Ribble Valley (Chiverrell 2007; Quartermaine and Chiverrell 2007), the Trent (Knight and Howard 2004) and the Twill-Tweed (Passmore *et al.* 2006).

7.3.17 In the River Trent catchment, for example, landscape investigations focused on integrating Lidar data, GPR, ERGI and GIS analysis to investigate terrace edge environments, floodplain palaeochannel systems and develop predictive palaeoenvironmental and archaeological models (Carey *et al* 2006, Howard *et al.* 2008; http://archaeologydataservice.ac.uk/archives/view/tvg_eh_2010/). The use of GPR in this study accurately defined the depth of silty clay alluvium overlying sands and gravels. Internal structure was revealed within the terrace gravels and at the margins of palaeochannels, allowing identification of bounding surfaces and construction of relative landform chronologies. However, GPR penetration into fine-grained palaeochannel fills was generally shallow, with little internal channel stratigraphy revealed.

A geoarchaeological approach to wetland site investigation

7.3.18 Commonly the approach to geoarchaeological investigation of a site can be divided into the three basic stages (Figure 27).

7.3.19 As with any archaeological project, a preliminary stage of desk-based assessment of existing data is usually undertaken prior to any fieldwork commencing. For a wetland site data may include:

- Bedrock and drift (Quaternary) geological maps supplied by the British Geological Survey – BGS);
- OS maps
- Hydrogeological data - held by organisations such as the Environment Agency and the water companies
- Borehole, testpit, Cone penetration testing (CPT) and other geophysical data acquired for geotechnical ground investigations
- BGS historical borehole data
- Remote sensing data (eg. Lidar, satellite and aerial imagery);

- Historic Environment Record (HER) data
- Other published records and archaeological 'grey' literature reports

7.3.20 Baseline geological maps from the BGS, now available digitally, may be utilised to outline the study area and define the nature of the sequences likely to be present beneath the surface. This information acts as the prime source of data in determining the focus of the investigation as well as a first order indication of the likely nature of the sub-surface conditions and potential associated archaeology. However, these maps, only represent those deposits immediately beneath the topsoil and do not convey the complexity of the sub-surface stratigraphy.

7.3.21 Allied to this, and providing detail on the specific nature of the sedimentary stack at a given location, is borehole data that may be obtained for geotechnical ground investigations, the BGS or other published sources, although there are interpretative limitations to using this type of data (see Bates 1998). Perhaps more useful is data from geotechnical interventions, especially test pits, that have been monitored in the field by a geoarchaeologist.

7.3.22 Sub-surface deposit modelling may use point-specific data (eg. boreholes and testpits) to model and understand the geometry and topography of buried sediment bodies (Chew 1995). Lithological dats is often inputted into geological modelling software (eg. Rockworks) to allow preliminary correlation of stratigraphy and surfaces with realtime visualization as cross-sections, profiles and 3D volumetric models. Common aims when constructing a sub-surface deposit model may be summarised as follows:

- To characterise the sequence of sediments and patterns of accumulation across site, including the depth and lateral extent of major stratigraphic units, and the character of any basal land surface pre-dating these sediments.
- To identify significant variations in the deposit sequence indicative of localised features such as topographic highs or palaeochannels.
- To identify the location and extent of any waterlogged organic deposits and address the potential and likely location for the preservation of archaeological and palaeoenvironmental remains.
- To clarify the relationships between, for example, fluvial, alluvial or estuarine sediment sequences and other deposit types, including periods of 'soil' or peat growth and the effects of relatively recent human disturbance, including the location and extent of made-ground.
- To relate the site sequences to current regional models.

7.3.23 Other forms of data such as the geomorphological map data and remote sensing data such as Lidar is of use characterising the general topography of a site or area and where features such as channels are of sufficient size to allow detection. GIS modelling is a powerful tool for the integration and analysis of a range of different datasets and the creation of a project GIS at the outset significantly enhances ability to characterise and assess zones of potential across the site or study area.

7.3.24 Ground truthing of any model is an essential stage in the site investigation. The specific field strategy will depend on a number of key factors (Table 2).

Geological or geomorphological system	An adequate sampling interval (both vertically and laterally) that takes into account the likely levels of variation within the system being studied.
Size of study area	Dependant on the perceived nature of the sediments/system being investigated and questions being asked, including the experience of the fieldworker. In commercially driven projects this may be defined by the construction area. However, that may, or may not, make geomorphological sense for understanding the regional context and the broader stratigraphic relationships of deposits.
Project aims	The information required and models being tested – eg. Sampling of a fluvial gravel body, eg, the Boyn Hill Member of the Lower Thames (Bridgland 1994; Gibbard 1994), for either contained archaeological material or gravel clast lithological analysis, requires radically different sampling types and frequency of interventions (many as opposed to one or two respectively).
Sequence recovery or sequence logging	The necessity to recover samples for characterisation or undisturbed testing will determine the type of borehole technique used. Sites where it is only necessarily to broadly categorise the underlying sediments and sub-surface topography could be investigated rapidly (and cost-effectively) through the application of geophysical techniques or CPT survey, coupled with occasional ground truth boreholes. If it is important to an individual project to look at the structure of the sediments and sample these for further assessment / analysis (eg, dating) then collection of sleeved borehole samples would be required.
Depth of sequences	The depth of burial of the features/deposits of interest is important as different techniques have different investigation ranges (equally applicable to drilling techniques as well as geophysical surveys). With all geophysical techniques the depth range is technique dependent, resulting in a “trade off” between the investigation depth and resolution of the technique with respect to the feature of interest. A technique that will look deep into the earth generally does so with lower resolution compared to a technique designed to investigate shallow depths. With boreholes it is often the case that sample recovery becomes poorer with depth.
Target size	An estimation of the target size is necessary prior to selecting appropriate techniques and survey parameters such as the spatial frequency of sampling. The target size should be considered in conjunction with the depth range for individual techniques

Measurement/sampling station interval	This depends on the nature and complexity of the geological system, as well as (for geophysical investigations) the burial depth, target size and techniques selected. In the case of geophysical surveys these have traditionally been conducted along line profiles or on grids, therefore the station spacing along the lines must be calculated together with the line separation in order to not miss a particular target size. Determining locations for boreholes is, in part, dictated by the perceived complexity of the sub-surface geology as well as the nature of the evidence that is necessary to extract from the samples (ie, larger samples and at more frequent intervals will be necessary if project objectives are the recovery of evidence pertaining to human activity (rather than vegetation or water body reconstruction based on pollen or foraminifera respectively).

Table 2: Key factors for consideration when designing a strategy for geoarchaeological field survey (from Bates and Stafford 2013)

7.3.25 Field techniques may fall into two categories – 1. Intrusive survey e.g. boreholes, augering, testpitting. 2. Non-intrusive survey eg. geophysical techniques - that may be used exclusively or in combination in a staged approach, depending on factors such as the size of the study area, nature of the geology and ground conditions as well as programme and budget restrictions.

7.3.26 Purposive boreholes, augering and testpitting surveys remain a mainstay of wetland geoarchaeological field investigation.

- To provide direct data on the nature, extent and distribution of the buried sediments,
- Aid in the development of a subsurface deposit model;
- Ground truth geophysical data;
- Allow samples to be recovered for palaeoenvironmental analysis and radiocarbon dating.

7.3.27 A range of equipment (see Figure 28) is available for investigation of sub-surface contexts from unpowered manually driven devices such as Hiller borers and Russian (D-section) corers, which retrieve variably undisturbed sediment cores from soft sediments, to powered mechanical corers with a number of interchangeable coring heads (eg. Eijkelkamp system); small portable drill rigs, including the Terrier 2000 self-propelled drill rig with a windowless liner sampling system; wireline cable percussive drilling and multi-purpose rigs such as the Comacchio system (Bates *et al* 2000a; Canti and Meddens 1998; Clayton *et al.* 1995). Selection of appropriate drilling equipment varies dependant on a number of factors including costs, site ground conditions, nature of the overburden, the type of sediment likely to be encountered in the sub-surface and the nature of the samples required for analysis (Table 3).

	Mostap sampler	Cable percussion (CP)	Commachio	Terrier	Power auger	Hand auger
Method	H	P	P	P	P	
Vehicle	W	W	T	T		
Approximate depth	6-8m	10s m	10s m	6-8 m	5-6m	4-5m
Mobility and ground conditions						
Access on soft ground	XX	XX	XX	XXX	XXX	XXX
Access on very soft ground	X	X	X	XX	XXX	XXX
Mobility/speed between sample points	X	X	XX	XX	XXX	XXX
Capability						
Drilling though concrete		Yes	Yes	Yes		
Drilling through gravel		Yes	Yes	<2m		
Cased holes		Yes	Yes	Yes		
Core sampling						
Core sample diameter	XX	XXX	XXX	XXX	XX	X
Intact continuous core sampling	XXX	XX	XXX	XXX	XX	X
Soft sediment compression	Minimal	Yes	Yes	Yes	Yes	Minimal
Cost	X	X	X	XX	XX	XXX

XXX = excellent, XX = fair, X = poor. H = hydraulic, P = percussion, W = wheeled, T = tracked

Table 3: Comparison of some commonly used coring methods

7.3.28 In the UK dense arrays of purposive mechanically drilled boreholes are not commonly carried out over extensive areas, largely due to the expense (Bates *et al.* 2007) - surveys often comprise transects, and if boreholes alone are used these often appear at widely spaced intervals. However, targeted interventions can be integrated with rapid geophysical survey techniques if ground conditions are suitable to provide more comprehensive coverage over a greater area (see examples below).

7.3.29 Augering and test pitting can be a more rapid and cheaper means of acquiring prospection data, but there are depth limitations and the size, quality and continuity of the samples from augering is often poor for palaeoenvironmental work.

7.3.30 Window test pitting, as opposed to the larger evaluation trenches frequently excavated on archaeological sites, is a useful means of rapidly examining open section faces and investigating deposits for artefactual material (Plate 14). Commonly test pits will be excavated in spits by machine fitted with a flat blade or ditching bucket. The test pits are usually the width of the machine bucket and are excavated up to *c* 5m depth, although groundwater levels can hamper visibility in wetland areas. Deposits are recorded from the edge of excavation or the resultant spoil and the excavations are not entered. This technique is commonly combined with other surveys to provide additional archaeological information on the nature of the sub-surface sediments.

7.3.31 As discussed above, the use of geophysical surveying techniques in archaeological investigations is well documented. In the majority of cases, however, these geophysical techniques have been used for locating specific buried features or to determine the location of buried structures in order to target evaluation trenches. Typically the methods used have penetration depths of less than 4m. Less common is the use of the geophysics in imaging subsurface sediment stratigraphy to investigate palaeolandscapes (Dalan and Banerjee 1996). A combined approach using geophysical techniques, in conjunction with a borehole sampling programme, can provide a cost-effective methodology for modelling subsurface stratigraphy (Bates 2000).

7.3.32 Electrical techniques are extensively used in near surface geophysical investigations and include both direct current (DC) resistivity methods and indirect electromagnetic (EM) methods. All electrical techniques induce electrical currents in the ground, which are used to measure the variation in ground conductivity or its inverse resistivity. Different materials (solid rock and drift deposits), and the fluids within them, show different responses to an applied electrical current. In general, sequences with high clay contents show higher conductivity as do saturated sequences, especially sequences where saline waters are present. Conversely sequences with low clay content, sands and gravel or bedrock, such as limestones and chalks, show low conductivity or high resistivity (Table 4). Direct current resistivity is one of the most common methods for field practice relying on directly placing an electrical current into the ground using two electrodes and measuring the response (the electrical potential) to that current over a set distance between two additional electrodes. By combining measurements made at a number of different electrode locations and separations it is possible to construct geo-electric pseudo-sections. These sections can then be interpreted as geologic sequences when correlated with borehole or CPT ground truth data. A number of commercial systems have been designed for the rapid acquisition of 2D pseudo-electrical resistivity sections, including the Lund System (Abem Ltd), Campus Instruments and SYSCAL (Iris Ltd) systems.

7.3.33 Electromagnetic techniques have been extensively developed and adapted over recent years to map lateral and vertical changes in conductivity (Reynolds 1997). Two types of electromagnetic survey are currently practised: i) time domain electromagnetic (TDEM) surveys which are mainly used for depth soundings and more recently in advanced metal detectors, and ii) frequency domain electromagnetic (FDEM) surveys that are used predominantly for mapping lateral changes in conductivity. Both electromagnetic survey types rely on inducing electrical currents in the ground by creating an electromagnetic field in a coil of wire located at the surface. In FDEM, the secondary electric currents are recorded by an additional electrical coil located at the surface. FDEM has proved particularly successful in mapping near surface and surface changes in conductivity because at low electrical induction numbers the ratio of the secondary and primary magnetic fields is linearly proportional to the terrain conductivity (McNeill 1990). FDEM potentially represents one of the most useful geophysical techniques in archaeological investigations as changes in conductivity are often associated with differences between archaeologically significant lithological sequences (see Table 4) and also disturbed ground. Instrumentation exists to survey to a range of depths by using different source and receiver coil separations (see Table 5).

Material	Density	P-velocity	S-velocity	Resistivity	Magnetic susceptibility
	Mg m^{-3}	ms^{-1}	ms^{-1}	Ohm-m	
Clay	1.6-2.6	1,000-2,500	500-1500	1-100	
Silt	1.8-2.2	500-2,500	250-1000	10-200	
Sand	1.7-2.3	200-2,000	100-1500	50-500	
Peat	1.1-2.4	100-500	100-500	10-300	

Gravel	1.7-2.4	400-2,500	200-1500	50-500	
Sandstone	1.6-2.7	1,400-5,000	800-3000	$10\text{-}10^{8}$	0-21,000
Chalk	1.5-2.6	2,000-5,000	800-3000	50-150	
Shale	1.7-3.2	2,000-4,500	800-2500	20-1000	60-18,600
Granite	2.5-2.8	4,500-6,500	1500-3000	$300\text{-}10^{6}$	10-50,000
Basalt	2.7-3.3	5,500-6,500	2000-3000	$10\text{-}10^{7}$	500-182,000

Table 4: Electrical properties of selected sediments

Instrument	**EM-38**	**EM-31**	**EM-34**	**EM-34**	**EM-34**
Coil Spacing	1m	3.7m	10m	20m	40m
Horizontal Dipole	0.75m	3m	7.7m	15m	30m
Vertical Dipole	1.5m	6m	15m	30m	60m

Table 5: Approximate depth of investigation ranges for Geonics Ltd., electromagnetic survey instruments.

7.3.34 Both DC and EM approaches have been successfully used such as to map lithology, channel-belts and valley fills (Baines *et al* 2002), to study the palaeohydrography and subsurface geology of sites in the Nile Delta (Ibrahim *et al* 2002), and to map Holocene and Pleistocene sediments in the Medway estuary (Bates *et al* 2007), the Thames estuary (Bates *et al.* 2007; Bates *et al.* 2012; Bates and Stafford 2013; Biddulph *et al.* 2012, Dyson *et al.* 2006) and in Sussex (Lewis and Roberts 1998; OA sites at Cuckmere Haven, Laughton Levels and Bexhill Link Road).

7.4 Predictive modelling for wetland sites

7.4.1 Early prehistoric hunter-gatherers relied heavily on wetlands for various aspects of life, transport, plant and wood resources, fishing, hunting and navigation. The river and wetlands would have been the lifeblood of early prehistoric life. By modelling the changing wetland edge over time and developing an understanding of landscape change, it possible to identify enhanced zones of early prehistoric activity.

7.4.2 Favoured locations associated with crossing points or natural spurs or islands have been noted as a focus of early prehistoric activity. Early prehistoric sites on the Thames have been used to demonstrate the repeated use of the same floodplain locations over many millennia (Champness *et al* forthcoming). This has been used to explain why we can often see early and late Mesolithic scatters near to each other and also on the same elevations, even though they are being deposited in very different environments and referencing very different wetland edges.

7.4.3 Neolithic and Bronze Age wetland edge activity has commonly been found along wetland margins in association with peat deposits. The establishment of the position of the changing wetland interface zone over time is key to understanding areas of potential wetland archaeology within a sequence.

7.4.4 Important sites like BHLR have already provided sufficient numbers of lithic scatters to identify some of the patterns in the elevation and selection of floodplain locations. Based on a site with large dataset we can create a series of assumptions to develop a predictive model for early prehistoric wetland archaeology for certain wetland locations in East Sussex.

7.5 Development of the model

7.5.1 The preservation and management of sites in wetland areas requires the development of new criteria to be used to help guide the identification of nationally important sites. As part of the project design it was envisaged that a model would be produced which could be used to predict where important sites would be likely to be located. The following sections describe this predictive toolkit for wetland sites in East Sussex, which is based on the following observations and assumptions:

- The BGS mapping of alluvial deposits provides a good indication of previous and present wetland sequences and the location of potential sites.
- That activities and settlements are more likely on free draining sandy substrates like those offered by the Ashdown Sands outcropping near the wetland edge.
- There is a focus of activity around more sheltered former tidal inlets that were cut off from the sea, allowing the thick accumulation of peat deposits as found in Willingdon Levels, Pevensey Levels and the Combe Haven.
- Early prehistoric activity is focused around the wetland interface zone between +0.5m and +3m OD.
- Particular focuses or staging posts of activity have been identified on natural spurs, peninsulars or islands that offer gentle sloping access to either the rivers or high ground.

7.5.2 It should be noted that there are inherent dangers in developing predictive models based on limited datasets and in applying them uncritically to other areas. Valley sequences such as those found to the west of Beachy Head, which lack the thick peat deposits of the Combe Haven and Ouse, do not fit with the general pattern described above. Early prehistoric settlement activity in some areas, particularly on the South Downs, appears to have been concentrated in rock shelters or at high elevations. It is likely that this is due to greater tidal influence in the rivers, making the valley environments more unpredictable and potentially less attractive as a locations for settlement.

7.5.3 Bearing this limitation in mind, a preliminary model has been developed for the Combe Haven, based on the BHLR and extended to cover the surrounding valley sequences. The idea is to demonstrate one potential approach to predicting early prehistoric activity around a specific wetland sequence. The model has been developed based on a combination of datasets that include LiDAR, geoarchaeological deposit modelling and geophysics (Figures 29-30).

7.6 Updating of the ESCC Archaeological Notification Areas

7.6.1 The previous Sections have demonstrated that scheduling, due to its stringent qualifying criteria for designation, may not always be the most effective mechanism for protecting sites of national importance. Protection of sites under the planning framework and ANA may provide a further mechanism of protection.

7.6.2 A review of the current ANA and comparisons with the predictive model developed in the previous section highlights the fact that very few of these important wetland edge environments are covered within the current alert mapping. Many of these wetland areas have the potential to contain nationally important sites, the majority of which are currently unprotected, with the one exception of the Willingdon Levels. What sites like the BHLR have highlighted is the potential of many of these wetland sequences to contain undisturbed early prehistoric land surfaces that have not been

affected by modern or agricultural disturbance. Many of these buried landscapes are currently invisible with the archaeological record and HER management measures.

7.6.3 Chris Butler tested one possible approach on behalf of ESCC Archaeology to managing sites within the HER that has been effectively used within Ashdown Forest (Butler 2011). This study proposed a system of site management based on archaeological significance using a red, amber and green system of colour coding. In this system red represents sites of national importance, amber regionally significant sites and green sites of archaeological remains that do not qualify under the other categories. This system was used to identify monument types and therefore make judgements on their significance based largely on LiDAR information and walkover surveys.

7.6.4 The challenge is how we integrate new predictive mapping data from wetland areas within the current HER alert mapping. A few key wetland areas have been examined and mapped on a GIS layer (Figures 31-33) using hatched polygons with red, amber and green colour coding for management purposes. The new alert mapping uses the same colour scheme as outlined above and is described in more detail below:

7.6.5 Category A (Red ANA) – these contain sites of national importance both scheduled and unscheduled that have been identified within the HER.

7.6.6 Category B (Amber ANA) – these are site areas with clearly demonstrated archaeological remains that may be regionally or locally significant but do not qualify as nationally important.

7.6.7 Category C (Green ANA) – these areas include heritage landscapes or areas based on predictive mapping. They may cover large-scale heritage landscapes that include inter-related sites that may comprise category A and B sites. These areas can be defined by series of similar monument types, deposits, topographic positions and geologies.

7.6.8 The RAG (Red, Amber, Green) approach is designed to provide a hierarchical framework to sites and ANA. The idea is that the ANA could be upgraded to include more detailed information on the nature of the notification area. The premise is that sites may increase in importance following the inclusion of new excavation data or research and therefore can move up a category if necessary. Also it is possible that category A and B sites may also exist within category C areas.

7.6.9 The Category A sites include both scheduled and non-scheduled sites that have been identified as nationally important. This would involve the identification of nationally important sites within the HER and the updating of the alert mapping across the county. This includes sites discussed in Section 6 such as burial mounds, wooden trackways and platforms and rock shelters. This category is not intended to replace or provide an alternative to scheduling but would ensure that non-scheduled sites are given the same levels of protection within the HER as scheduled sites. This data could also be used to update the SHINE mapping if possible.

7.6.10 Category B sites and ANA comprise the vast majority of important archaeological sites identified within the HER and currently form the majority of those in the current ANA mapping. These represent a range of regionally and locally important sites based on excavation and historical evidence. This has the added advantage that it requires very little in the way of modification to the current ESCC alert mapping.

7.6.11 Category C is the new category of mapping that incorporates predictive modelling and represents a broader range of sites and wetland areas. The clear advantages with Category C is that it can encompass a whole landscape or number of inter-related

sites that form a specific heritage landscape or wetland sequence. This has particular advantages when dealing with wetland sequences that can often lacking the detailed information required for the high level ANA categories. These categories can be defined based on similarities in topography, geophysics, or geoarchaeological deposit modelling.

7.6.12 One of the key requirements is the involvement of relevant specialists in the development of the category C areas. This may include (for example) the involvement of environmental, geoarchaeological and flint specialists to aid in the identification of potential sites and to help in defining the boundaries of these areas. An initial desk-based approach using the BGS mapping of alluvium (with a suitable buffer) to flag up wetland and waterlogged archaeology notification zones. These could be easily digitised/extracted from the BGS mapping and added to HERs. They could alert curators to the need for geoarchaeological involvement at the DBA and evaluation stages of a project to assess the potential for archaeological to be buried underneath alluvial and colluvial deposits along the wetland edge. This could then be evaluated if necessary by a targeted phase of fieldwork investigation or geophysics to help ground-truth the mapping. This may involve many of the techniques for investigating wetland sequences that were outlined within the previous section.

7.6.13 The use of this system has been applied to the following examples to illustrate how it could be applied to specific wetland environments.

7.6.14 As one of the GIS outputs of the project (see Section 3) the ES ANA have been reviewed and updated. This mapping will be further discussed with ESCC and the updated ANA shapefiles will be submitted to the HER with the final project GIS database.

Combe Haven (Figure 31)

7.6.15 The ANA notification areas have been updated within the catchment of the Combe Haven to take into account the preliminary findings of the BHLR and also the subsequent generation of a predictive model. The importance of the Combe Haven as a potentially national/international landscape of early prehistoric archaeology highlights the importance of protecting wetland areas which have previously produced very little archaeological evidence. Three potential sites of national importance were identified along the scheme, only one would have potentially qualified for scheduling, the other sites lack sufficient structures to qualify and are classed as ‘sites without structures’. All three required full or near complete excavation to identify their status as sites of national importance. Based on the density of the scatters recorded it is very likely that further potential nationally important sites are located around the margins of the Combe Haven.

7.6.16 The early prehistoric landscape of the Combe Haven has been protected by a category C landscape ANA, which covers the wetland sequence and associated archaeology up to 10m OD elevation. This should cover the main wetland edge deposits, interface zone and associated up-slope archaeology. The large size of the ANA reflects the density of flint scatters that have recently been uncovered around the margins of the Haven and also the mapping which suggests that similar geological, topographic positions and landscape features are present within the undisturbed areas of the sequence. There is a high possibility that further flint scatters are located within the margins of the Haven, and these have the potential to be nationally important if found associated with structural remains, faunal remains or *in situ* wooden structures.

Willingdon and Pevensey Levels* (*Figure 33)

7.6.17 The Pevensey Levels cover a vast area of 8,650.9 acres (3,500.9 ha) of wetland which currently contains at least 13 SMs. Currently no early prehistoric sites have been identified within the Pevensey Levels and only one lithic scatter and prehistoric trackway is recorded within the HER. A series of findspots from 5 potential sites have been identified around or just above the 10m OD contour line around the Pevensey Levels. These assemblages have all been recovered from the ploughsoil, with the predominant implement types being recorded as microliths, small numbers of end scrapers, burins and notched blades (Butler 2002). The largest of these sites is located at Magham Down, near Halisham. This assemblage contained 213 pieces of worked flint of flake, blades and bladlets. It also contains six microliths and one unfinished microlith; all of these have been identified as scalene triangles (ibid).

7.6.18 Mesolithic flint scatters have also been identified at Decoy Drive, Eastbourne, just above the 10m OD contour line (ibid). In addition, over 100,000 Bronze Age worked flints have recently been identified on a site at Newhaven, on the Willingdon Levels (ASE pers com.). The Willingdon Levels also contains the Shinewater SM described in the previous sections and three Bronze Age trackways highlighted on the map.

7.6.19 The alert mapping (shown in Figure 32) has been updated to take into account the distribution of the potential Mesolithic sites around Pevensey. Due to the vast size of the Pevensey Levels, the alert category C mapping has been extended to cover the wetland interface zone up to 10m OD, but does not extend across the whole wetland area of the Levels. A similar category C ANA (Shinewater Wetland landscape) already currently exists within the Willingdon Levels to protect the SM.

Pett Levels (Figure 34)

7.6.20 The HER records a concentration of 28 flint scatters within one of the drainage tributaries that flows into the Pett Levels. The site also contained Roman activity and the remains of an undated log boat that was found within the alluvium. These flints were recovered mainly from surface collections suggesting that more extensive scatters may be present. The current ANA covers the main area of where the flints and Roman activity have been recorded.

7.6.21 The flints were recovered from sandy gravel Head deposits on a low-lying interface zone at a narrowing point of the inlet, potential representing a natural ford or crossing point. A category B ANA covers the main area of the Roman archaeology and the focus of flint scatters potential along the crossing point. A category C ANA has been extended across the valley sequence to cover the extent of the Head deposits and low-lying elevations up to 10m OD that are present with the wetland area. The category C mapping has also been extended to other wetland sequences where there are similar Head deposits, low-lying slopes and spurs overlying shelter alluvial environments.

7.7 Limitations of the approach

7.7.1 The key issue with this approach is in the integration of the alert mapping within other land management datasets like SHINE and NMR, which have specific criteria regarding the kinds of sites that can be included within their datasets. Many of the category C landscape ANA would not currently qualify as SHINE or NMR sites. The HER alert mapping will therefore only currently be relevant to commercial impacts. The study has already identified that for many of these wetland areas, change within land-stewardship and management is potentially the greatest future threat. A way of integrating category C within the SHINE database is therefore suggested as a way forward.

7.7.2 The study has outlined just one possible approach to the development of a more detailed alert mapping strategy that could be used for managing sites of national

importance within wetland areas. However, it is recognised that each county adopts different approaches and uses different levels of alert mapping within their HER and such a RAG approach may not be the most appropriate for all wetland areas or sequences. Some areas may lack the necessary detailed information to develop evidence or modelling based alert mapping.

7.7.3 The BGS solid and drift geologies around wetland edges have in certain areas been found to be insufficiently detailed enough for predictive mapping. Further ground truthing through targeted fieldwork may be required in certain areas.

7.7.4 One potential drawback to this approach is the perception of what the different levels of alert mapping may mean to the different HER users. If the primary purpose of the ANA is to trigger consultation with ESSC, then having greater complexity runs the risk of creating greater confusion. The development of different categories within the alert mapping may also open up the mapping to more challenges from developers. Therefore it might be better to have it mapped without colour for external users with only the different colour levels visible to the ESCC archaeologists, to indicate areas of potential wetland archaeology and the likely need for geoarchaeological/specialist techniques and input at the desk-based and evaluation stages.

8 DISCUSSION, RECOMMENDATIONS AND CONCLUSIONS

8.1 Discussion

8.1.1 Currently only by designating archaeological wetland areas as Scheduled Monuments would adequately protect wetland archaeology through both ensuring active, appropriate management and by stopping unsuitable actions. However, scheduling does not usually cover large areas and is monument-specific. Wider area protection offered by non-heritage management schemes do not necessarily offer protection to wetland archaeological sites, often because such sites are not flagged as important or even as existing using the data sources consulted when management options are considered. This is at least partially due to wetland heritage sites not commonly being included within SHINE records used in agri-environment schemes or within HER records supplied to non-heritage organisations responsible for managing the environment. Unless these sites are flagged as existing and/or as being nationally important their sustainable management will be overlooked in favour of what is most favourable to wetland habitats not archaeology.

8.1.2 The study has identified significant gaps and biases within the current distribution of Scheduled Monuments in East Sussex. This has heavily skewed the protection of nationally important sites towards visible archaeological remains, both upstanding monuments and those that are clearly visible from aerial photographs. Early prehistoric sites and activity in the forms represented by lithic scatters, footprints or butchery sites, commonly dating from the Palaeolithic to Bronze Age, may be of national importance but not fulfil the scheduling criteria. These sites are often deemed 'sites without structures', and therefore do not currently qualify under the 1979 Scheduled Monument Act. Further new early prehistoric sites, which could be designated, are slow to be adopted and often can only be confirmed through evidence provided by further destructive excavation.

8.1.3 Many of the SM records of these monuments reveal historical biases in that they were scheduled before the 1960s using the techniques available at the time. Areas like the South Downs, with a rich prehistoric landscape of upstanding monuments and cropmark features, were favoured over other areas such as the Weald. Scheduling does appear to have been effective in these areas to protect some of the most important remains in terms of key upstanding prehistoric monuments, given that many of these monuments were under increasing threat from post-war ploughing and commercial development. Equally, the concentration of monuments in areas like the High Weald relate to the location of the Romano-British and medieval iron industries, associated with the natural outcrops of iron ore. This pattern of scheduling partly reflects both the density of activity in certain areas, but it also the concentration of researchers within certain areas and periods.

8.1.4 Further research and mapping of wetland sequences are required in order test many of the assumptions in the model described above (see Section 7). The project has highlighted the significant potential of the East Sussex wetlands to contain sites of national importance many of which can not be scheduled using the established criteria. Identification and protection of new sites in wetland areas will help to redress the balance in terms of the current gaps within the SMs coverage in the County.

8.1.5 The project has demonstrated that with the greater use of new remote sensing techniques, geoarchaeological deposit modelling, GIS mapping, LiDAR and satellite

imagery we have the potential to adopt a more pro-active approach in identifying and mapping nationally important sites in areas where the archaeology is less visible. This approach is particularly valuable in areas like the High Weald where sites are less prominent due to woodland coverage and in low-lying wetland areas such as the Pevensey Levels, Combe Haven and Romney Marsh, where sites or waterlogged remains might be buried by thick colluvial or alluvial deposits.

8.1.6 A recent example of the value of these techniques is the discovery of four prehistoric barrows identified by geophysics at Catsford, near Battle, on the High Weald. The identification as barrows still need to be confirmed by evaluation trenching as part of a proposed pre-planning commercial development, but their identification early in the process meant that future protection in the form of preservation *in-situ* could be recommended. The significance of the Catsford barrows is that they potentially represent examples of a new subset of barrows that have recently been identified on the High Weald, often located not on the top of high ridges such as the South Downs, but often mid slope overlooking wetlands. This, together with future publication of the BHLR excavations, will hopefully raise the profile and importance of East Sussex wetlands. The recent discovery along the BHLR of a densely settled prehistoric landscape around the Combe Haven has the potential to transform our understanding of Mesolithic activity and in particular the Mesolithic/Neolithic transition on the High Weald.

8.1.7 Some of the lithic scatters recently identified around the edges of the Combe Haven may individually qualify as sites of national importance based on the EH guidelines for flints. However, very few of them would have been eligible for scheduling due to the lack of substantial structures. One of the key questions is whether scheduling of new sites is the appropriate mechanism to protect new sites of national importance, particularly in the case of densely populated areas within wetland sequences. The limitations of scheduling is that it is very prescriptive in terms of the qualifying criteria and many nationally important early prehistoric sites often do not meet this criteria due to the transient and ephemeral nature of their subsistence. The challenge will be to attempt to redress this balance within the current distribution and character of SMs.

8.1.8 In the case of the East Sussex wetlands the emphasis should therefore potentially be moved away from purely the protection of individual sites to areas of significance, defined by a series of inter-related sites and their relationship to the landscape and other forms of designated sites (eg SMs and SSSIs). Wetland areas and sites are less likely to be limited by issues of differing levels of preservation or survival, similar to dryland sites. In order to secure the long-term preservation of these sites we need to ensure that future heritage management adopts a much more integrated approach into the conservation and enhancement plans of these wetland landscapes. This can only achieved through greater co-ordination with the other government bodies like Natural England and the Environment Agency who are responsible for the conservation of many of these wetlands. The identification of sites of national importance within the HER, together with looking into how they could be incorporated within the SHINE mapping, would be an important first step.

8.1.9 The current threat to many of these sites is to a lesser extent from commercial development infringing on brown field sites or wetland fringes. The greatest risk to the long-term preservation of many of these sites is changing land management or current flood control measures. New habitat and agri-environmental schemes which include the digging of ponds, plant of trees, ditch clearance or ground reduction have considerable potential to impact archaeological remains. Areas and sites of potential national importance need to be taken into account and this can only occur through the

inclusion of nationally important sites and updating of the HER and if possible SHINE mapping.

8.1.10 At present the preferred option for preservation *in-situ* may not always be the most effective protection for wetland sites, unless there is a long-term preservation plan in place for maintaining the hydrological and environmental conditions of the site.

8.2 Recommendations

8.2.1 The consideration of early prehistoric potential as part of the planning process through alert mapping provides the key to unlocking the significance of less visible early prehistoric remains. Many developments impact upon this resource, with major impacts from infrastructure projects such as road and rail schemes, for instance the High Speed Rail Link, Crossrail and the Bexhill to Hasting Link Road, which involved a huge programme of archaeological works for all periods, including the early prehistoric. However, many curators do not have readily available access to specialist researchers or advice and many potential sites may go unrecognised. What would be particularly desirable, and this perspective is supported in the most recent National Research Framework (English Heritage/Prehistoric Society 2008), would be for further research and understanding of wetlands to form part of planning consideration, not merely the presence of archaeological remains. This should include alert mapping of potential wetland interface zones/deposits or floodplain islands, supported where possible by organic and palaeo-environmental remains, which can also provide information on climate change and landscape development.

8.2.2 The study has demonstrated that East Sussex has significant potential to contain further early prehistoric sites in association with wetland sequences with high palaeoenvironmental potential. Where eligible, the most exceptional of these key sites should first be considered for scheduling, as this is the only means offering any legal protection from destruction. If nationally important sites or series of inter-connected sites forming specific heritage landscapes are identified, then some way of identifying and highlighting these would be the next best thing.

8.2.3 One potential way forward is to identify potential sites of national importance within the HER, which can then be evaluated through the planning system, by pre-determination evaluation if threatened. The heritage asset's significance can then be looked at in sufficient detail to determine if all or part of the asset is worthy of protection/preservation *in situ* as a site of national importance or whether loss and recording is acceptable. Inclusion on SHINE mapping would maximise the potential for appropriate management from land management schemes.

8.2.4 The compilation of alert mapping and prediction of sites of national importance for wetland sites have its particular problems related to the fact that the sites are often 'sites without structures'. Many finds like worked flint (field walking) which are likely to come from 'lithic scatters' are recorded on the HER as Findspot/Site. Only sites where some form of excavation has taken place will it be identified as a Monument Type = Flint Scatter or Lithic Scatter. Therefore there are two different types of data sets represented within the HER. Additionally, some of the best preserved early prehistoric sites will not be visible from surface collections as they are sealed underneath later alluvial or colluvial deposits typically found on valley edges and around the wetland fringes. These facts highlight the need for better mapping and understanding of buried landsurfaces, many of which will contain some of the best preserved archaeological sites and structures.

8.2.5 This study has suggested an approach for updating the existing alert mapping to extend beyond the limited study area, using an initial desk-based approach with a

combination of LiDAR to identify key transitional environments (0.5-2m OD) and buried features like islands that have enhanced archaeological potential. Further integration of geological, topographic and spatial analysis of HER data could help to extend the coverage of this mapping to the other main wetland sequences in East Sussex.

8.2.6 A second phase of this work could be to further develop and test the new predictive alert mapping in targeted areas to assess the accuracy of the model. This could be achieved through either a targeted phase of test pitting, boreholes or geophysics.

8.2.7 Local authorities will require further support from EH in their management of sites of national importance in terms of planning and land-stewardship schemes. The role of EH would be to support LPAs and their archaeological advisors through the production of guidance documents and potential resources in funding further research projects to develop a suitable agreed mechanism for this work.

8.3 Summary recommendations

8.3.1 The study produced a series of main recommendations for the identification, mapping and management of sites of national importance:

- Sites of national importance should be highlighted within the HER record and clearly labelled and justified in reference to the Regional Research framework.
- Alert mapping used by the East Sussex County Council (Archaeological Notification Areas) should be updated in respect to sites of national importance and areas of further wetland archaeological potential mapped.
- Consideration should be given to whether it would be possible, and if so the best way to, incorporate wetland sites into the SHINE database as used by Natural England to ensure suitable management.
- English Heritage will need to provide support to LPA and advisors in the form of guidance documentation and further funding for the identification and recording of non-scheduled sites of national importance through NHPP funded research.
- Greater consistency is required in the way that Palaeolithic and Mesolithic flint scatters and other sites without structure are recorded within the HER, to make the querying of datasets more efficient and productive.
- Heritage resources need to be taken into account more during the development of management plans of wetland areas. If the preferred option is to preserve national important sites *in-situ*, then there needs to be a long-term strategy in place for preserving the hydrological and environmental conditions.
- Multi-disciplinary geoarchaeological approaches are required to model and map wetland areas including LiDAR, deposits modelling, geophysical survey, boreholes and auger surveys and test pitting to provide an evidence base behind the updated the alert mapping.
- Sites of potential national importance should be evaluated through the planning process, by pre-determination evaluation if threatened. A judgement can then be made on the heritage asset's significance to determine if all or part of the asset is worthy of protection/preservation *in situ* as a site of national importance or whether loss and recording is acceptable.

- Greater co-ordination between LPA and EH with other land management bodies is needed in order to identify and appropriately manage the heritage potential of wetland areas.

8.4 Conclusions

8.4.1 The project set out to make recommendations for the identification, mapping and management of sites of national importance within wetland sequences. Using East Sussex as the study area, important sites have been identified which were found to be missing from the current coverage of Scheduled Monuments and many of which would not qualify for protection as SMs. Clear concentrations of early prehistoric activity have been discovered around specific wetland margins within the study area and many of these have either produced sites of national importance or have the potential to produce such sites in the future.

8.4.2 The project has developed a model to identify nationally important wetland sites, and proposes that it be used as part of a RAG system of alert mapping which can be used within the HER and ideally to inform SHINE. It is proposed that this would compliment, rather than provide an alternative to, scheduling.

8.4.3 The project has identified a number of issues and problems involved in creating this model to identify nationally important sites and its use to manage/protect these sites effectively. These issues primarily concern how data is recorded within the HER, the invisibility of this type of buried archaeological resource within the HER and on the ground and the extent to which predictive mapping data could be integrated within the current legal frameworks involved in the protection of sites of national importance.

8.4.4 Based on the results of this work a series of recommendations have been made to undertake further studies/actions to clarify and hopefully work towards the resolution of these issues. Principally the study has identified the need for further geoarchaeological and palaeoenvironmental investigation of many of these key wetland sequences within East Sussex. It will be important to develop practical methodologies and guidelines for the way in which nationally important 'sites without structure', including flint scatters, waterlogged structures and associated palaeoenvironmental sequences, are identified both to inform planning issues and appropriate management.

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Plate 1: Chalk cliffs of the Severn Sisters Country Park, Cuckmere Haven

Plate 2: Reclaimed landscape of Romney Marsh, East Sussex

Plate 3: The Cuckmere Valley, East Sussex

Plate 4: Borehole sampling within the Cuckmere Haven, East Sussex

Plate 5: Borehole sampling at the edge of Northeye DMV, Pevensey Levels

Plate 6: Borehole samples of the marsh sequence from the Pevensy Levels (1m scale)

Plate 7: Evaluating the wetland interface zone on the BHLR, Combe Haven

Plate 8: Identification of the flint bearing surface within a Geoarchaeological test pit on the BHLR, Combe Haven

Plate 9: Excavation of early prehistoric flint scatter on the BHLR

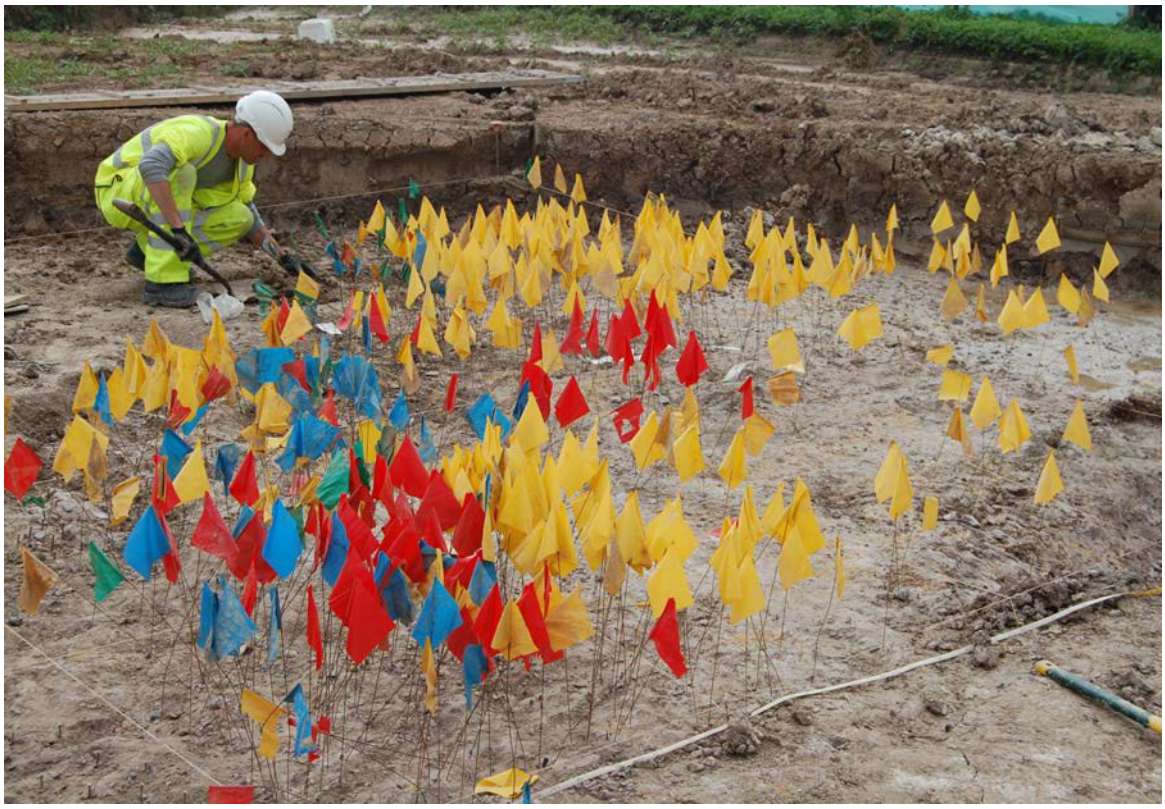

Plate 10: The density of worked flint represented by coloured flags on BHLR

Plate 11: Excavation of early prehistoric wooden structure on BHLR

Plate 12: EM 31 survey being undertaken on reclaimed marshland

Plate 13: Undertaking resistivity profilling at London Gateway, Thames Estuary

Plate 14: Geoarchaeological testpitting within the Combe Haven, East Sussex

Figure 1: Study Area

Study Area

Metres (OD)

High : 243.935

Low : -5.13719

N

ROMNEY MARSH

RYE HARBOUR

PETT LEVELS

COMBE HAVEN

PEVENSEY LEVELS

WILLINGDON LEVELS

OUSE VALLEY

CUCKMERE VALLEY

0 10 km

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Figure 2: Topography of East Sussex

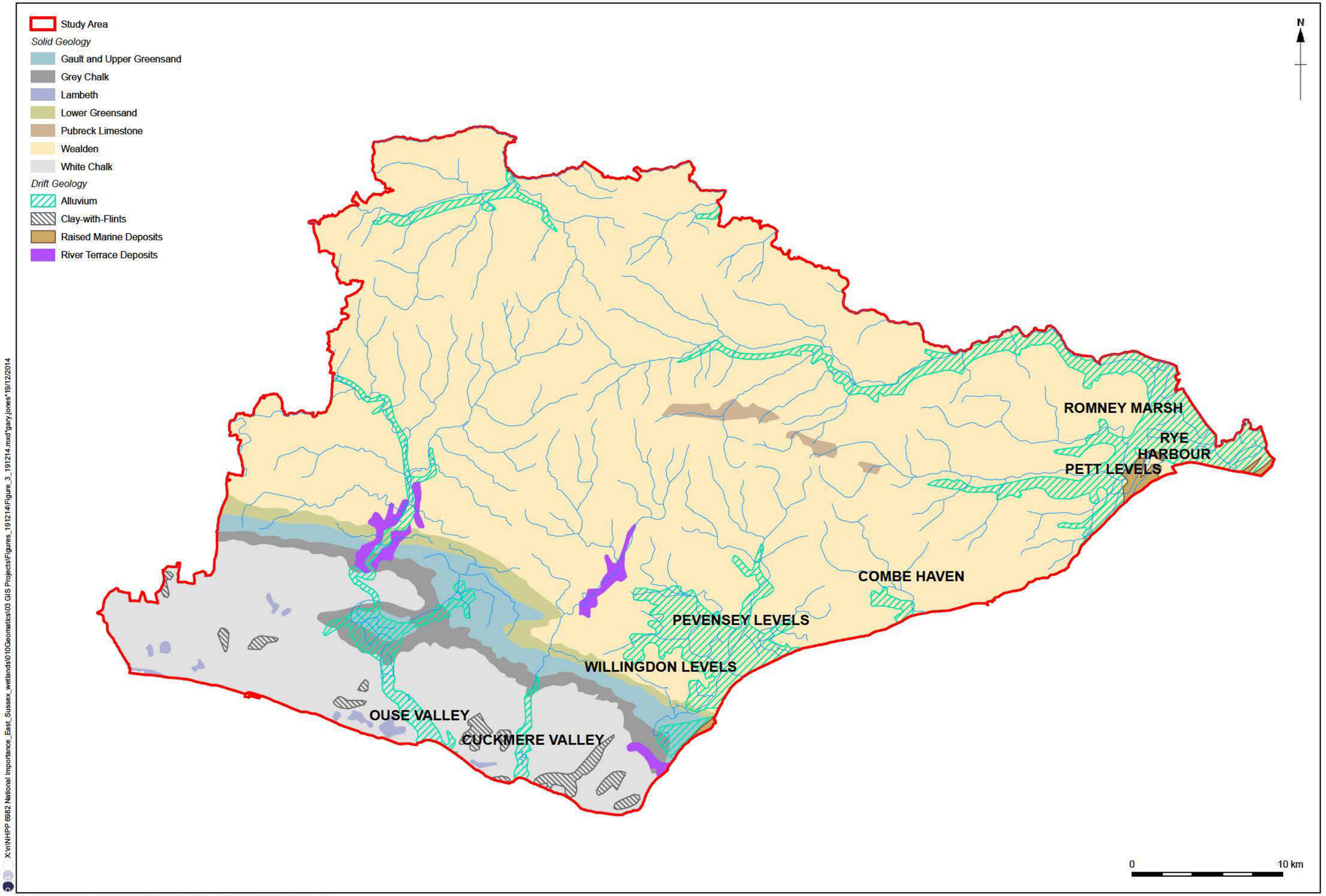

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Figure 3: Solid and drift geology of East Sussex

Study Area

N

High Weald

Low Weald

South Downs

Pevensey Levels

Romney Marshes

0 10 km

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Figure 4: National Character Areas of East Sussex

Study Area
RAMSAR
Special Protection Areas
Special Areas of Conservation
SSSI

N

0 10 km

X:\n\NHPP 6982 National Importance_East_Sussex_wetlands\010Geomatics\03 GIS Projects\Figures_191214\Figure_5_191214.mxd*gary.jones*19/12/2014

Figure 5: Conservation and Protection Areas

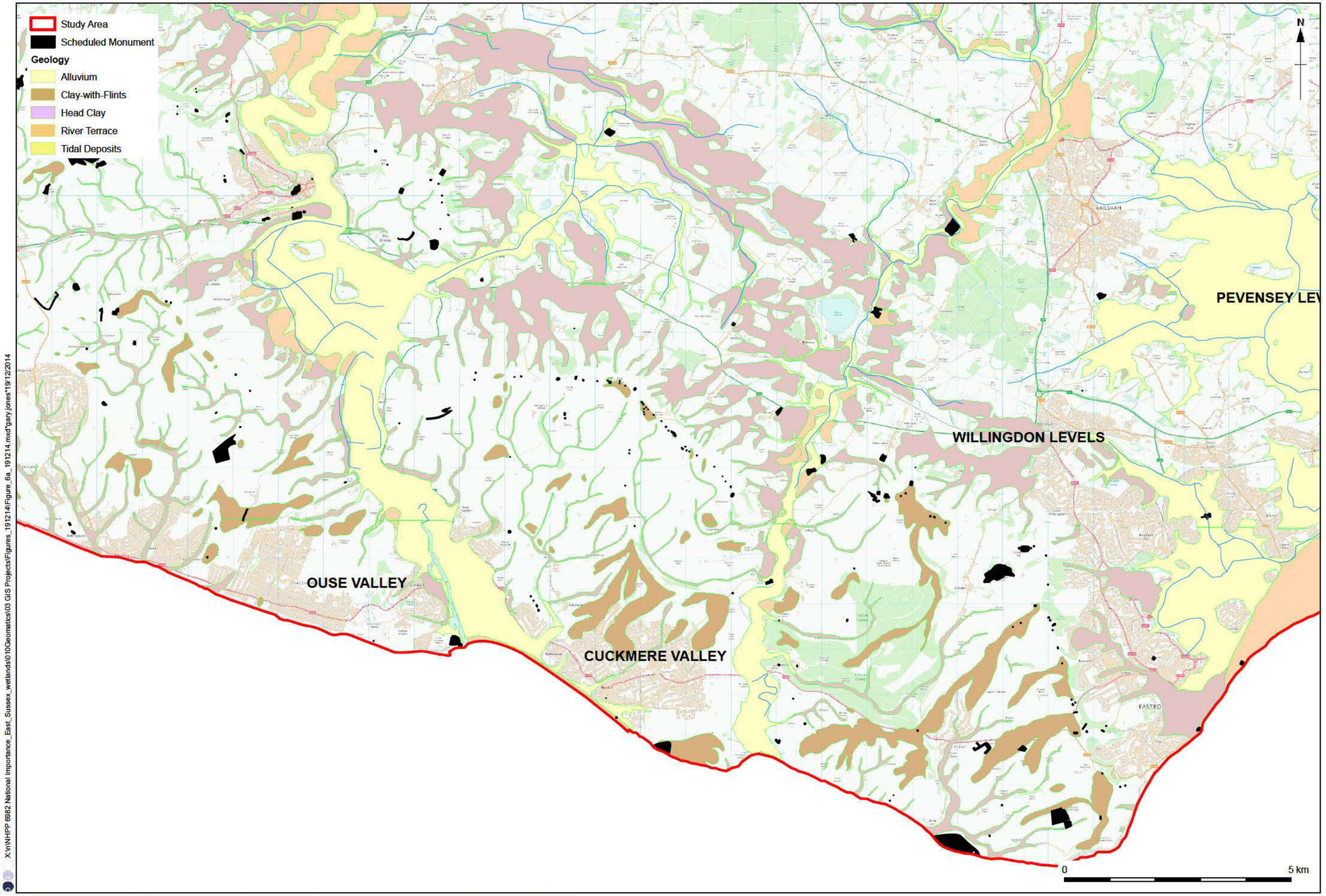

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Figure 6a: Mapped drift geology of East Sussex Wetlands

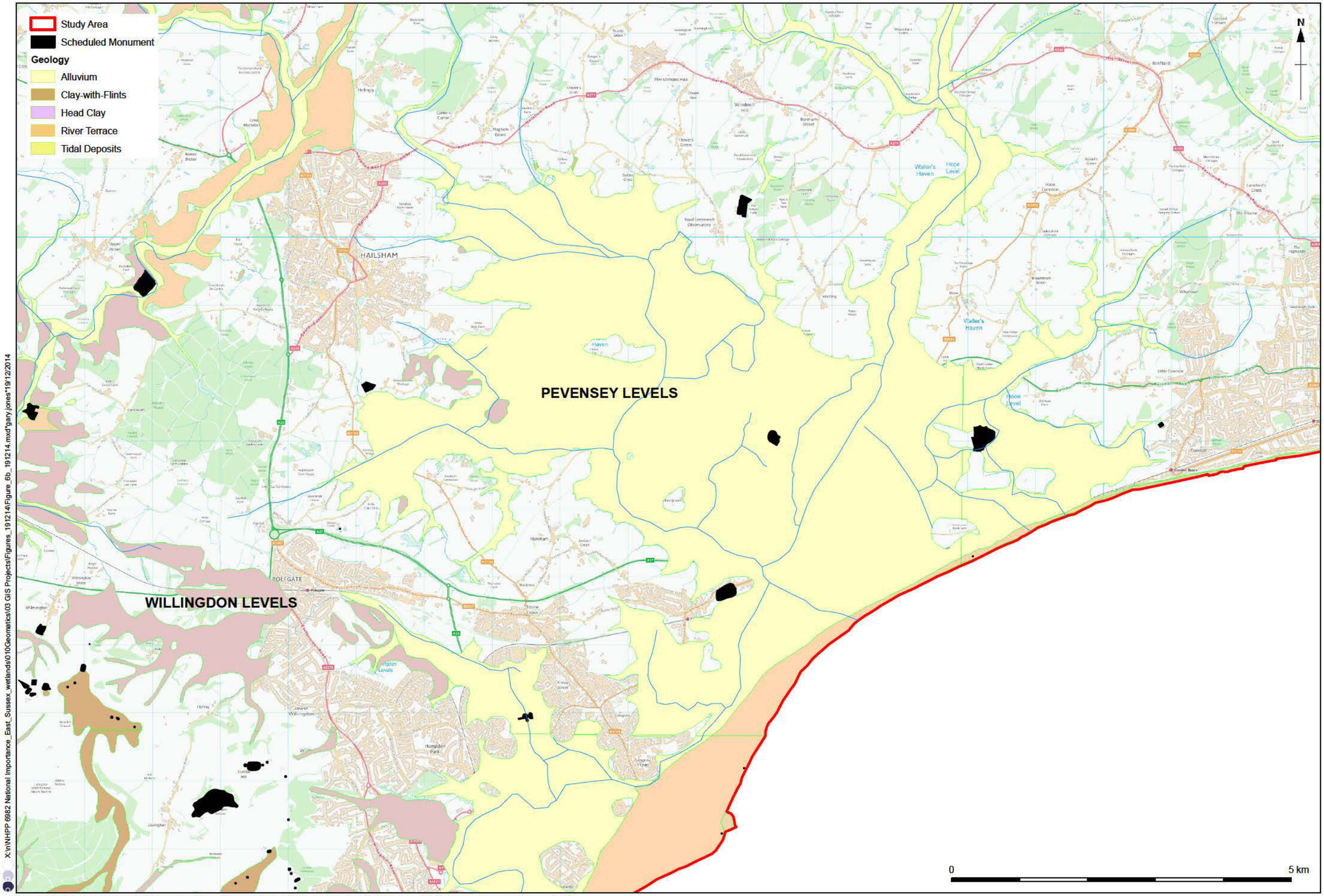

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Figure 6b: Mapped drift geology of East Sussex Wetlands

Study Area
Scheduled Monument

Geology

Alluvium
Clay-with-Flints
Head Clay
River Terrace
Tidal Deposits

N

COMBE HAVEN

BATTLE
BEXHILL
HASTINGS
Westfield
Telham
Netherfield
Ninfield
Waller's Haven
Hope Level

0 5 km

X:\n\NHPP 6982 National Importance_East_Sussex_wetlands\010Geomatics\03 GIS Projects\Figures_191214\Figure_6c_191214.mxd*gary.jones*19/12/2014

Figure 6b: Mapped drift geology of East Sussex Wetlands

Study Area
Scheduled Monument

Geology

- Alluvium
- Clay-with-Flints
- Head Clay
- River Terrace
- Tidal Deposits

N

ROMNEY MARSH

RYE HARBOUR

PETT LEVELS

0 5 km

X:\n\NHPP 6982 National Importance_East_Sussex_wetlands\010Geomatics\03 GIS Projects\Figures_191214\Figure_6d_191214.mxd*gary.jones*19/12/2014

Figure 6d: Mapped drift geology of East Sussex Wetlands

Study Area

Phase

- Anglo-Saxon (1)
- Medieval (10)
- Post-medieval (1)

N

High Weald

South Downs

Pevensey Levels

0 5 km

X:\n\NHPP 6982 National Importance_East_Sussex_wetlands\010Geomatics\03 GIS Projects\Figures_191214\Figure_7_11_191214.mxd*gary.jones*19/12/2014

Figure 7: Scheduled Monuments by Period against NCA - Low Weald

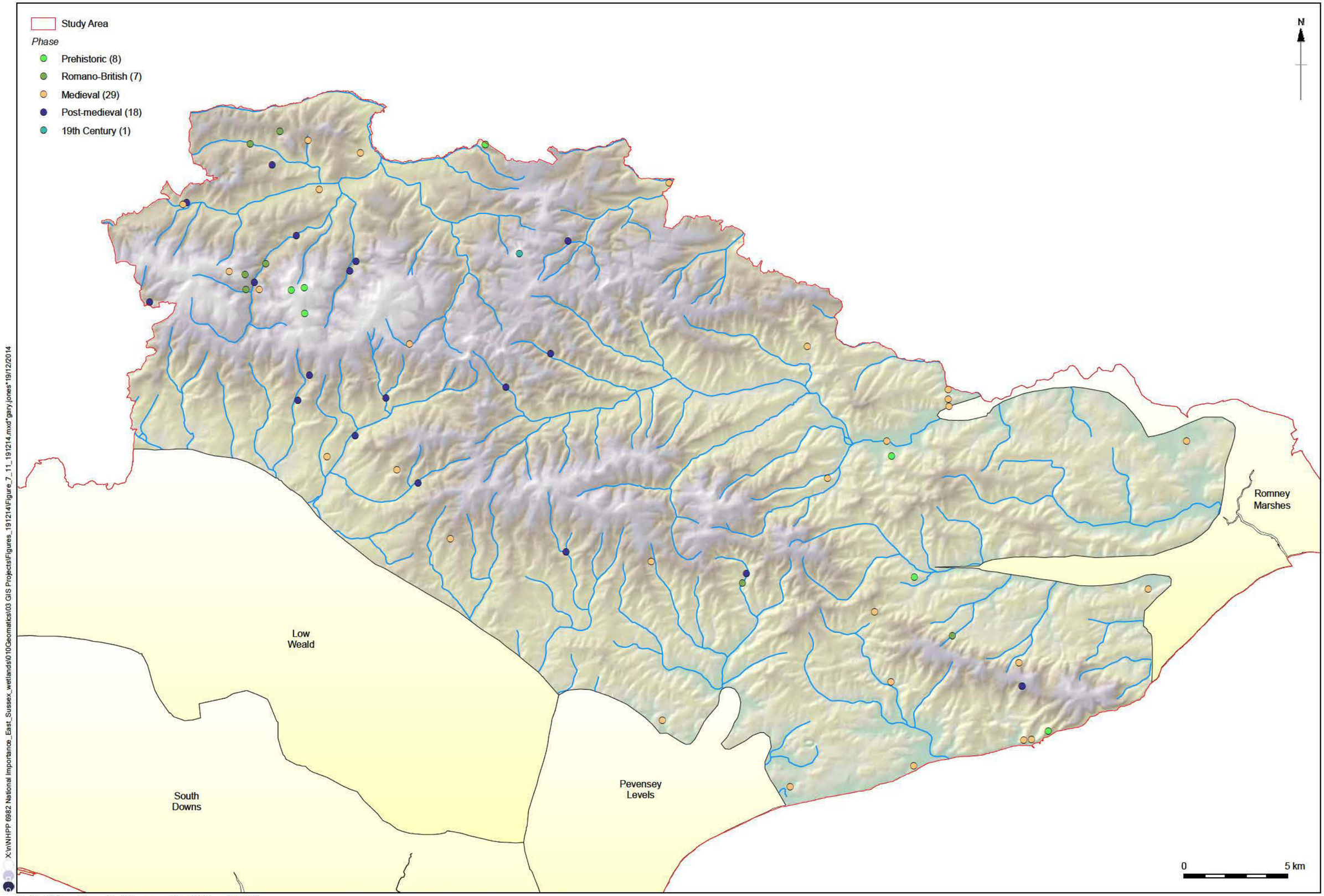


Figure 8: Scheduled Monuments by Period against NCA - High Weald

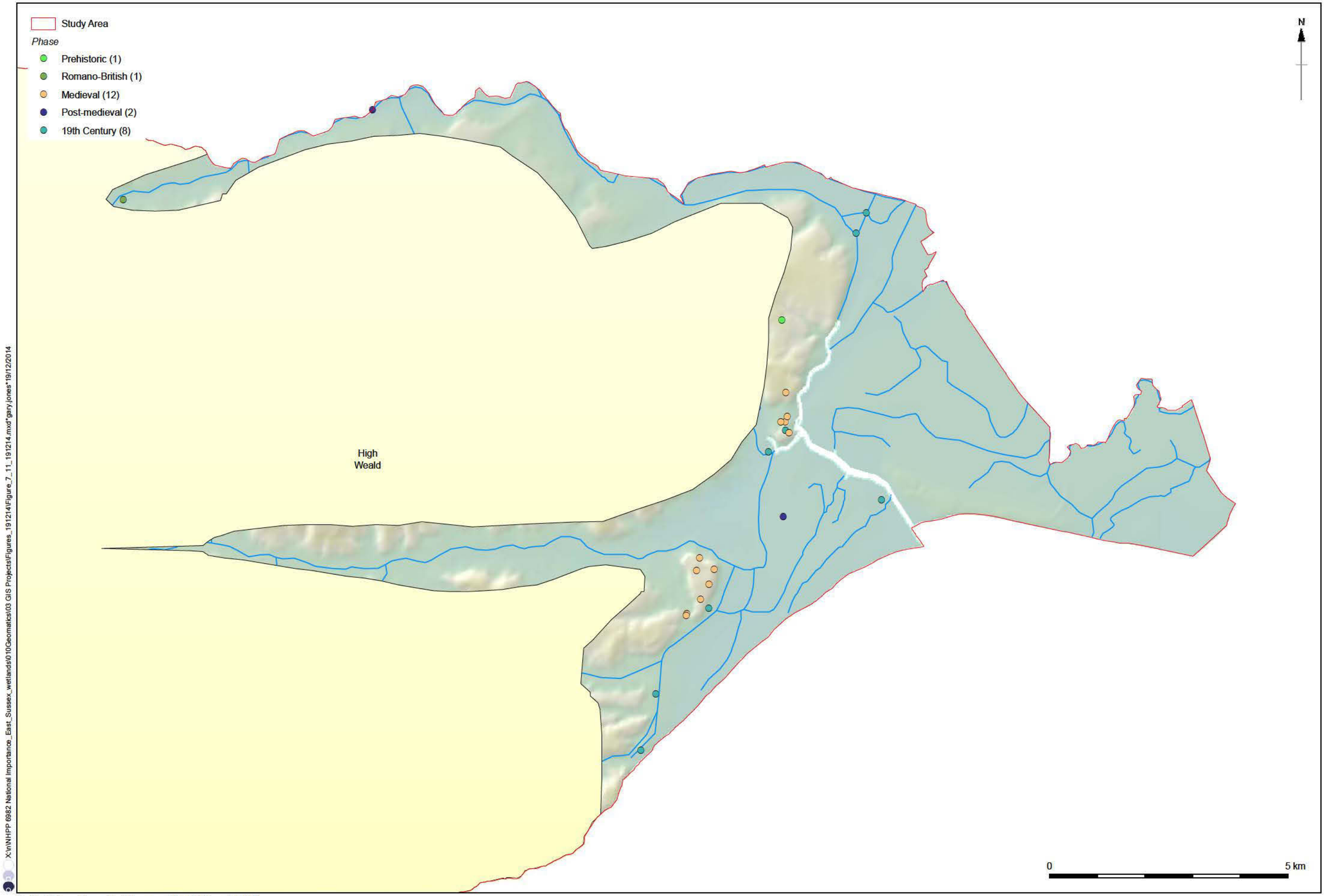


Figure 9: Scheduled Monuments by Period against NCA - Romney Marshes

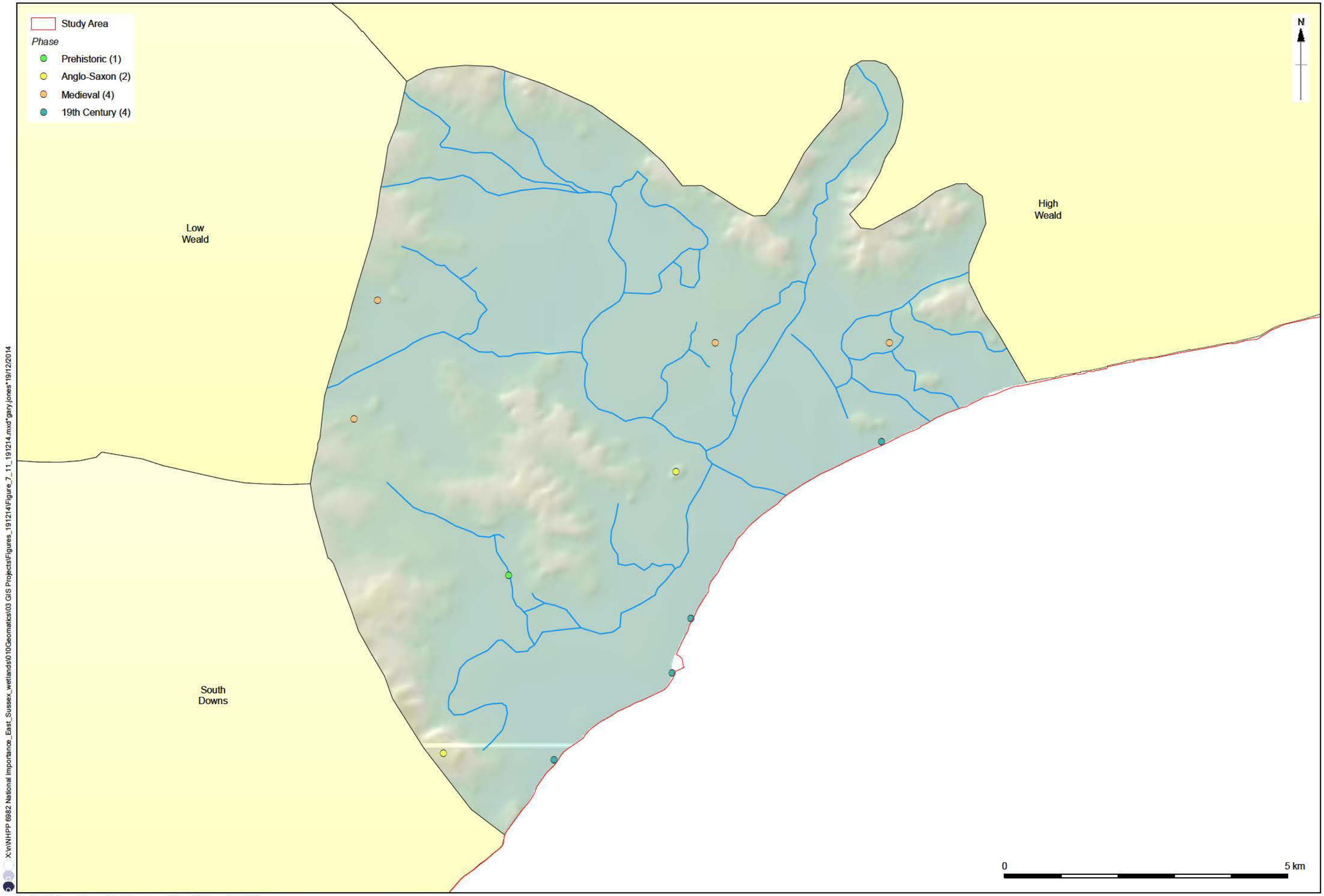


Figure 10: Scheduled Monuments by Period against NCA - Pevensey Levels

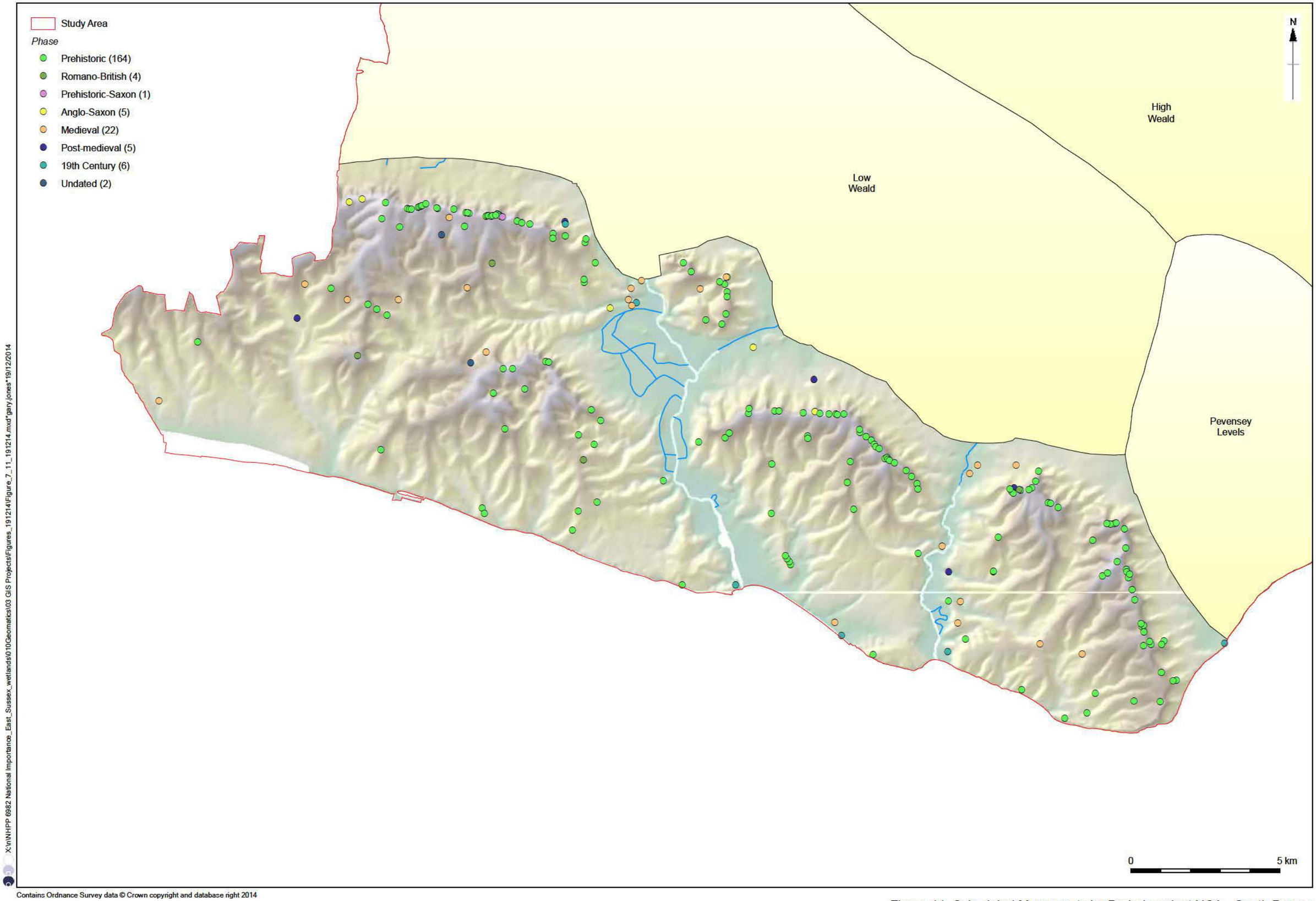


Figure 11: Scheduled Monuments by Period against NCA - South Downs

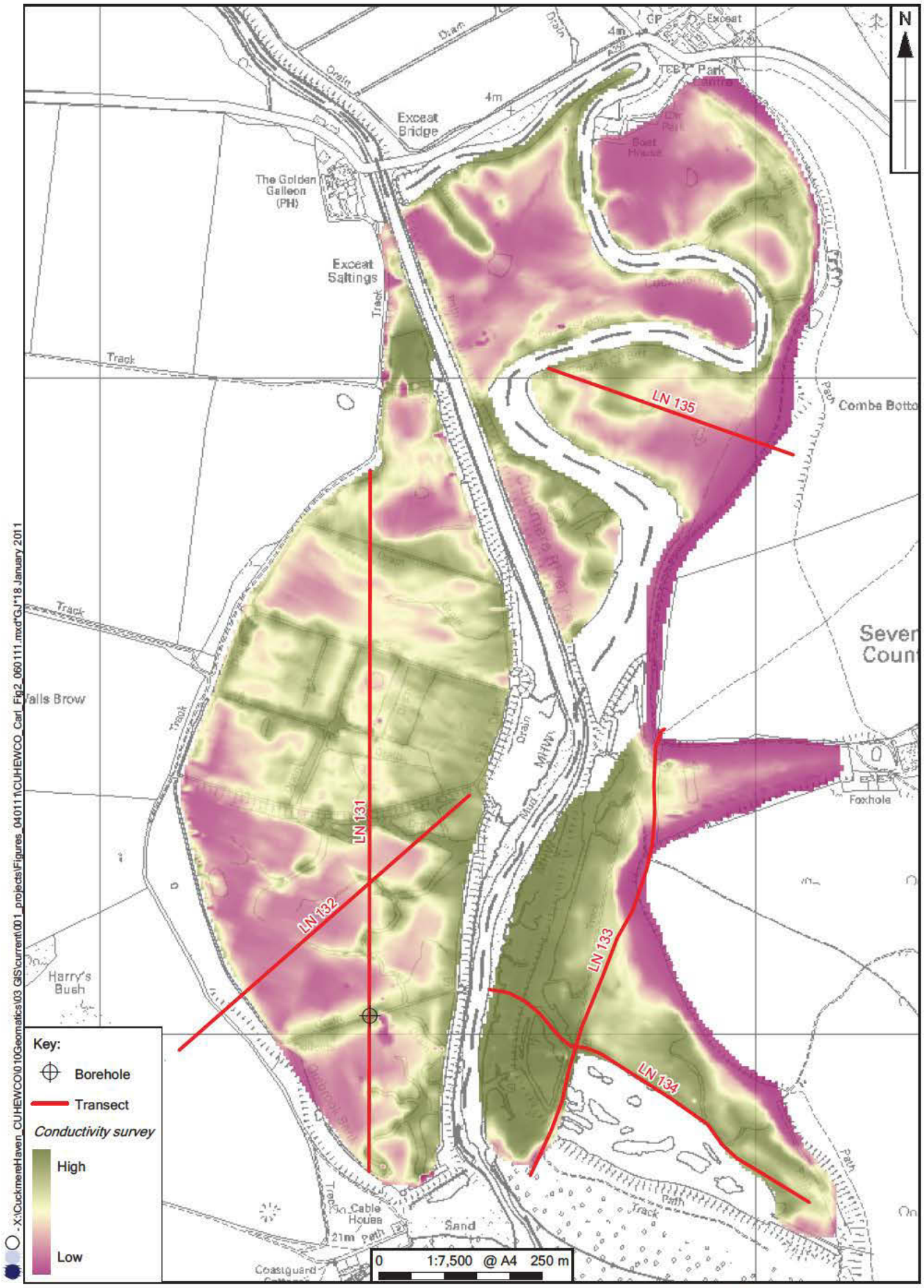


Figure 19: Borehole location and geophysical transects

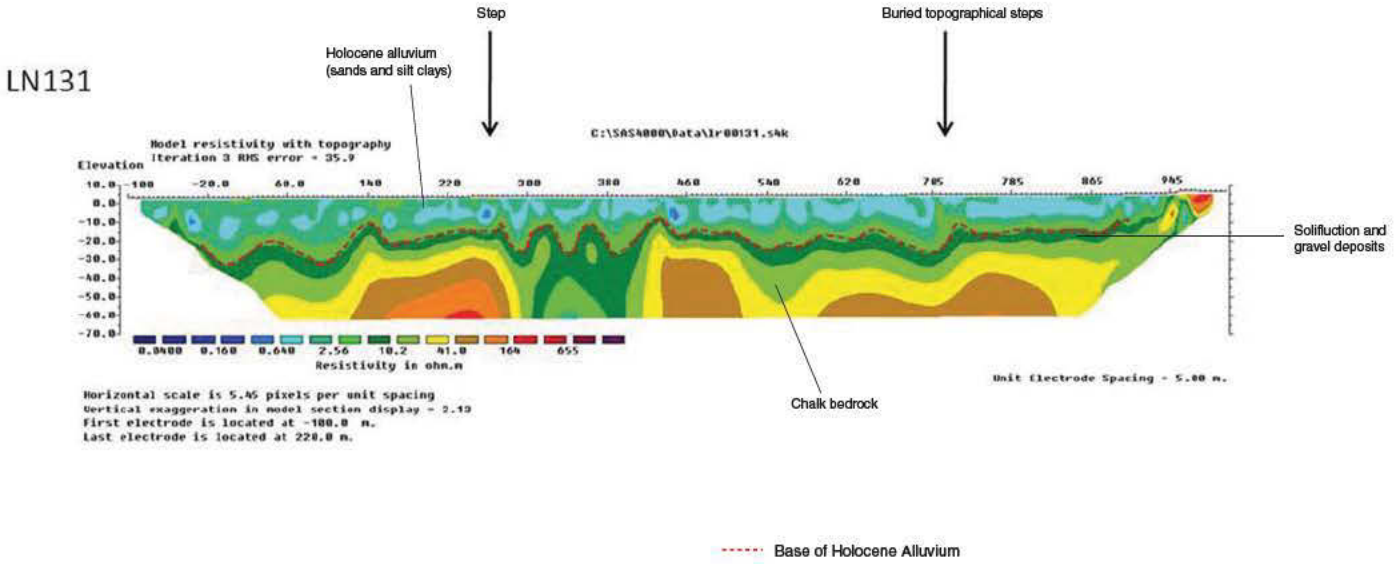
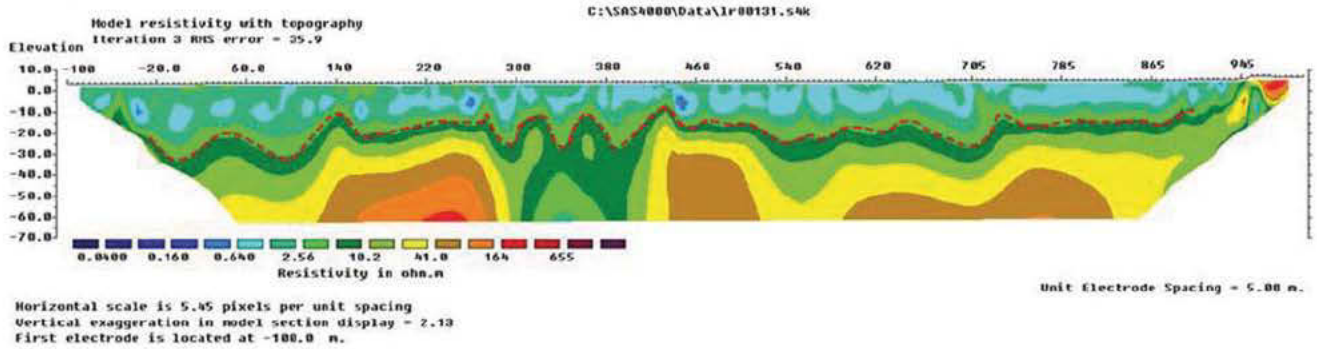


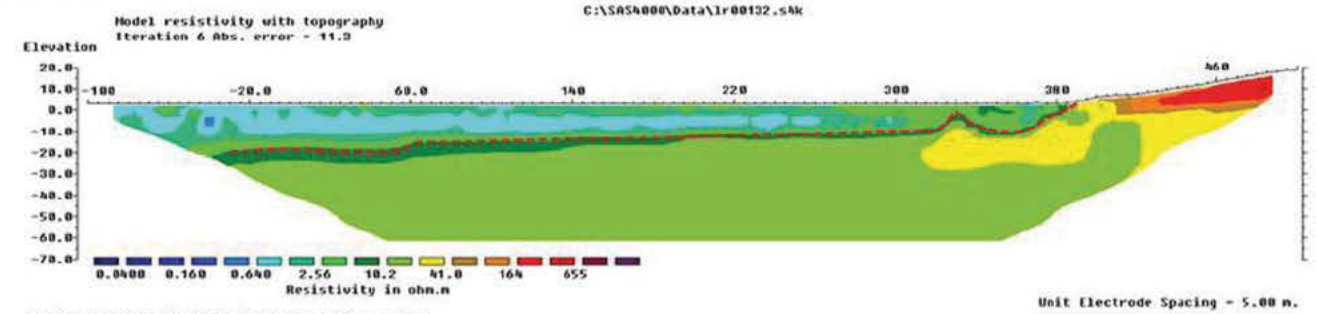
Figure 20: Geo-electric section showing base of Holocene Alluvium

LN131



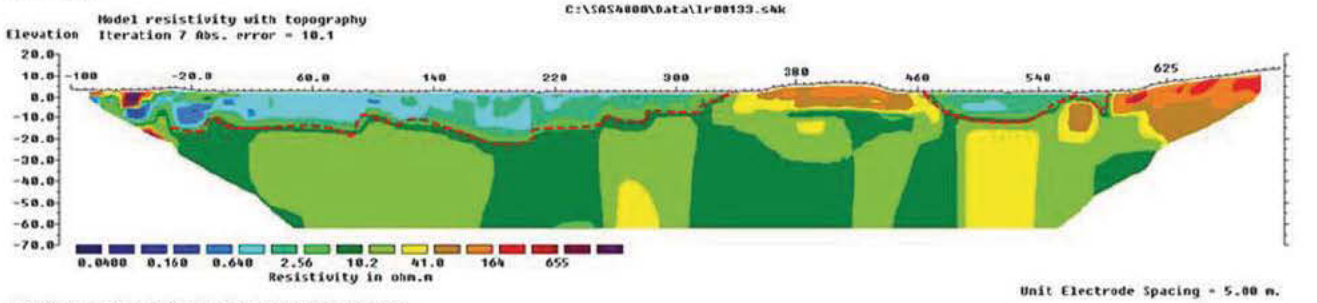
Horizontal scale is 5.45 pixels per unit spacing
Vertical exaggeration in model section display = 2.13
First electrode is located at -100.0 m.

LN132



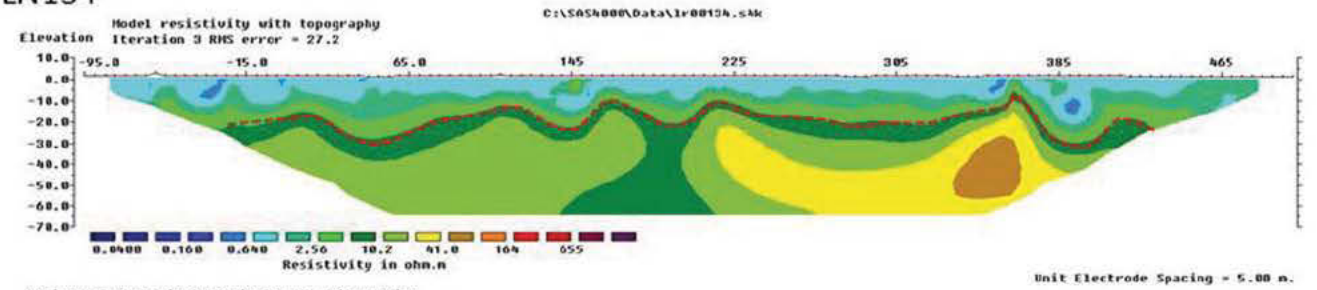
Horizontal scale is 9.92 pixels per unit spacing
Vertical exaggeration in model section display = 1.21
First electrode is located at -100.0 m.
Last electrode is located at 120.0 m.

LN133



Horizontal scale is 7.44 pixels per unit spacing
Vertical exaggeration in model section display = 1.61
First electrode is located at -100.0 m.
Last electrode is located at 160.0 m.

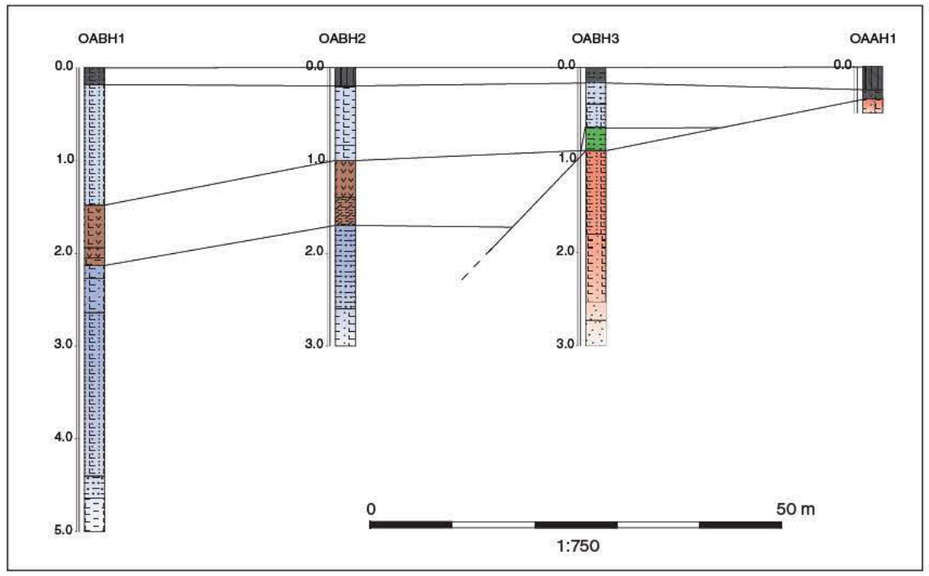
LN134

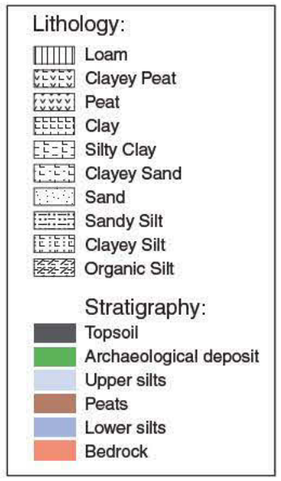


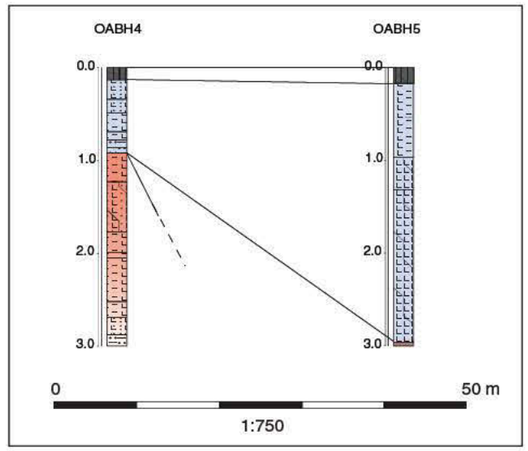
Horizontal scale is 9.99 pixels per unit spacing
Vertical exaggeration in model section display = 1.20
First electrode is located at -95.0 m.
Last electrode is located at 119.0 m.

Base of Holocene Alluvium

Figure 21: Geo-electric section showing base of Holocene Alluvium







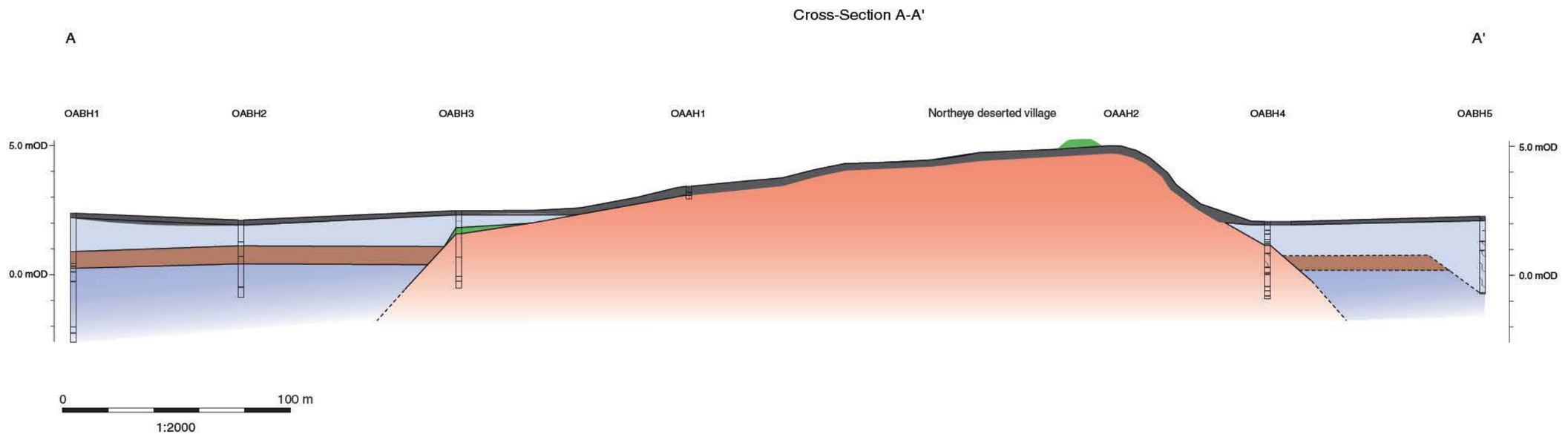


Figure 22: Northeye cross-section

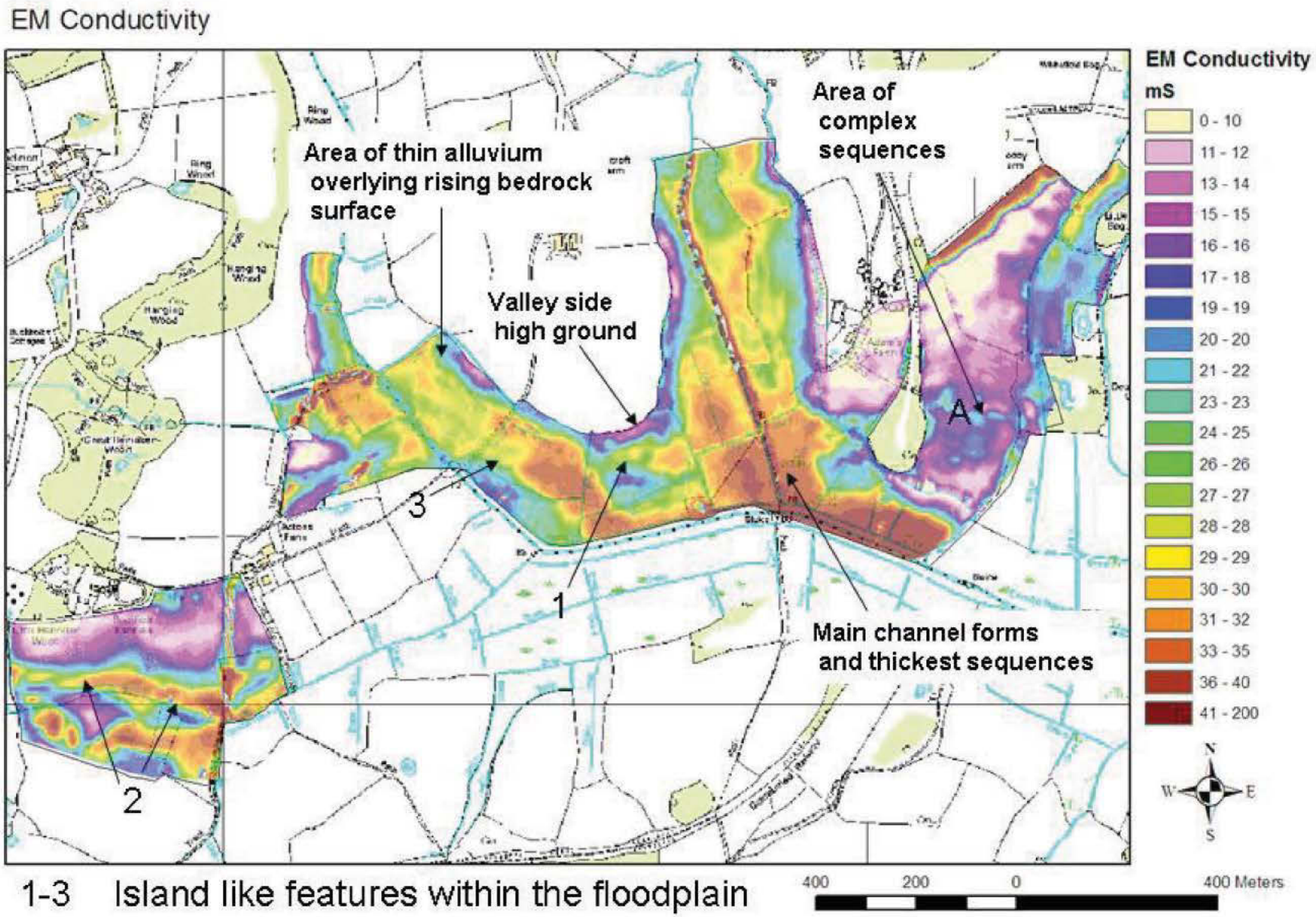


Figure 23 : EM conductivity mapping, BHLR.

Early Holocene topography (M OD)

-8.0 - -7.0
-7.0 - -6.0
-6.0 - -5.0
-5.0 - -4.0
-4.0 - -3.0
-3.0 - -2.0
-2.0 - -1.0
-1.0 - 0.0
0.0 - 1.0
1.0 - 2.0
2.0 - 3.0
3.0 - 4.0
4.0 - 5.0
5.0 - 6.0
6.0 - 7.0
7.0 - 8.0
8.0 - 9.0
9.0 - 10.0
10.0 - 11.0
11.0 - 12.0
12.0 - 13.0
13.0 - 14.0
14.0 - 15.0
15.0 - 16.0
16.0 - 17.0
17.0 - 18.0
18.0 - 19.0
19.0 - 20.0
20.0 - 21.0
21.0 - 22.0
22.0 - 23.0
23.0 - 24.0
24.0 - 25.0
25.0 - 26.0
26.0 - 27.0
27.0 - 28.0
28.0 - 29.0
29.0 - 30.0
30.0 - 31.0
31.0 - 32.0
32.0 - 33.0
33.0 - 34.0
34.0 - 35.0
35.0 - 36.0
36.0 - 37.0
37.0 - 38.0
38.0 - 39.0
39.0 - 40.0
40.0 - 41.0
41.0 - 42.0
42.0 - 43.0
43.0 - 44.0
44.0 - 45.0
45.0 - 46.0
46.0 - 47.0
47.0 - 48.0
48.0 - 49.0
49.0 - 50.0
50.0 - 51.0
51.0 - 52.0
52.0 - 53.0
53.0 - 54.0
54.0 - 55.0
55.0 - 56.0

N

Scatter H
Scatter J
Scatter E
Scatter F1
Scatter D
Scatter G
Scatter B + C

Key:
- Base Camp
- Hunting Camp
- Former Flint Finds from Testpits
- Phase 1 Trenches
- Other Trenches
- Development Area
- Main footprint of scheme
- OS 1:2500 Data

X:\Bexhill to Hastings 2012\010Geomatics\03 GIS\current\001_projects\evaluation\Bexhill to Hastings_EVAL_figure 38_220512.mxd*matt.bradley* 04/12/2012

0 1 km

Scale at A3 1:10,000

Figure 24: Phased Landscape Plan - Mesolithic to Early Neolithic (Phase 1)

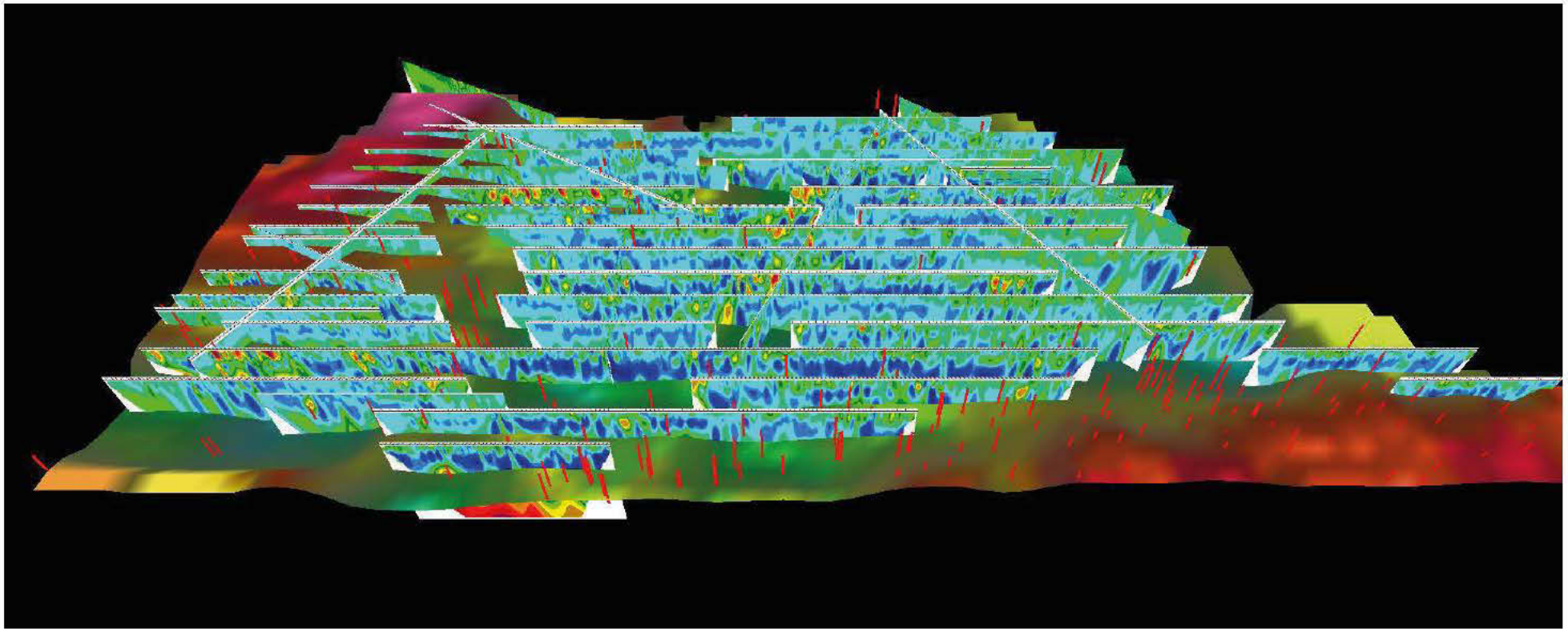


Figure 25 : Multi-transect resistivity survey, London Gateway.

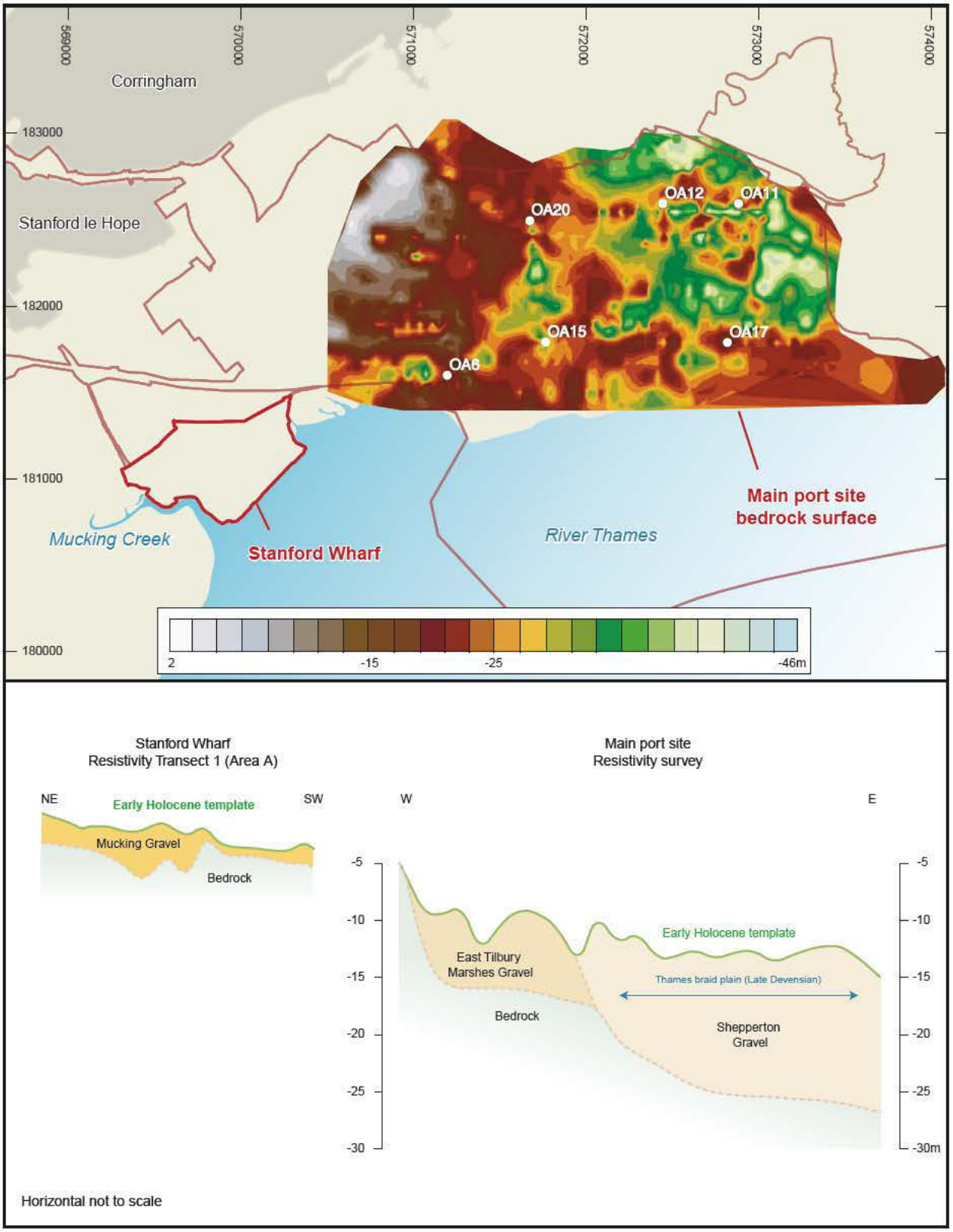


Figure 26: Resistivity survey mapping the elevation of the bedrock surface across the London Gateway Port site (after Bates *et al.* 2012) and correlation of the buried gravel terrace deposits with Stanford Wharf (Biddulph *et al.* 2012)

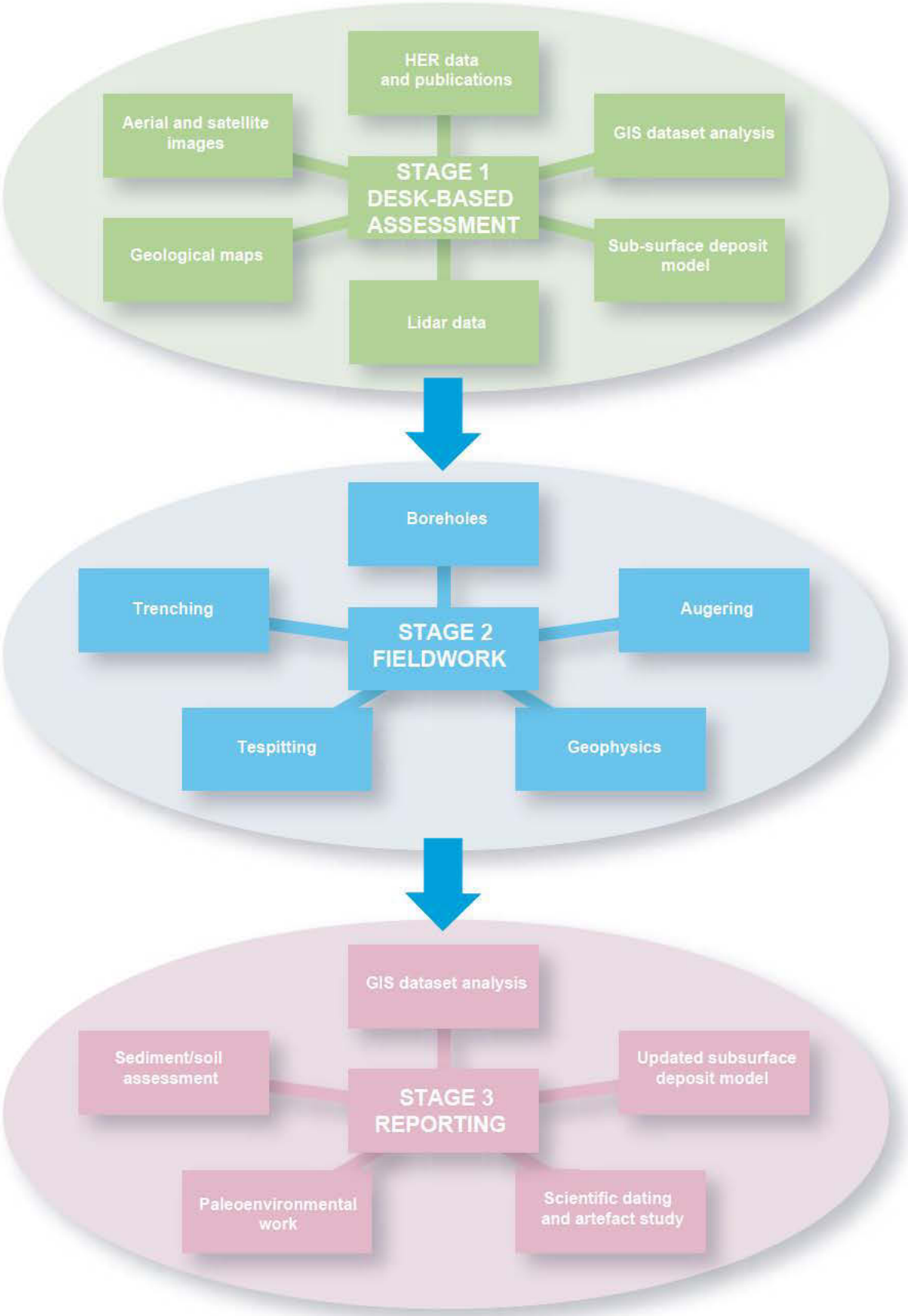


Figure 27: The three main stages for geoarchaeological investigation of a wetland site

Figure 28 : Wetland field sampling techniques

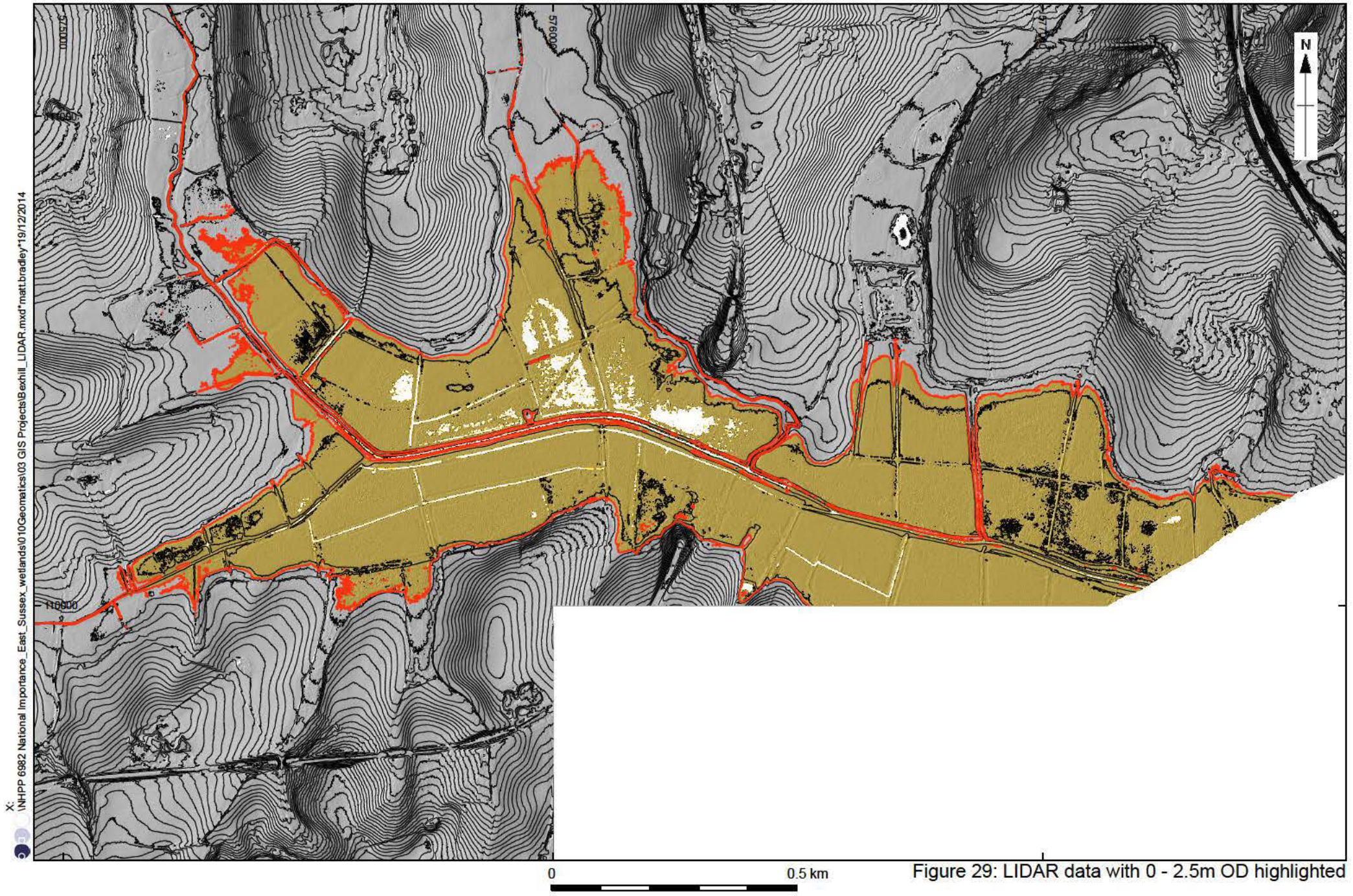
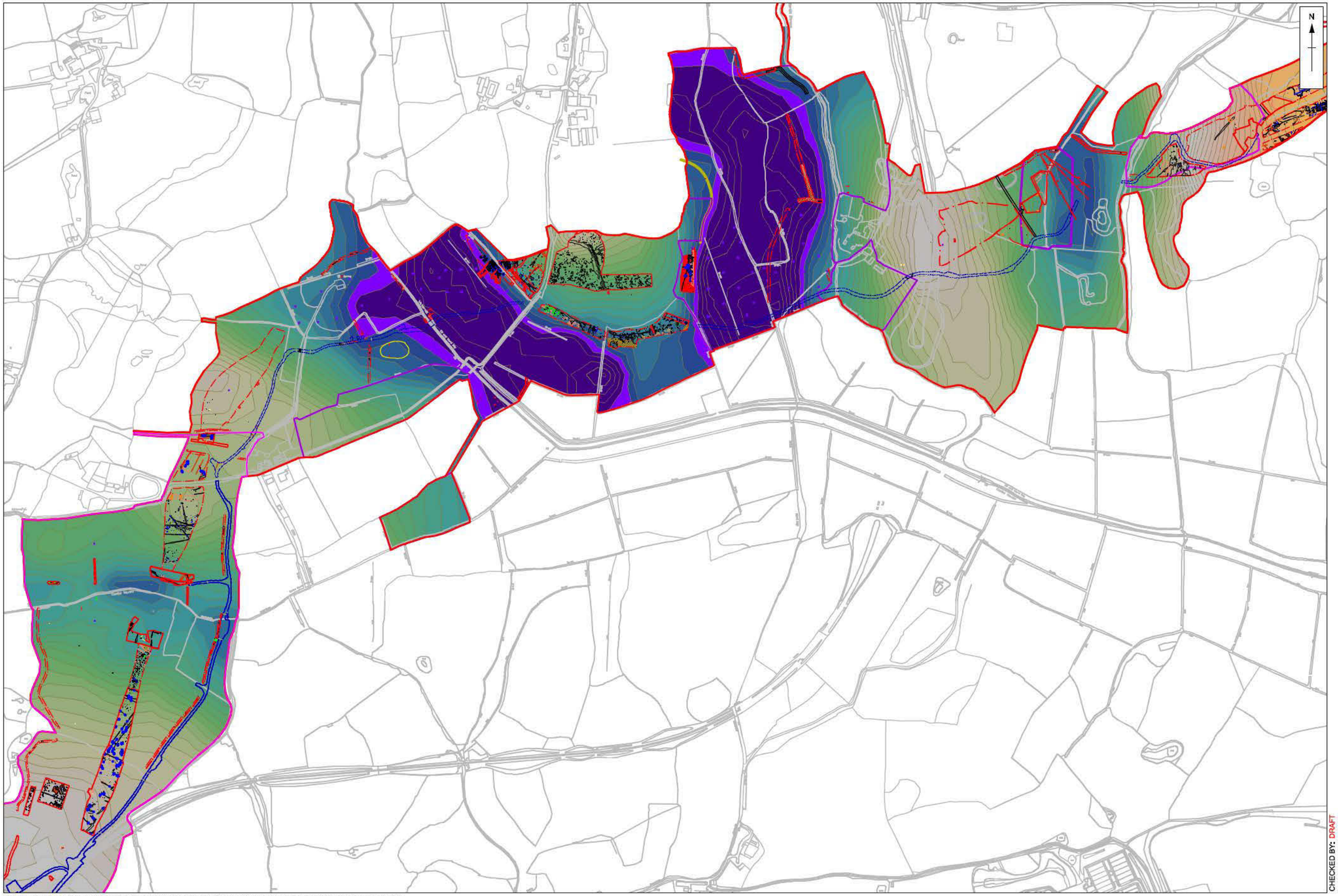


Figure 29: LIDAR data with 0 - 2.5m OD highlighted

X:\tb\Bexhill to Hastings 2012 \010\Geomatics \02 CAD\001current\Carls deposit model \BEXHM-2013,6 Bexhill to Hastings 2013-09-30.dwg(A3 WB)*BEXHM:2013,6*BXEX10*Bexhill to Hastings*Conan Parsons* 25 Oct 2013



Survey Data supplied by :
Conan Parsons

Scale at A3 NOT TO SCALE

Figure 30: Deposit model with flint scatters, BHRL

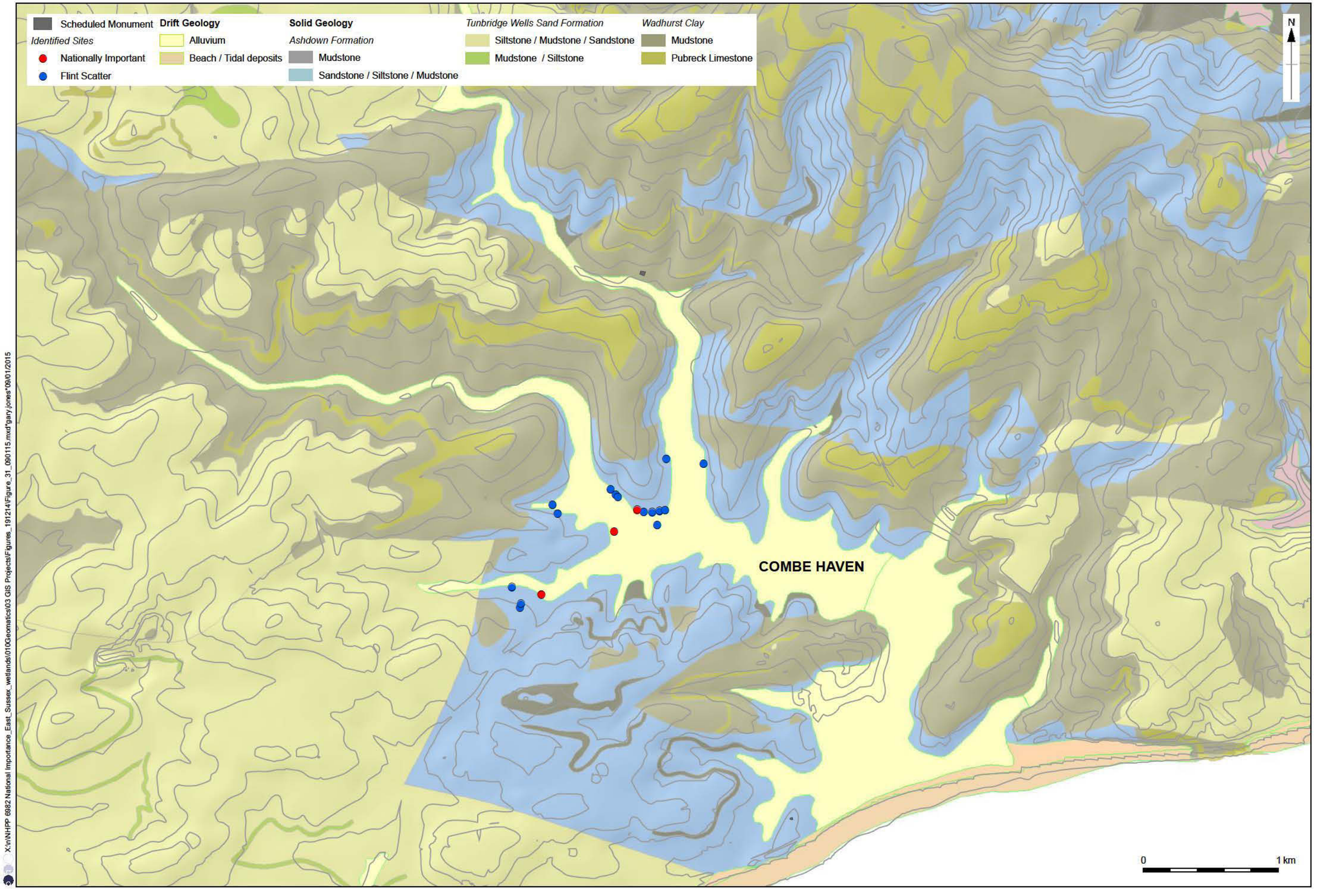


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Figure 31: Predictive mapping for Early Prehistoric activity within the Combe Haven

Scheduled Monument
Nationally Important
Flint Scatter
Archaeological Notification Areas
Category A
Category B
Category C
Original Areas

N

COMBE HAVEN

0 1 km

COMBE HAVEN

0 1 km

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Figure 32: Updated (Top) and original (Bottom) ANA for the Combe Haven

Scheduled Monument
Trackways
Lithic or Flints
Wood
Mesolithic Site
Archaeological Noification Areas
Category A
Category B
Category C
Original Areas

N

PEVENSEY LEVELS

WILLINGDON LEVELS

0 2 km

PEVENSEY LEVELS

WILLINGDON LEVELS

0 2 km

X:\nNHPP 6982 National Importance_East_Sussex_wetlands\010Geomatics\03 GIS Projects\Figures_200215\Figure_33_200215.mxd*gary.jones*20/02/2015

Figure 33: Updated (Top) and original (Bottom) ANAs for the Pevensey Levels

Scheduled Monument
Flint Scatter
Wood
Archaeological Noification Areas
Category A
Category B
Category C
Original Areas

N

PETT LEVELS

0 2 km

PETT LEVELS

0 2 km

X:\n\NHPP 6982 National Importance_East_Sussex_wetlands\010Geomatics\03 GIS Projects\Figures_200215\Figure_34_200215.mxd*gary.jones*20/02/2015

Figure 34: Updated (Top) and original (Bottom) ANAs for the Pett Levels

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