Lukely Brook and Plaish Meadows
Isle of Wight

Palaeoenvironmental Assessment

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Summary

A programme of geoarchaeological borehole survey, palaeoenvironmental assessment and scientific dating was undertaken at Lukely Brook and Plaish Meadows in order to establish the extent and nature of archaeological and palaeoenvironmental remains which may be impacted by the Scheme, to characterise the sedimentary sequence, collect base line data on present ground conditions, and inform on future monitoring of these deposits, following the scope outlined by IWCAHES (2022).

A total of twelve boreholes were undertaken at the Site. Four boreholes (WA-01 to WA-03 and WA-10) were located within the Scheduled Monument, each of which was positioned to investigate the peaty deposit and palaeochannel sediments recorded in the valley bottom during previous work undertaken by Busby et al (2001). An additional borehole (WA-04) was located upstream of the possible cross-valley roadway (outside of the Scheduled Monument) to assess conditions behind this possible barrier; two additional boreholes were located in Horse Paddock (WA-12) and the southwestern end of Plaish Meadows (WA-11), along with two transects of two and three boreholes respectively (WA-05 to WA-09) located within the area southwest of the Scheduled Monument within Plaish Meadows.

Organic deposits were encountered only in WA10 and WA01; in WA10 a peat unit was identified, described as a homogenous, well humified peat with occasional gravels between 25.34 to 25.01 m OD and a well humified, woody and herbaceous peat with inclusions of brick/CBM between 25.01 to 24.90 m OD. No other organic deposits were found in the boreholes other than an organic alluvium identified in WA01 at 25.43 m OD, which was not bottomed at 25.34 m OD.

A programme of palaeoenvironmental assessment was undertaken on the peat deposits in borehole WA10. No buried soils were recorded within this borehole, but the peat here is considered to be the same deposit identified by Busby et al (2001) in Trench 2 and examined in detail by Scaife (2001). A radiocarbon date from the base of the peat in WA10 (0.78 to 0.80 m bgl) returned a Late Iron Age to Early Romano-British date of 60 cal. BC – cal. AD 120 (2000 ± 30 BP; Beta-654319), broadly consistent with the earliest evidence for occupation at the Site from a buried soil containing ceramics of mid-1st century AD date identified by Busby et al (2001).

A dip well installed by Atkins (Plaish SAM Dip Well) in July 2022 provides limited baseline hydrological data prior to the installation of the Scheme features in November 2022, particularly given the drought conditions of that summer and exceptionally high rainfall of November 2022 (see Atkins 2023). On the basis of this data, groundwater levels are consistently within the depth range of the organic deposits (i.e., below their surface, but above their base) in WA10 prior to November 2022, with groundwater levels remaining consistently above the level of the organic deposits since November 2022. It is difficult to separate the impacts of the Scheme since November 2022 due to the limited baseline hydrological information within the SAM. However, data for June to September 2023 shows a gradual decline in groundwater levels during this period to between 25.4 and 25.3 m OD, punctuated by rainfall events where groundwater rises to 25.6 m OD, indicating that groundwater levels remained consistently higher in the summer of 2023 than in 2022 (prior to installation of the Scheme features), and that groundwater levels are now generally above or at the top of the organic deposits in the Scheduled Monument.

The results of the palaeoenvironmental assessment indicate that the preservation and condition of waterlogged plant macrofossil remains, wood fragments, and invertebrates at the site can be classed as very poor to poor in all the samples examined in WA10. Pollen was encountered in varying abundance and diversity, with preservation poorest towards the top of the sequence. When compared to the full analyses undertaken by Scaife (2001), a very similar signal was encountered, typified by an open landscape with a reduction in trees over time.

Considering the proximity to the study site of Scaife (2001), combined by the fact that these preliminary results are very similar to the full analyses undertaken by Scaife (2001), no further work is deemed necessary at this stage. Given the unique presence of peat deposits within a chalk catchment, the study of the levels of preservation of pollen, through the calculation of biochemical and mechanical preservation indices, will provide a valuable baseline data set if further works are undertaken at the Site as part of any future investigations.

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The fieldwork was managed on site by Jon Badger. The report was compiled by Daniel Young with contributions from Dr Inés López-Dóriga, Dr Ed Treasure, Dr Tom Hill and Rachel Seager-Smith and reviewed by Alex Brown. Figures were produced by Amy Wright. The project was managed on behalf of Wessex Archaeology by Daniel Young.

Lukely Brook and Plaish Meadows, Isle of Wight

Palaeoenvironmental Assessment

1 INTRODUCTION

1.1 Project and planning background

1.1.1 Wessex Archaeology was commissioned by Past Wight Heritage Consultancy (hereafter referred to as 'the Client') to undertake a geoarchaeological borehole survey and palaeoenvironmental assessment in advance of proposed works at Lukely Brook and Plaish Meadows, Carisbrooke, Isle of Wight (the 'Site'). The Site is divided into three areas, Horse Paddock, Plaish Meadows and Sheep Dip Fields (**Figure 1**).

1.1.2 The work at the Site is being undertaken as part of the Southern Water 'Water Industry National Improvement Plan' (WINEP) Investigation project at Horse Paddock and Plaish Meadows. At these locations Lukely Brook has been historically pushed to the side of the floodplain and has become deeply incised through Plaish Meadows to drain the land in order to make way for grazing (Atkins 2023).

1.1.3 To restore the river to its natural location (i.e., the lowest point in the floodplain), it was determined that a Stage Zero river restoration approach should be adopted; Stage Zero is a term used to describe a river-floodplain system prior to any human disturbance, where water flows across the floodplain in multi-threaded shallow channels, creating a mosaic of floodplain habitats and a system that is highly diverse and resilient to change (Atkins 2023).

1.1.4 The proposed work comprised blocking of existing channels, diverting and reconnecting flows, a short section of stream restoration and rewetting of the floodplain to improve habitats within the meadow and the brook (the 'Scheme'). The Scheme features were installed in November 2022 and include, ordered from upstream to downstream:

- woody features on Lukely Brook in Horse Paddock and Plaish Meadows;
- A ford on Lukely Brook in Plaish Meadows; and
- Four woody features on drains leading to Lukely Brook in Plaish Meadows.

1.1.5 The expected impact of the Stage Zero restoration project is that water will back up behind the features and spill onto the floodplain more frequently, with water retained for longer on the floodplain, slowing the flow of water and potentially attenuating flood peaks (see Atkins 2023).

1.2 Scope of works

1.2.1 A scoping document and brief was prepared by Isle of Wight Society and East Cowes Heritage (IWCAHES 2022) outlining the requirement for a geoarchaeological borehole survey in advance of the proposed works in order to establish the extent and nature of archaeological and palaeoenvironmental remains which may be impacted by the works, to characterise the sedimentary sequence, collect base line data on present ground conditions, and inform on future monitoring of these deposits (IWCAHES 2022).

1.2.2 The works followed the methodology outlined in the Written Scheme of Investigation (WSI) prepared by Wessex Archaeology (2022), which outlined the strategy for the geoarchaeological borehole survey and palaeoenvironmental assessment. A total of twelve boreholes (WA01 to WA12) were proposed at the Site. It was anticipated that Atkins would install piezometers in three of the geoarchaeological boreholes (WA10 to WA12) after samples have been retained for geoarchaeological purposes.

1.2.3 A total of four boreholes (WA-01 to WA-03; WA-10) were located within the area of the Scheduled Monument, each of which was positioned in order to investigate the peaty deposit recorded in context 537 upslope and downslope of a possible building (Building 2), and palaeochannel deposits recorded in the valley bottom (see IWCAHES 2022). An additional borehole (WA-04) was located upstream of the possible cross-valley roadway (outside of the Scheduled Monument) in order to assess conditions behind this possible barrier.

1.2.4 Piezometer installation boreholes were located in Horse Paddock (WA-12) and the southwestern end of Plaish Meadows (WA-11). Finally, two transects of two and three boreholes respectively (WA-05 to WA-09) were located within the area southwest of the Scheduled Monument within Plaish Meadows.

1.2.5 Minor adjustments to the final locations of the boreholes were required on the basis of ground conditions; nine window sample boreholes were undertaken using a hand-held window sampling rig (WA-02, WA-04 to WA-10 and WA-12), with three hand auger boreholes undertaken by IWCAHES (WA-01, WA-03 and WA-11).

1.2.6 The work presented here includes the results of the borehole survey, preliminary deposit modelling, and palaeoenvironmental assessment of selected sequences as agreed with Historic England and IWCAHES, and considers these results in the context of the interim hydrological monitoring report provided by Atkins (2023).

1.3 Scope of document

1.3.1 To help frame archaeological and geoarchaeological investigations of this nature, Wessex Archaeology has developed a four-stage approach, encompassing different levels of investigation appropriate to the results obtained, accompanied by formal reporting of the results at the level achieved. The borehole survey and palaeoenvironmental assessment reported on here represents Stages 2 and 3 of this process (**Table 1**).

1.3.2 In format and content, the work follows the methodology set out within the WSI (Wessex Archaeology 2022), and conforms to current best practice, including the guidance in *Management of Research Projects in the Historic Environment* (MoRPHE, Historic England 2015a), the Chartered Institute for Archaeologists' (CIfA) *Standard and guidance for archaeological field evaluation* (CIfA 2020a), Historic England's technical guide to Geoarchaeology: Using Earth Sciences to Understand the Archaeological Record (Historic England 2015b) and Deposit Modelling and Archaeology (Historic England 2020).

Table 1 Staged approach to geoarchaeological investigations

Stage 1: Geoarchaeological Desk-based Assessment (GDBA) and deposit modelling	A Geoarchaeological Desk-Based Assessment (GDBA) examines a range of data (published and unpublished ("grey literature"), LiDAR, historic maps) and models existing Ground Investigation (GI) data to inform on the possible Palaeolithic archaeological and geoarchaeological potential of a site. The GDBA may include, dependant on the site and complexity of a site, a Geoarchaeological Deposit Model which demonstrates the vertical and lateral extent of superficial deposits across the site. The GDBA establishes the requirements for and scope of Stage 2 archaeological and geoarchaeological field elevation. Geoarchaeological potential is defined as potential for paleoenvironmental and dating evidence. Should Stage 2 evaluation be required, appropriate and proportionate recommendations for the site are provided.
Stage 2: Geoarchaeological monitoring of GI works and/or Geoarchaeological borehole survey	Field evaluation to establish the geoarchaeological and archaeological potential of Quaternary deposits within an evaluation area, which informs on the requirements and scope of further works at Stage 2 (e.g. purposive borehole survey), Stage 3 palaeoenvironmental assessment and/or Stage 4 mitigation. The principal methods of geoarchaeological evaluation are through monitoring of Ground Investigation (GI) works or targeted boreholes. A geoarchaeological evaluation report is produced, which includes deposit modelling (where sufficient data allows) and recommendations for further work at Stage 2 or Stage 3 if required. Further works may include additional interventions (stepped trenches, test pits or boreholes) to retain additional/suitable samples for assessment.
Stage 3: Palaeoenvironmental assessment	Palaeoenvironmental samples recovered during Stage 2 are assessed to inform on the archaeological and geoarchaeological potential of deposits and guide the scope and need for Stage 4 analysis. A report is produced outlining the palaeoenvironmental potential of the deposits including targeted and proportionate recommendations for Stage 4 analysis.
Stage 4: Palaeoenvironmental analysis	Based on the results of the Stage 3 palaeoenvironmental assessment, palaeoenvironmental analysis on selected deposits/samples may be required. In addition to full analysis of suitable samples identified during the assessment. work at Stage 4 may include additional scientific dating where appropriate/required. A final analysis report is provided on completion of mitigation program. Where appropriate, this may include recommendations for publication or other forms of dissemination.
Publication	The scope and location of a publication report will be agreed in consultation with the client and LPA advisor. The publication report may comprise a note in a local journal or a larger publication article or monograph, dependant on the significance of the archaeological and geoarchaeological work.

2 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

2.1 Introduction

2.1.1 The archaeological background to the Site was outlined by IWCAHES (2022) in the scoping document and brief, including a review of published and grey literature and the Historic Environment Record for the Isle of Wight (IWHER) for the Site and its immediate

surroundings. The details of this assessment relevant to the geoarchaeological investigations are included here, with the reader referred to IWCAHES (2022) for a more thorough review.

Prehistoric (970,000 BC - AD 43)

2.1.2 No finds earlier than Romano British are recorded within the Site. However, the wider Bowcombe Valley has long been recognised for its significant archaeological landscape, and IWCAHES (2022) suggest that it is likely to have been a focus for human activity from at least the Bronze Age onwards. Sporadic Neolithic, Bronze and Iron Age finds are recorded close to the Site with the Portable Antiquities Scheme (see IWCAHES 2022).

Romano British (AD 43 – AD 410)

2.1.3 IWCAHES (2022) describe at least three buildings of Romano British date, including the villas at Carisbrooke and Clatterford, located within the Bowcombe Valley, although there is debate as to whether Carisbrooke Castle has a Romano-British origin (Young 2000, Tomalin 2002). On the basis of the concentration of activity in the valley, Tomalin (2006) described the area as 'the demographic epicentre of Romano-British Wight'.

Anglo-Saxon to Medieval (AD 410 – AD 1500)

2.1.4 IWCAHES (2022) highlight a concentration of Saxon activity in the area of the Site, including Early Saxon cemeteries excavated at Bowcombe Down (IWHER 449) and Carisbrooke Castle (Arnold 1982, Young 2000). The Lower Enclosure at Carisbrooke Castle has been postulated to be a Saxon burgh of late 10th or early 11th century, predating the establishment of the Motte and Bailey Castle of c. AD 1100 (Young 2000). IWCAHES (2022) record a scatter of metal detector finds south east of Carisbrooke Castle, interpreted as the remains of a possible Mid-Saxon market site (Ulmschneider, 2003).

2.1.5 IWCAHES (2022) discuss the emergence of Late Anglo Saxon estate centres on the Manor of Bowcombe and the parochial of Carisbrooke, as earlier described by Hockey (1982), Sewell (2000) and Margham (1992), and consider the relationship between settlement at Carisbrooke, Bowcombe Farm and the earlier settlement referred to as Bowcombe in the Domesday survey (see Margham 2008).

Investigation of the Roman Villa

2.1.6 The previous archaeological investigation of Clatterford Roman Villa is described in detail in IWCAHES (2022), a summarised excerpt from which is presented here.

2.1.7 The Roman Villa at Clatterford was first noted in the mid-19th century when the Reverend Edmund Kell recorded Roman tile scattered over three fields and described a wall about 3 feet thick of mortared stone and flint which he traced for 20 or 30 feet (Kell 1856; IWHER 496). In 1977 a magnetometer survey and subsequent test pit revealed 'substantial tumbled walling' (IWHER 1416). Metal detector and other finds including Roman pottery and coins, a terret ring, and brooches were reported during the late 1980s (IWCAHES 2022).

2.1.8 In 1991, aerial photography carried out by the Isle of Wight County Archaeological Unit revealed parch marks outlining a building. Subsequent geophysical survey was undertaken by the Ancient Monuments Laboratory in 1993 (Payne 1993). This confirmed the layout of the villa building and also revealed an extensive spread of anomalous features which could not be easily interpreted in the water meadow to the south of the villa (IWCAHES 2022).

2.1.9 In 1995 trial trenching and coring was carried out by English Heritage's Central Archaeology Service in order to investigate the anomalies identified by the geophysical survey in the

water meadow (Busby 1998; Busby et al 2001), the trial trenches providing an indication of the nature of the archaeological deposits within the wetland. The trenches were excavated down to the level of infilled palaeochannels and natural geology, except in Trench 2, where the remains of a chalk floored building (Building 2) were left in situ, and archaeological features including pits and ditches were recorded in plan. Most of the archaeology recorded was at a depth of less than 1 m below ground level (bgl), although the infilled palaeochannels were not bottomed so their depth is unknown (IWCAHES 2022).

2.1.10 The excavation established that the geophysical survey anomalies were generally contemporary with the villa located just beneath the topsoil, and which were likely to be masking earlier Roman activity in the valley bottom; the earliest occupation identified was a buried soil containing ceramics of mid-1st century AD date, although this sealed other buried soils and palaeochannels which could indicate earlier activity (IWCAHES 2022).

2.1.11 Three compact cobble surfaces between 3 and 5 m wide dated to the late 1st to early 2nd century AD were interpreted as several phases of a roadway running along the western side of the villa complex and crossing the wetland. To the east of the roadway, an accumulation of up to 300 mm of herb-rich fen peat (context 537) was recorded in Trench 2 (Scaife 2001). The peat contained a mid-late 1st century AD pottery sherd (Lyne 1998). This accumulation stopped when a flint rubble layer was deposited on top in the 3rd century AD (IWCAHES 2022).

2.1.12 A possible boundary ditch cut into underlying soils and palaeochannels and marking the southern and eastern extent of an enclosure around the villa was suggested to have caused changes to the drainage regime and accumulation of the peat layer (IWCAHES 2022). Phase 4 (late 2nd to early 3rd century) saw the construction of a timber framed building and the deposition of an extensive spread of flint rubble on top of the peat accumulation, interpreted as a major reclamation of the wetland area to the southeast of the villa (IWCAHES 2022).

2.1.13 Extensive palaeochannel deposits were recorded in excavations on the valley floor, overlain at the south eastern end by a peaty layer beneath topsoil and backwater deposits (Busby 1998; see IWCAHES 2022). Busby (1998) suggested that ‘the deposits and stratigraphically later palaeochannels in the southern portion of SSD 1 suggest that the course of the Lukely Brook may have meandered during this period (which IWCAHES 2022 consider meaning after abandonment of the villa) over the southern portion of the valley’.

3 GEOARCHAEOLOGICAL BACKGROUND

3.1 Introduction

3.1.1 The following section provides a summary of the known geoarchaeological record for the Site and surrounding landscape.

3.1.2 Where age estimates are available for deposits, there are expressed in millions of years (Mya), thousands of years (Kya) and within the Holocene epoch as either years Before Present (BP), Before Christ (BC) and Anno Domini (AD). Where radiocarbon dates are included, they are quoted as calibrated (cal.) BC or AD. These dates are supplemented where relevant with the comparable Marine Isotope Stage (MIS) where odd numbers indicate an interglacial period and even numbers a glacial period.

3.1.3 The superficial sediments within the area of the Site include Holocene and potentially Pleistocene units associated with the valley of the Lukely Brook, a tributary of the River Medina which is confluent with the latter c. 3 km downstream just to the northeast of

Newport. Together, the Pleistocene and Holocene epochs form the most recent parts of the Quaternary, a period covering the last 2.6 Mya, and defined by repeated fluctuations between cold (glacial) and warm (interglacial) climate stages (**Table 1**).

Table 2 British Quaternary chronostratigraphy

Geological Period	Chronostratigraphy		Age (Kya)	Marine Isotope Stage (MIS)
Holocene	Holocene interglacial		11.7 – present	1
Late Pleistocene	Devensian Glaciation	Loch Lomond Stadial	11.7 – 12.9	2 – 5d
		Windermere Interstadial	12.9 – 15	
		Dimlington Stadial	15 – 26	
		Upton Warren Interstadial	40 – 43	
		Early Devensian	60 – 110	
	Ipswichian interglacial		115 – 130	5e
Middle Pleistocene		Unnamed cold stage	130-374	6
		Aveley interglacial		7
		Unnamed cold stage		8
		Purfleet interglacial		9
		Unnamed cold stage		10
	Hoxnian interglacial		374 – 424	11
	Anglian glaciation		424 – 478	12
	Cromerian Complex		478 - 780	13 – 19

3.2 Site location, topography and geology

3.2.1 The Site is located to the southwest of Carisbrooke within the upper reaches of the Lukely Brook, where it flows through the Bowcombe Valley, meeting the River Medina c. 3 km to the northeast and to the north of Newport. The centre of the Site is located at National Grid Reference (NGR) SZ 47770 87240 (**Figure 1**).

3.2.2 The Site stretches from Southern Water's Pumping Station to the southwest of Plaish Farm, to Clatterford Shute, covering an area of c. 6 ha and c. 1.25 km in length. The Site is formed of several field parcels of low-lying meadows that are dissected by the Lukely Brook, the topography of the Site being dominated by the valley of the Lukely Brook, lying at c. 33 m OD on the floor of the valley at it southwestern end to c. 27 m OD towards the northeast. The ground rises to levels of c. 38 and 30 m OD where the Site occupies the northern side of the valley, towards the southwest and northeast respectively.

3.2.3 Part of Plaish Meadows and adjacent field upslope are designated as a Scheduled Monument (Clatterford Roman Villa NHLE 1009390). IWCAHES (2022) note that the designated site is restricted to the area of the geophysical survey undertaken in 1993 by the Ancient Monuments Laboratory (Payne 1993), and that there may be significant archaeology beyond the Scheduled Monument.

3.2.4 The whole Site, aside from the most south western field parcel (Horse Paddock) falls within the Carisbrooke Conservation Area (IWCAHES 2022). The whole of the Site is located within the Isle of Wight AONB, whilst Plaish Meadows is a Site of Interest for Nature Conservation (SINC ref. C072A).

3.2.5 The bedrock geology across the majority of the Site is mapped by the British Geological Survey (BGS) as Lower Chalk (Zig Zag Chalk Formation) with Middle Chalk (Holywell Nodular Chalk Formation and New Pit Chalk Formation) to the north (**Figure 1**).

3.3 Superficial Geology

Alluvium

3.3.1 On the floor of the valley the bedrock at the Site is overlain by Holocene alluvium associated with the floodplain of the Lukely Brook, described by the BGS here as clay, silt, sand and gravel (**Figure 2**). Alluvium is a generalised term covering unconsolidated sediment transported by water in a non-marine environment. Pleistocene river terrace deposits are technically alluvium, but the term here is applied to fine-grained deposits of Holocene date (11.7 Ka to present).

3.3.2 The geoarchaeological potential of alluvium is generally low, although it may contain layers of peat or organic-rich deposits of high potential, and may also contain or partially obscure archaeological remains. The floodplain may also contain palaeochannels which are key contexts for understanding the physical evolution of the landscape and act as effective traps preserving both artefacts and ecofacts indicative of the surrounding environment, human activity and land-use.

3.3.3 Previous archaeological excavations (Busby 1998) and palaeoenvironmental analysis of the Site (Scaife 1998; 2001) has revealed the presence of both palaeochannels and peat and organic-rich units within the alluvial sequence of high geoarchaeological and palaeoenvironmental potential. Plant macrofossil and pollen analyses undertaken on the peat and buried soil identified good organic preservation in these deposits, with both charred and uncharred plant remains, including waterlogged material, present.

3.3.4 Pollen analysis was undertaken by Scaife (2001) on peat deposits sealed under a flint rubble adjacent to the villa. Well-preserved pollen was extracted from the peat deposits, which Scaife (1998) described as a rare find given the usual poor preservation of all but hardy pollen grains and spores in calcareous and oxygenated groundwater in chalkland environments elsewhere in southern England. The deposits at the Site thus make a significant contribution to Late Holocene vegetation history on the Isle of Wight.

3.3.5 Scaife (2001) describes the depositional habitat of the Clatterford peat as that of a herb-rich fen, including aquatic and marshland taxa, with a paucity of tree and shrub taxa indicative of an absence of woodland locally. The dominance of herbaceous taxa, including cereals, is attributed to the on-site, peat forming vegetation, the adjacent valley sides and Romano British agricultural landscape in proximity to the villa (Scaife 2001).

Head and colluvium

3.3.6 The BGS maps Head, described as gravel, sand, silt and clay, on the valley slopes north of the Lukely Brook (**Figure 2**). The Head deposits are of unknown date, but may include both Holocene colluvium and Pleistocene slope deposits generally referred to as ‘Head’.

3.3.7 Head and colluvium are deposits which include material reworked downslope through climatically and environmentally controlled slope processes associated with landscape

instability. Head is defined as poorly sorted cold-climate slope deposit that represents material reworked downslope from earlier formations, often through solifluction processes (alternate freeze-thawing). Head deposits are therefore most widely recorded at the base of slopes and along river valleys.

3.3.8 Colluvium represents unconsolidated material which has been deposited downslope by either rainwash, sheetwash and/ or slow continuous downslope creep. Colluviation is likely in areas of topographic relief where soil instability has been brought on by activities such as clearance of woodland, agricultural activity and soil degradation, leading to downslope movement of sediment.

3.3.9 Head and colluvium may include eroded and redeposited archaeology. They also have the potential to contain and/or bury stable land surfaces associated with minimally disturbed/in situ archaeology. Where Holocene colluvium occurs, this could bury archaeological features and layers as well as other deposits of geoarchaeological potential, which at the present Site could include alluvium and archaeological contexts and features associated with the Roman villa.

3.4 Previous investigations

Hydrological monitoring

3.4.1 A summary of the current understanding of the hydrology of Lukely Brook, based on preliminary results from monitoring between August 2017 and February 2018, are outlined within the scoping document and brief (IWCAHES 2022), the results of which have been supplemented by a subsequent report on the initial monitoring programme (Atkins 2023; see below).

3.4.2 Dipwells installed by Atkins upstream and downstream of the Scheduled Monument comprised three dipwells located in the wetland meadow sediments to monitor shallow ground water, and two stilling wells placed in the Lukely Brook and another within the Froglands stream to monitor surface water flows. This was complimented by monitoring of the ground water at depth within the chalk bedrock from a borehole at Plaish Farm.

3.4.3 The results of this work are summarised in IWCAHES (2022). Based on this data, a provisional conceptual model of the hydrological regime has been suggested as follows:

- during dry conditions the chalk groundwater is detached from the upper ground water which is fed from the gravels overlying the chalk
- in wet conditions, upwelling of groundwater in the chalk and lateral flows from the gravels indicate that the two ground water systems are connected

3.4.4 Although there is an understanding of the hydrological regime within the catchment, its relationship to the extent and current state of preservation of the archaeological and palaeoenvironmental deposits within the wetland is not fully understood IWCAHES (2022).

3.4.5 An understanding of the hydrological regime within the catchment is necessary in order to consider the impacts of any changes to land and water management within the catchment upstream and within the vicinity of the Scheduled Monument as a result of the proposed Scheme.

Initial monitoring report (Atkins 2023)

3.4.6 A monitoring programme was agreed with Southern Water and the Environment Agency to monitor both Horse Paddock and Plaish Meadows from May 2022 until December 2024

(Atkins 2023). An interim monitoring report has been completed by Atkins (2023), including the initial results of a monitoring programme implemented for Horse Paddock and Plaish Meadows following the installation of key scheme features in November 2022 (see Section 1.1).

3.4.7 Hydrometric monitoring at five surface water locations (stilling wells) and five shallow groundwater monitoring locations in the floodplain was undertaken to monitor impacts of the scheme features on water levels upstream and downstream of those features (Atkins 2023). Of these 12 locations, three surface water monitoring locations, two groundwater monitoring locations and one barometer were installed in June 2017 by Atkins.

3.4.8 Atkins downloaded the automatic water level monitoring devices, conducted regular stage board and manual water level readings, and processed the data until March 2019 (Atkins 2018). From November 2017 to May 2022, Stantec also downloaded the loggers and recorded stage board and manual dip readings on behalf of Southern Water initially as part of the AMP6 Heavily Modified Water Body (HMWB) project further downstream and more recently as part the Bowcombe Drought Permit baseline monitoring (see Atkins 2023).

3.4.9 In May 2022, two further surface water and three further groundwater monitoring locations were installed by Atkins, and regular stage board and manual groundwater level readings reinstated as part of this project (Atkins 2023). Further detail on the results of the hydrological monitoring, particularly those relevant to the organic deposits at the Site, are present in **Section 7.2**.

Geophysical survey (Wessex Archaeology 2023)

3.4.10 Gradiometer and earth resistance surveys were conducted at the Site in July 2022 by Wessex Archaeology (2023) with the aim of establishing the presence, or otherwise, and nature of detectable archaeological features. The area of the survey encompassed the western part of the Scheduled Monument (not extending to the location of the peat deposits recorded in WA10; see **Figure 3**) and Plaish Meadows, along with an area of land to the northeast of the Scheduled Monument.

3.4.11 The surveys suggested the presence of activity within the western portion of the site, which may be associated with the Roman villa complex to the north-east. A possible wall line, demolition material, and potential ditches are present in the south-western survey area. Given the proximity to the known Roman activity, it was considered possible these relate to further structures and trackways or ditches but are too weak to provide any confident interpretation as to their purpose (Wessex Archaeology 2023).

3.4.12 There is evidence of natural geological variation across the site. This is mostly associated with alluvial deposits associated with Lukely Brook, with a suggested distribution that broadly corresponds to the results of the borehole survey (see **Section 6**). However, there was also evidence that dry conditions at the time of survey limited the effectiveness of the resistivity as the survey moved up the slope away from the brook. The remaining anomalies were modern and related to a footpath and two services.

4 AIMS AND OBJECTIVES

4.1 Introduction

4.1.1 A brief for a geoarchaeological borehole survey was prepared by IWCAHES (2022) following consultation with Southern Water, Atkins and Historic England's Regional Science Advisor and Inspector for Ancient Monuments. The overall archaeological field assessment at the Site will comprise geophysical survey, borehole survey to assess the nature, extent

and preservation of deposits, in particular organic/palaeoenvironmental remains, and a watching brief on proposed groundworks in the Horse Paddock and Sheep Dip Fields.

4.1.2 As outlined in IWCAHES (2022), proposed piezometers located within the Scheduled Monument will enable the hydrological conceptual model to be directly related to the distribution and character of the archaeological deposit sequence, and its current state of preservation. The geoarchaeological recording of the deposit sequences at the piezometer locations (and elsewhere) will allow the stratigraphy to be correlated with the previous records.

4.1.3 Subsequent palaeoenvironmental assessment of the organic deposits will enable the previous and current state of preservation of the remains to be compared and any impacts from the Scheme to be assessed. It will also inform the future management of the scheduled site.

4.1.4 On the basis of the geoarchaeological potential of the superficial deposits at the Site, a geoarchaeological borehole survey comprising a total of 12 boreholes (WA-01 to WA-12) was recommended, including a total of three boreholes for piezometer installation work (WA-10 to WA-12), at specified locations agreed with Historic England and the IWCAHES (**Figure 3**).

4.1.5 The aims and objectives of the geoarchaeological investigations were met through the application of the field and post-fieldwork methods outlined in **Section 5**.

4.2 Overarching aims and objectives

4.2.1 The overarching aims and objectives of the geoarchaeological and archaeological works at the Site are to:

- establish the potential for archaeological and palaeoenvironmental remains to survive in each location (Horse Paddock, Plaish Meadows, Sheep Dip Fields);
- characterise the sequence of superficial deposits at the Site;
- obtain baseline data on the present condition of archaeological and palaeoenvironmental remains to allow for meaningful monitoring and management in the future; and
- examine the relationship between the state of preservation of archaeological and palaeoenvironmental remains and the water environment of the Site, to better-understand the threat to their survival and significance from future changes in hydrology.

4.3 Site specific aims and objectives

4.3.1 The specific aims and objectives of the geoarchaeological investigations are to:

- undertake a geoarchaeological borehole survey, comprising a total of 12 boreholes (including three for piezometer installation work) to a depth of c. 3m below ground level (bgl) or until the bedrock is reached;
- describe the character and distribution of the superficial deposits at the Site;
- correlate the deposits present within the Scheduled Monument with those recorded during previous excavations at the Site;
- enable comparison between organic/biological preservation in samples retained during the previous excavations with those arising from the present investigation;

- enable any likely impacts from the Scheme to be assessed;
- assess the current state of preservation of environmental remains and organic deposits, which will form a baseline for future work and enable comparison with previous work;
- utilise the findings of the updated hydrological conceptual model to examine the relationship between the state of preservation of archaeological and palaeoenvironmental remains and the water environment of the site; and
- report on the results and inform on future management of the Scheduled Monument.

5 METHODS

5.1 Introduction

5.1.1 Health and safety override archaeological considerations in all works since, as stated in CIfA guidance, *Health and Safety regulations and requirements cannot be ignored no matter how imperative the need to record archaeological information; hence Health and Safety will take priority over archaeological matters* (CIfA 2020a, 11).

5.1.2 All works were undertaken in accordance with the detailed methods set out within the WSI (Wessex Archaeology 2022). Any significant variations to these methods were agreed in writing with IWCAHES and Historic England's Regional Science Advisor and Inspector for Ancient Monuments, and the client, prior to being implemented. The fieldwork was carried out under the supervision of an experienced geoarchaeological specialist.

5.2 Setting out of the boreholes

5.2.1 All boreholes were set out using GNSS in the approximate positions shown in **Figure 3**. The borehole locations were tied into the Ordnance Survey (OS) National Grid and Ordnance Datum (OD) (Newlyn), as defined by OSGM15 and OSTN15.

5.2.2 Before excavation began, area of the boreholes was walked over and visually inspected to identify the location of any below/above-ground services. All borehole locations were scanned before and during excavation with a Cable Avoidance Tool (CAT) to verify the absence of any live underground services.

5.2.3 A hand-dug test pit was excavated to a depth of 1.2 m below ground level (bgl) prior to drilling.

5.3 Geoarchaeological borehole survey

5.3.1 The geoarchaeological borehole survey was undertaken in two phases. In the first phase, nine window sample boreholes were undertaken using a hand-held window sampling rig at the locations of WA-02, WA-04 to WA-10 and WA-12 in June and July 2022. Due to access constraints in the form of overgrown vegetation, boreholes WA-01, WA-03 and WA-11 were not undertaken in this phase of fieldwork.

5.3.2 An experienced member of the Wessex Archaeology geoarchaeology team monitored the excavation of targeted geoarchaeological boreholes undertaken using a hand-held window sampling drilling rig operated by experienced geotechnical drillers from Geotechnical Engineering Ltd (GEL). The attending geoarchaeologist liaised closely with the geotechnical drillers in order to ensure effective communication was maintained throughout the works.

5.3.3 Boreholes WA-01, WA-03 and WA-11 were undertaken in July 2022 during a second phase of borehole survey by IWCAHES using a hand (narrow gouge) auger.

5.3.4 The boreholes were excavated to depths between 0.23 and 2.0 m below ground level (bgl). Samples retained in sleeved plastic liners were sealed and marked with the project number, site number, borehole number and sample depth and returned to the Wessex Archaeology laboratory for later description. Boreholes were backfilled with a combination of bentonite and arisings from the borehole.

5.3.5 The supervising geoarchaeologist recorded and interpreted the sequence of deposits encountered to allow assessment of likely geoarchaeological potential. Where appropriate, selected cores were retained as part of the sedimentary archive against which further works will be recommended.

5.3.6 Any exposed archaeological deposits and features were recorded using a pro forma recording system. A record of the datum (either m above Ordnance Datum or m below ground level) levels of the archaeological deposits was recorded by the monitoring geoarchaeologist. This data was tabulated by test pit/borehole and depth.

5.4 Sediment description

5.4.1 The boreholes were recorded using Wessex Archaeology's pro-forma digital recording system. For each stratigraphic unit descriptions and interpretations of the deposits are provided. Descriptions of deposits included information such as:

- *Depth*
- *Texture*
- *Composition*
- *Colour*
- *Inclusions*
- *Structure*
- *Shape and nature of contacts between deposits*

5.4.2 Interpretations included, where possible, probable depositional environments and formation processes.

5.4.3 For the peat deposits in WA10, the Troels-Smith (1955) method for the description of unconsolidated sediments and peat was adopted in the laboratory, noting the physical properties (colour), composition (gravel, sand, clay, silt and organic matter), peat humification and inclusions (e.g. artefacts). The procedure involved: (1) cleaning the samples with a spatula to remove surface contaminants; (2) recording the physical properties; (3) recording the composition, including moss peat (Turfa bryophytica; Tb), wood peat (Turfa lignosa; Tl), herbaceous peat (Turfa herbacea; Th), completely disintegrated organic matter (Substantia humosa; Sh), gravel (Grana glareosa; Gg), fine sand (Grana arenosa; Ga), silt (Argilla granosa; Ag) and clay (Argilla steatoides); (4) recording the degree of peat humification, and (5) recording the boundary changes e.g. sharp or diffuse. The results of the field and laboratory-based descriptions are provided in **Appendix 1**, with selected records displayed in **Figures 4** and **5**.

5.4.4 A full photographic record was made using a digital camera equipped with an image sensor of not less than 10 megapixels. This recorded both the detail and the general context of the principal lithological and stratigraphic features, and the evaluation area as a whole.

5.4.5 Digital images were subject to managed quality control and curation processes which will embed appropriate metadata within the image and ensure long term accessibility of the image set. Photographs were taken of all areas, including access routes, to provide a record of conditions prior to and on completion of the borehole survey.

5.5 Survey

5.5.1 The real time kinematic (RTK) survey of all boreholes was carried out using a Leica GNSS connected to Leica's SmartNet service. All survey data was recorded in OS National Grid coordinates and heights above OD (Newlyn), as defined by OSGM15 and OSTN15, with a three-dimensional accuracy of at least 50 mm.

5.6 Deposit modelling

5.6.1 A geoarchaeological deposit model was constructed for the site following a review of the data arising from the borehole survey and four nearby British Geological Survey (BGS) online archive boreholes (https://mapapps2.bgs.ac.uk/geoindex/home.html).

5.6.2 Only those stratigraphic records with sufficiently detailed descriptive terminology and location data (including surface elevation) were included in the model. The deposit modelling was undertaken following the guidelines in Historic England (2020).

5.6.3 All available data points were entered into industry standard geological utilities software (RockWorks 23). Each stratigraphic unit was given a colour and pattern allowing cross correlation and grouping of the different sedimentary units. The grouping of these deposits is based on lithological descriptions, which define distinct depositional environments referred to as 'stratigraphic units'.

5.6.4 Sedimentary units from the boreholes were classified into six stratigraphic units: (1) bedrock, (2) peat, (3) peat with anthropogenic inclusions, (4) colluvium, (5) subsoil and (6) topsoil. The classified data for groups 1 to 6 were then input into a database within the RockWorks 23 program.

5.6.5 Two-dimensional stratigraphic profiles ('transects') of selected interventions across the site were generated using RockWorks 23. The transects are illustrated in **Figures 4** and **5**, showing the main stratigraphic units and their lateral and vertical variability across this area of the site.

5.6.6 The key aims of the modelling were to interpret the data, identify the probable depositional environments represented, and determine areas of higher and/or lower geoarchaeological potential where further work may be required (e.g., deposits with potential for the recovery of significant archaeological and palaeoenvironmental remains).

5.7 Plant macrofossil assessment

5.7.1 A total of eight subsamples from borehole WA10 were processed for the recovery of palaeoenvironmental evidence (plant macroremains, wood, invertebrates) to assess waterlogged preservation conditions at the site.

5.7.2 The primary aim of the assessment was to determine the condition of the waterlogged plant macroremains, wood, and invertebrate remains at the site. The assessment has been

undertaken in accordance with the guidance outlined in *Preserving Archaeological Remains: Appendix 2 – Preservation Assessment Techniques* (Historic England 2016) and *Environmental Archaeology: A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation* (English Heritage 2011).

5.7.3 The subsamples ranged between 10 ml to 20 ml in volume processed by wet sieving using a 0.125 mm mesh. The processed samples were kept wet and stored in a refrigerated unit prior to assessment.

5.7.4 The samples were examined using a stereomicroscope at up to x40 magnification for uncharred and charred botanical remains, including organic/vegetative material, herbaceous epidermal tissues, wood remains, mosses, and plant macroremains ('seeds'), as well as other material (e.g., insects/invertebrates, molluscs, etc.). Plant macroremains were identified through comparison with modern reference material held by Wessex Archaeology and relevant literature (Cappers *et al.* 2006). Selected wood fragments were identified to provide suitable material for radiocarbon dating through examination of the transverse, tangential longitudinal, and radial longitudinal sections at up to 400x magnification. Wood identifications were aided through comparison with Wessex Archaeology's reference collection and relevant literature (Gale and Cutler 2000; Hather 2000; Schweingruber 1990). Nomenclature follows Stace (1997) for wild taxa, with additional habitat information taken from Preston *et al.* (2002).

5.7.5 Remains were recorded semi-quantitatively on an abundance scale: C = <5 ('Trace'), B = 5-10 ('Rare'), A = 10-30 ('Occasional'), A* = 30-100 ('Common'), A** = 100-500 ('Abundant'), A*** = >500 ('Very abundant/Exceptional').

5.8 Radiocarbon dating

5.8.1 Single-entity, short-life samples of waterlogged wood (e.g., twigs, branchwood) were selected as the first-choice for radiocarbon dating following Historic England's guidelines for *Radiocarbon Dating and Chronological Modelling* (Bayliss and Marshall 2022). Extracted remains were stored in a small quantity of de-ionised water in glassware and refrigerated prior to submission.

5.8.2 One sample of waterlogged wood was submitted for radiocarbon dating to Beta Analytic, Florida. The sample was pre-treated and measured following standard procedures, with full details of analytical methods available online at https://www.radiocarbon.com/ (ISO/IEC 17025:2017 accreditation).

5.8.3 The results are presented as conventional radiocarbon ages (Stuiver and Polach 1977) together with calibrated date ranges which have been calculated using the probability method (Stuiver and Reimer 1993) in OxCal 4.4 (Bronk-Ramsey 2009) with the atmospheric calibration curve for the northern hemisphere, IntCal 2020 (Reimer *et al.* 2020). Calibrated dates are reported at the 95% probability level, with end points rounded outwards to 10 years. The reported $\delta^{13}C$ values were measured separately by Isotopic Ratio Mass Spectrometry (IRMS).

5.9 Pollen assessment

5.9.1 A total of eight samples were submitted for pollen assessment from borehole WA10. The majority of samples were deemed organic-rich, although minerogenics were either described or encountered during pollen preparations. **Table 3** summarises the pollen sampling strategy and associated lithologies applied by Wessex Archaeology.

5.9.2 The value of undertaking an assessment of palynological potential at this site is emphasised by the comparative scarcity of pollen profiles from chalkland landscapes. Whilst peat deposits located on, or in proximity, to chalk downland is not uncommon on the Isle of Wight, Scaife (2001) described the Clatterford sequence as being the first in which pollen had been successfully extracted from a peat sequence on chalkland. As the sequence from Lukely Brook has been derived from within a Scheduled Monument, Wessex Archaeology requested a standard assessment of potential to be undertaken, in conjunction with an assessment of the preservation of pollen within the sequence, following the guidelines outlined by Historic England (2016), summarised in **Table 4**. Such an approach was proposed by to provide baseline data associated with the level of pollen preservation within this unique chalkland-peatland sequence.

5.9.3 Pollen preparation will vary depending on the organic/minerogenic content of each sample. Preparations were undertaken at The Department of Geography, University of Liverpool, broadly following the methodology outlined by Campbell et al (2016), to include (1) sampling a standard volume of sediment; (2) adding one tablet of the exotic clubmoss *Lycopodium clavatum* to provide a measure of pollen concentration in each sample; (3) treatment with hydrochloric acid and potassium hydroxide to remove carbonates and humic acids respectively (4) sieving of the sample to remove coarse mineral and organic fractions (>180µm); (5) removal of finer minerogenic fraction (using sodium pyrophosphate); (6) density separation (sodium polytungstate); (7) acetolysis and (8) mounting of the sample in glycerol jelly and onto microscope slide.

Table 3 Summary of the samples submitted for pollen assessment

Borehole	Depth (m bgl)	Description	Interpretation
WA-10	0.24	Very dark brown. soft well humified moist organic matter with reeds/hollow stems throughout.	Peat/topsoil interface
	0.32		
	0.40	Very dark brown well humified, moist organic matter with trace of small rootlets throughout. Homogenous texture.	Peat
	0.48		
	0.56		
	0.64	Dark brown, grey in places, gravel and chalky fragments within matrix of well humified, moist organic matter.	
	0.72	Dark brown well humified, moist organic matter, with fibrous wood fragments, as well as a brick/CBM fragment.	Disturbed peat (archaeology - likely CBM)
	0.80		

5.9.4 Upon completion of preparation, a standard assessment of potential would require either a total of 10 microscope slide traverses to be undertaken, or a count of at least 100 total land pollen grains (TLP) excluding aquatics and spores (whichever comes first). During assessment, comments of other visible microfossil features (charcoal, pre-Quaternary pollen and spores, other identifiable non-pollen palynomorphs such as dinoflagellate cysts, testate amoebae etc) are also provided, if encountered.

5.9.5 In order to undertake the assessment of deterioration (Historic England, 2016), for each sample, 100 identifiable pollen grains were required and as such, additional slide traverses were undertake for some samples in which pollen abundance was found to be low. The 100 grains were then scored using the criteria summarised in Table 2. The scores were then

used to calculate each sample's preservation index (described further in the Discussion section; Tinsley, 2013).

Table 4 Preservation categories used for identified pollen grains, as summarised in Historic England (2016), modified from Delcourt and Delcourt (1980) and Tinsley (2013)

Deterioration type		Description	Processes responsible	Category	Score	Weighting for calculation of preservation indices
		After Delcourt & Delcourt (1980)				
Well preserved		No observable deterioration		1. well preserved	0	0
Biochemical deterioration	Corroded	Exine pitted, etched or perforated	Biochemical oxidation related to fungal/bacterial activity	2. <¼ corroded	1	0
				3. ¼-½ corroded	2	
				4. >½ corroded	3	
	Degraded	Exine thinned and/or structural features fused and indeterminate	Chemical oxidation within aerial and sub-aerial environments	5. partly degraded	1	
				6. extensively degraded	2	
				7. outline of grain only	3	
Mechanical deterioration	Broken	Grain split or fragmented	Physical transport of pollen grains	8. partly broken	1	X 3/2
				9. extensively broken	2	
	Crumpled	Grain squashed	Compaction of grains within the sediment, particularly resulting from the progressive extrusion of water	10. partly crumpled	1	
				11. extensively crumpled	2	

6 RESULTS

6.1 Introduction

6.1.1 This section summarises the results of the geoarchaeological borehole survey and palaeoenvironmental assessment, integrating the results of a water environment assessment. A total of 12 geoarchaeological boreholes (**Appendix 1**) were undertaken as outlined in **Section 4.3**, followed by a programme of palaeoenvironmental assessment and scientific dating of deposits in WA-10.

6.1.2 The results of the geoarchaeological borehole survey are presented below, supported by the geoarchaeological deposit models presented in **Figures 4** and **5**. This is followed by the results of the water environment assessment and palaeoenvironmental assessment.

6.2 Borehole survey

6.2.1 The locations of the geoarchaeological boreholes at the Site are shown in **Figure 3**. The mechanical (hand held window sampler) boreholes were put down to depths between 0.4 and 2.0 m bgl, with the hand auger boreholes put down to between 0.23 and 0.47 m bgl. The full sequence of deposits recorded during the borehole survey, demonstrated in **Figures 4** and **5**, comprises:

- Topsoil/subsoil (modern)
- Organic alluvium (Holocene)

- Peat (Late Iron Age to Early Romano-British)
- Colluvium (Holocene)
- Bedrock (Late Cretaceous Chalk)

6.2.2 More detail on the variability and composition of these deposits is described below, with a consideration of their geoarchaeological and archaeological potential outlined in **Section 6**.

Bedrock

6.2.3 The bedrock was recorded as a weathered chalk, generally comprising chalk and flint gravel in a firm to stiff matrix of sand, silt or clay. This unit was encountered in all but the hand auger boreholes (WA01, WA03 and WA11) at depths between 0.2 (WA07) and 1.3 m bgl (WA10). The surface of the bedrock falls from c. 30 m OD in the area of WA12 to c. 24.9 m OD in WA03 (**Figure 5**).

6.2.4 The hand auger boreholes penetrated to depths of 0.23 (WA03) to 0.47 m bgl (WA11) where obstructions were encountered; it is unclear what the nature of the obstruction in these boreholes was, although based on their location it seems unlikely to have been the bedrock chalk. These boreholes are therefore not likely to have recorded the full sequence of superficial deposits.

Colluvium

6.2.5 Deposits comprising poorly sorted subangular flint gravels in a matrix of sand, silt and/or clay were recorded at between 0.37 to 0.58 m bgl in WA05 and 1.00 to 1.30 m bgl in WA12. These sediments are interpreted as material which has been deposited downslope by either rainwash, sheetwash and/ or slow continuous downslope creep, and are of unknown Holocene date.

Peat

6.2.6 Peat was identified in a single borehole (WA10) located within the Scheduled Monument in Plaish Meadows (see **Figure 4**), close to Trench 2 excavated by Busby et al (2001). The peat here was described using the Troels-Smith (1955) method as a very dark brown well humified decomposed organic matter with traces of herbaceous rootlets (Sh4 Th+ Ag+; humo. 3) between 0.36 and 0.69 m bgl (25.34 to 25.01 m OD) and a dark brown well humified decomposed organic matter with fibrous wood fragments and a CBM fragment (Sh2 $Th^2$1 Tl21; humo. 2) between 0.69 and 0.80 m bgl (25.01 to 24.90 m OD).

6.2.7 The fragment of CBM in this unit was examined by a finds specialist and found to be of Romano-British date, but not datable to a specific period or brick/tile type due to the absence of the full thickness of the piece. It is, however, in a standard fabric for the Carisbrooke area.

6.2.8 The upper surface of the peat was affected by modern soil forming processes, and was described as a very dark brown soft well humified decomposed organic matter with moderately humified reeds/hollow stems (Sh3 $Th^2$1 Ag+; humo. 3) in its upper part (between 25.47-25.34 m OD).

6.2.9 The peat is relatively localised in extent, and was not recorded in the remainder of the boreholes. Peat comprises partially decomposed organic matter preserved within waterlogged anaerobic (oxygen-free) conditions, formed within a semi-terrestrial environment supporting the growth of fen wetland vegetation. This unit is present towards the base of the valley (see **Figure 4**), not far from the modern stream, and may have formed in a boggy location related to either an abandoned channel or a floodplain hollow associated with the Lukely Brook.

6.2.10 A subsample for radiocarbon dating was obtained from the base of this unit (0.78 to 0.80 m bgl) (see **Section 6.4**).

Organic alluvium

6.2.11 Alluvium recorded as an organic silt with occasional chalk flecks was recorded at between 0.27 and 0.36 m bgl in WA01. These deposits are recorded at similar elevations upstream (c. 35 m) of the peat identified in WA10. This deposit is likely to have formed in a low energy environment such as a slow-moving or deactivated channel or within a freshwater back swamp environment associated with the floodplain of the Lukely Brook.

Topsoil/subsoil

6.2.12 The topsoil/subsoil was between 0.2 and 0.5 m thick and was generally described as a humic loam with frequent root material. Where the soil was recorded forming into the peat in WA10 it was described as a well humified moist organic matter with frequent root material present at between 0.23 and 0.36 m bgl. Where the soil is present on chalk bedrock it is generally described as a loam with frequent angular flint and chalk gravels.

6.3 Plant macrofossil assessment

6.3.1 The results of the palaeoenvironmental assessment are summarised in **Table 5**. The samples produced small quantities of waterlogged remains, including plant macroremains ('seeds'), wood fragments, and invertebrates (e.g., beetle fragments, earthworm egg cases). Charred plant remains and wood charcoal are recorded in trace quantities. Other material noted comprises fragments of pottery/CBM and animal bone.

6.3.2 There were too few remains available to undertake a detailed assessment of preservation conditions following Historic England's (2016) guidance. However, the condition of the waterlogged plant, wood, and invertebrate remains can be characterised as very poor to poor based on the degraded nature of the wood fragments and the limited range of plant taxa present, including species with decay-resistant seeds.

6.3.3 In general, the samples from the upper parts of the sequence contain fine rootlets, herbaceous stems, small wood fragments, and low numbers of plant macroremains. With increasing depth, the samples contain fewer rootlets and slightly higher concentrations of plant macroremains and wood fragments. The sample from 0.78–0.80 m produced a comparatively large fragment of wood (approx. 5 by 2 cm) together with numerous smaller wood fragments. The wood fragment has moderate growth ring curvature, eccentric growth rings/rays, and a twisted appearance which suggests that it is reaction wood (e.g., a knot or branch). It is difficult to identify reaction wood to species, although the fragment has been tentatively identified as an apple sub-family species (cf. Maloideae) based on the presence of solitary vessels in the transverse section and multi-seriate rays (2-3 wide) in the tangential section. However, other key diagnostic features could not be observed to confirm this identification. Other wood species may be present, although only a few fragments were examined as part of this assessment to provide material for radiocarbon dating.

6.3.4 The waterlogged plant macroremains include seeds of rushes (*Juncus* sp.), willowherbs (*Epilobium* sp.), common nettle (*Urtica dioica*), elder (*Sambucus nigra*), sedges (*Carex* sp.), marshworts (*Apium* sp.), docks (*Rumex* sp.), and buttercups (*Ranunculus* subg. *Ranunculus*). Some of these plant macroremains appear to be modern contaminants based on their excellent condition. To test this, a few seeds of buttercup and common nettle were extracted, and these subsequently germinated on a Petri dish, confirming that at least some of these plant macroremains are recent intrusions. With the exception of the well-preserved seeds of common nettle, most of the plant macroremains display signs of erosion/corrosion

and fragmentation. In particular, the elder seeds were generally highly fragmented (>50% fragmented), although some entire seeds were also present. Similarly, marshwort seeds tended to be fragmented (25-50%), and damage to their 'bars' indicates erosion/corrosion.

6.3.5 Charred plant remains comprised a few cereal (Triticeae) grains and small-seeded grasses (Poaceae).

Table 5 Results of the palaeoenvironmental assessment, borehole WA10

Depth bgl (m)	Sample vol. (ml)	Flot vol. (ml)	Sample composition
0.24-0.26	12	5	Fine rootlets and herbaceous stems A**; degraded small wood frags C; plant macroremains ('seeds') A* - *Rumex* sp. (modern?), *Juncus* sp., *Epilobium* sp., *Urtica dioica*; charred plant material C <1 mm; Earthworm egg cases B
0.32-0.34	10	5	Fine rootlets and herbaceous stems A**; degraded small wood frags C; plant macroremains ('seeds') A - *Juncus* sp., *Sambucus nigra*, *Urtica dioica* (inc. germinated - modern), *Ranunculus* subg. *Ranunculus*; charred plant material, inc. wood charcoal 1-2mm C, <1mm A*; Earthworm egg cases C
0.40-0.42	10	5	Fine herbaceous stems A**; plant macroremains ('seeds') A* - *Urtica dioica* A (germinated – modern), *Ranunculus* subg. *Ranunculus* (germinated - modern) *Rumex* sp., *Juncus* sp.; charred plant material <1mm C
0.48-0.50	12	5	Fine herbaceous stems A**; plant macroremains ('seeds') A - *Urtica dioica*, *Sambucus nigra* (fragmented), *Juncus* sp. A; charred plant material inc. wood charcoal >2mm C, 1-2mm A, <1mm A*
0.56-0.58	15	10	Fine herbaceous stems A**; plant macroremains ('seeds') A - *Urtica dioica*, *Sambucus nigra* (fragmented), *Juncus* sp. A; charred plant material inc. wood charcoal >2mm A*, 1-2mm A**, <1mm A***, charred Poaceae (small <2mm) C and Triticeae grain frag.; animal bone frags C; Coleoptera frags.; Animal bone.
0.64-0.66	10	5	Fine herbaceous stems A*; plant macroremains ('seeds') B - *Urtica dioica*, *Sambucus nigra* (fragmented), *Juncus* sp. A, *Carex* sp. (fragmented), *Apium* sp. (fragmented, eroded); charred material inc. wood charcoal >2mm A*, 1-2mm A*, <1mm A**, charred Triticeae grain; Coleoptera frags.; Animal bone.
0.72-0.74	15	15	Fine herbaceous stems A*, wood frags and some bark A (eccentric growth rings, reaction wood?); plant macroremains ('seeds') B - *Sambucus nigra* (fragmented), *Juncus* sp. C; charred plant material inc. wood charcoal 1-2mm C, <1mm B; earthworm egg case
0.78-0.80	20	20	Fine herbaceous stems A, wood frags. A** (inc. large frag. approx. 5cm by 2cm, eccentric growth rings – reaction wood (C14 dated, Beta-654319); plant macroremains ('seeds') C – *Apium* sp.; charred plant material <1mm C

6.4 Radiocarbon dating

6.4.1 The results of the radiocarbon dating are presented in **Table 6**. The wood fragment from between 0.78 and 0.80 m bgl in WA10 returned a Late Iron Age to Early Romano-British date of 60 cal. BC – cal. AD 120 (2000 ± 30 BP; Beta-654319).

6.4.2 The sample is reaction wood with moderate growth ring curvature, probably indicating it is from a branch. There is unlikely to be any considerable age-offset due to the 'old wood effect'. The large-size of the wood fragment makes it unlikely that it has been re-worked within the profile, and it should therefore provide an accurate date for the deposit.

Table 6 Radiocarbon dating results

Laboratory number	Depth bgl (m)	Sample details	$\delta^{13}C$ ‰*	Radiocarbon age (BP)	Calibrated date (95% probability)
Beta-654319	0.78-0.80	Waterlogged wood: cf. Maloideae (Apple sub-family) – reaction wood with moderate growth ring curvature	-28.8	2000 ± 30	60 cal. BC – cal. AD 120

**Measured by IRMS*

6.5 Pollen assessment

6.5.1 A total of eight samples were assessed from WA10, with the two basal samples deriving from a disturbed peat, overlain by four samples from the main peat unit and a further two samples from topsoil/peat. Pollen abundance and floral diversity was found to vary between samples, but overall pollen abundance and diversity was found to be moderate to good. Of the eight samples under assessment, only two samples contained pollen in low relative abundance. **Table 7** summarises the results obtained from assessment of pollen from borehole sequence. In addition to this, the preservation index is also provided in **Table 8**.

6.5.2 The lowermost samples associated with the 'disturbed peat' contained a relatively diverse floral signal consisting of a mix of trees, shrubs and herbs. In the arboreal realm, *Alnus* (alder) was most common, with small contributions also from *Quercus* (oak) and *Pinus* (pine). A single grain of *Tilia* (lime) was identified within the basal sample. Shrubs were dominated by *Corylus-Myrica* type (hazel or sweetgale), but occasional grains of *Hedera helix* (ivy) and *Salix* (willow) were noted in the upper sample. Herbs are typified by Poaceae (wild grasses), Lactuceae (dandelions etc) and Cyperaceae (sedges), supported by a suite of subordinate herbs including Asteraceae (daisies etc), Brassicaceae (mustards etc), Caryophyllaceae (pink family), *Plantago* undiff. (plantains) and *Ranunculus* (buttercups). Aquatics are absent except for a single grain tentatively identified as *Menyanthes* (bogbean). Spores are typified by *Pteropsida* (monolete) undiff. (ferns), whilst occasional spores of *Sphagnum* (moss), *Pteridium* (bracken) and *Polypodium* (polypody) were also recorded within this basal unit. Other microfossil evidence includes the presence of *Pediastrum*, Pseudoschizaea and *Trichuris* eggs within the lowermost sample.

6.5.3 The overlying peat unit consisted of four samples which yielded broadly similar assemblages. When compared to the underlying samples, there is an apparent increase in the contribution from herbs, with both trees and shrubs reducing in abundance in response. Herbs continue to be dominated by Poaceae and Cyperaceae, both of which increase in numbers, Lactuceae continues to contribute similar numbers to that within the underlying samples, whilst there is a subtle increase in the abundance of the subordinate herbs such as Asteraceae, Brassicaceae and *Plantago* undiff. Occasional grains of *Centaurea nigra* (knapweed), in addition to a single grain of *Centaurea cyanus* (cornflower) were recorded toward the top of the unit. Shrubs are now typified by only occasional grain of *Corylus-Myrica* type and *Hedera helix*, whilst some grains of Ericaceae (heathers) were also noted in one sample. There is a subtle reduction in shrubs with height. Trees also follow this overall trend of reduced influence with height. *Alnus* is much more restricted in abundance, in addition to only occasional grains of *Pinus* and *Fraxinus* (ash). A few grains of *Ulmus* (elm) were noted within a single sample from the unit. Aquatics are absent, whilst spores have reduced in numbers when compared to the underlying samples, with occasional spores of *Pteropsida* (monolete) undiff, *Pteridium* and *Polypodium* noted. Other microfossil evidence is similarly limited, with charcoal encountered in low numbers, occasional *Trichuris* eggs and Pseudoschizaea in varying numbers.

6.5.4 The uppermost samples, from the assumed topsoil/peat interface, contain assemblages almost wholly typified by herbs. Whilst occasional grains of trees and shrubs are noted (incl. *Pinus*, *Fraxinus*, *Hedera helix* and *Salix*), herbs are dominant and the section of the profile is once again typified by Poaceae, Lactuceae and Cyperaceae, with the assemblage supported by Asteraceae, Brassicaceae, *Plantago* undiff. *Centaurea nigra* is encountered in both samples, albeit isolated grains. Again, aquatics are absent and spores remain typified by *Pteropsida* (monolete) undiff, *Pteridium* and *Polypodium*. Additional microfossil evidence is restricted to occasional charcoal, testate amoebae and Pseudoschizaea.

Table 7 Results of the pollen assessment

Stratigraphy		Topsoil/Peat		Peat				Disturbed Peat	
Depth (m bgl)		0.24	0.32	0.40	0.48	0.56	0.64	0.72	0.80
Trees	*Alnus*					1	2	10	17
	Betula		1		1				
	Fraxinus	2	1			1	7		
	Pinus	4	9	11	6	4	1	4	3
	Quercus							1	4
	Tilia								1
	Ulmus					2			
Shrubs	*Corylus-Myrica* type				2	4	2	18	17
	Ericaceae undiff.					2			
	Hedera helix		2		1	1	4	2	
	Salix	2						1	
Herbs	Poaceae	34	19	36	41	33	31	25	21
	Poaceae >37mic	2	2	2	3	2	3	2	1
	Cyperaceae	29	27	33	22	14	22	12	13
	Apiaceae (Umbelliferae) undif.				1				
	Artemisia type				1				
	Asteraceae	4	7	2	3	5	2	1	2
	Brassicaceae	1	2	3	1	2	5		2
	Caryophyllaceae		1		1	1		2	1
	Centaurea cyanus			1					
	Centaurea nigra	1	1	1	2				
	Chenopodiaceae		1		1	1		1	
	Cirsium type		1			1		1	
	Filipendula	2							2
	Lactuceae	12	18	10	12	15	16	18	10
	Plantago sp.	1	6	4	1	4	2	1	1
	Polygonum sp.								
	Rubiaceae	2			1				
	Ranunculus	2				2	1	2	1
	Rhinanthus	1		2					
	Rumex	1	1						1
	Sanguisorba					1	1	1	
	Urtica				1		1		
Spores	*Dryopteris*								
	Polypodium	1	2	3	1	1	1	10	2
	Pteridium	6	4	7	8	3	1	8	5
	Pteropsida (monolete) undif.	7	2	4	3	3	6	37	15
	Sphagnum								3
	Thelypteris				1				

Stratigraphy		Topsoil/Peat		Peat				Disturbed Peat	
Depth (m bgl)		**0.24**	**0.32**	**0.40**	**0.48**	**0.56**	**0.64**	**0.72**	**0.80**
Aquatics	*Hydrocotyle*								
	Menyanthes								1
	Typha latifolia								
Charcoal		x	x	x		x	x		
Testate amoebae		x	x						
Pseudoschizaea		x	xx	xx	xx	x		xx	x
Trichuris eggs						xx	x		x
Pediastrum							x	xx	xx
Abundance		low	mod	mod	mod	high	low	mod	mod
Diversity		low	mod	mod	mod	mod	low	mod	mod
Suitable for further analysis?		n	y	y	y	y	n	y	y

x = present, rare, xx = present, occasional, xxx = common, xxxx = abundant, xxxxx = super-abundant

Summary

6.5.5 Most of the plant taxa present are typical of mire vegetation communities (Preston *et al.* 2002). In particular, common nettle often forms a component of nutrient-rich fen communities, probably explaining its presence throughout the sequence. The pollen assemblage in WA10 was found to contain a floral signal of moderate to good abundance and diversity. Overall, the pollen signal was broadly similar throughout the eight samples under assessment, but there is a reduction in trees and shrubs with height through the profile. At the base of the sequence, within the 'disturbed peat' unit, there was a more mixed pollen signature, typified by trees, shrubs and herbs. Alder and hazel or sweetgale are most typical, likely a reflection of marginal valley floor woodland. Given the floral signal and stratigraphy encountered, the trizonoporate grain interpreted as either hazel or sweetgale, is likely hazel and will be referred to as such from hereon in. The arboreal signal is also supported with occasional grains of pine, oak (and ?lime), likely a reflection of sparse woodland on the drier uplands. The overall dominance of wild grasses, sedges and dandelions etc however suggests that the landscape was already open at this time.

6.5.6 Isolated large wild grass grains could allude to cereal pollen, but the grains were often very crumpled and would prevent reliable identifications. Spores are encountered in their greatest numbers within the basal samples, typified by ferns, bracken and common polypody (but some sphagnum moss was also observed). This may support the presence of ferns under the canopy of the surrounding wooded areas. The presence of occasional *Trichuris* eggs could support human activity (animal grazing?) proximal to the site. The presence of *Pediastrum* would also suggest freshwater proximal to the site, but an almost total absence of aquatic taxa throughout the sequence suggests the study site was elevated above the water table for the duration of deposition. The microfossil Pseudoschizaea is encountered within the basal unit (and indeed throughout the sequence), in varying abundance. This microfossil is poorly understood, yet studies by Milanesi *et al* (2006) suggest their presence is indicative of damp calcareous soils (perhaps unsurprising given the underlying geology).

6.5.7 Within the overlying main peat unit, a reduction in tree and shrub pollen is encountered, replaced by an expansion of wild grasses and sedges, in addition to a subtle increase in other herbs including daisies, mustards, plantains etc. The arboreal signal is now typified

by pine, with the grains often broken, which may allude to long distance transportation (and hence not necessarily reflect proximal pine woodland etc). Isolated grains of hazel, ivy and heathers are also noted. Occasional microcharcoal begins to be observed within this section of the sequence, whilst some *Trichuris* eggs are also observed within selected peat samples.

6.5.8 The uppermost samples, derived from the peat/topsoil interface, were dominated by herbs, with very restricted tree/shrub content. Wild grasses, sedges and dandelions etc continue to dominate. The supporting herbaceous signal remains relatively diverse and includes knapweed, the Madder family and docks. It was however noted that pollen preservation was very poor in the uppermost samples and multiple additional slide traverses were required to achieve a 100TLP count. Supporting microfossil evidence included charcoal, isolated testate amoebae and Pseudoschizaea.

7 DISCUSSION

7.1 Introduction

7.1.1 A programme of geoarchaeological borehole survey, palaeoenvironmental assessment and scientific dating was undertaken at Lukely Brook and Plaish Meadows in order to establish the extent and nature of archaeological and palaeoenvironmental remains which may be impacted by the Scheme, to characterise the sedimentary sequence, collect base line data on present ground conditions, and inform on future monitoring of these deposits, following the scope outlined by IWCAHES (2022).

7.1.2 A total of twelve boreholes were undertaken at the Site as outlined in the WSI (Wessex Archaeology 2022). Four boreholes (WA-01 to WA-03 and WA-10) were located within the Scheduled Monument, each of which was positioned in order to investigate the peaty deposit recorded in context 537 upslope and downslope of a possible building (Building 2), and palaeochannel deposits recorded in the valley bottom during the previous work undertaken by Busby et al (2001). An additional borehole (WA-04) was located upstream of the possible cross-valley roadway (outside of the Scheduled Monument) in order to assess conditions behind this possible barrier.

7.1.3 Two additional boreholes were located in Horse Paddock (WA-12) and the southwestern end of Plaish Meadows (WA-11), along with two transects of two and three boreholes respectively (WA-05 to WA-09) located within the area southwest of the Scheduled Monument within Plaish Meadows.

7.2 Organic deposits within Plaish Meadows

7.2.1 Organic deposits were encountered only in WA10 and WA01, within the Scheduled Monument; in WA10 a peat unit was identified, described as a homogenous, well humified peat with occasional gravels between 25.34 to 25.01 m OD and a well humified, woody and herbaceous peat with inclusions including Romano-British CBM between 25.01 and 24.90 m OD. The top of the peat was impacted by modern soil formation between 25.47 and 25.34 m OD. No other organic deposits were found in the boreholes other than an organic alluvium identified in WA01 at 25.43 m OD, which was not bottomed at 25.34 m OD.

7.2.2 A programme of palaeoenvironmental assessment and scientific dating was undertaken on the peat deposits in borehole WA10. This borehole is located within the Scheduled Monument in Plaish Meadows, close to Trench 2 excavated by Busby et al (2001) in which an accumulation of herb-rich fen peat up to 300 mm thick (context 537) over an earlier buried soil (Busby et al 2001; Fig. 4) was identified. No buried soils were recorded within

WA10, but the peat here is considered to be the same deposit identified by Busby et al (2001) in Trench 2 and examined in detail by Scaife (2001).

7.2.3 Most of the archaeology recorded by Busby et al (2001) was at a depth of less than 1 m below ground level (bgl), although IWCAHES (2022) noted that the infilled palaeochannels were not bottomed, so their depth is unknown. During the present borehole survey the weathered chalk bedrock within Plaish Meadows was recorded at its deepest at 0.8 m in WA10, although palaeochannels may have incised the chalk to deeper levels elsewhere.

7.2.4 A radiocarbon date from the base of the peat in WA10 (0.78 to 0.80 m bgl) returned a Late Iron Age to Early Romano-British date of 60 cal. BC – cal. AD 120 (2000 ± 30 BP; Beta-654319), broadly consistent with the earliest evidence for occupation at the Site from a buried soil containing ceramics of the mid-1st century AD (Busby et al 2001). This date on the peat deposits is consistent with the hypothesis that they pre-date the construction of the late 2nd to early 3rd century timber framed building, and reclamation of the wetland by an extensive spread of flint rubble (see Busby et al 2021).

7.2.5 The peat here is well humified, generally comprising decomposed organic matter with moderately humified herbaceous and woody remains; the results of the macrofossil assessment indicate that the condition of the waterlogged plant, wood, and invertebrate remains in the peat can be characterised as very poor to poor based on the degraded nature of the wood fragments and the limited range of plant taxa present, including species with decay-resistant seeds. Anthropogenic material was encountered throughout much of the sequence, with charred plant material including wood charcoal encountered in all but the uppermost sample (25.46 to 25.44 m OD), and animal bone and Triticeae (cereal) grain fragments encountered between 25.14 and 25.04 m OD.

7.2.6 Pollen abundance and floral diversity was found to vary through the sequence, but overall abundance and diversity was found to be moderate to good. Most of the plant taxa present were found to be typical of mire vegetation communities, including common nettle, which often forms a component of nutrient-rich fen communities. Overall, the pollen signal was broadly similar throughout the eight samples under assessment, although a reduction in trees and shrubs was recorded with height through the profile.

7.2.7 At the base of the sequence, within the basal ‘disturbed peat’ unit, there was a more mixed pollen signature, typified by trees, shrubs and herbs, although the overall dominance of wild grasses, sedges and dandelions etc suggests that the landscape was already open at this time. The herbaceous taxa present in the assemblage are likely associated with the marshland environment on the floodplain. However, it is possible that selected taxa, particularly those typical of ruderal and disturbed plant communities, such as Brassicaceae, *Rumex* and *C. cyanus* may relate to arable activity in the wider catchment. However, the number of grains of these species is small and it was not possible to determine these to species level in all cases, and as such they could equally represent components of local wetland habitats.

7.3 Water environment

7.3.1 The hydrological characteristics and wider hydrological context for the water levels at Horse Paddock and Plaish Meadows are discussed in Atkins (2023). Lukely Brook typically becomes dry around Plaish Meadows most summers in late spring, reactivating in autumn, with water on the floodplain observed in both Horse Paddock and Plaish Meadows during high winter flows (Atkins 2023). Summary statistics of water levels for rainfall at Carisbrooke and loggers installed in 2017 for each water year are shown in Atkins (2023).

7.3.2 It is of note that abnormally dry (summer 2022) and wetter than average (winter 2022/2023) periods have been experienced during the period of monitoring, and Atkins (2023) note that it is important to consider the results in the context of these wider hydrological conditions which may make it difficult to separate the impacts of the scheme from the extreme hydrological conditions in 2022.

7.3.3 The organic deposits at the Site were encountered only in Plaish Meadows, specifically within the Scheduled Monument in boreholes WA01 (25.43 to <25.34 m OD) and WA10 (25.34 to 24.90 m OD). The discussion on the water environment is therefore primarily focussed on the results obtained by Atkins (2023) within Plaish Meadows, specifically the Dip Well installed at the location of WA10 (Plaish SAM Dip Well) with a consideration of baseline data upstream of here in Plaish Meadows (Plaish Upstream Stilling Wells #1 and #2; Plaish Upstream Dip Wells #1 and #2).

7.3.4 Longer-term data derived from stilling wells and dip wells upstream of the Scheduled Monument show that the groundwater in Plaish Meadows has a regular seasonal pattern, with the lowest levels typically occurring around September when water levels drop below 27.0 m OD; groundwater levels rise rapidly around November in response to winter recharge, to around 27.5 m OD before starting to decline around April/May back to below the base of the dip well by September (Atkins 2023; see **Figure 7**).

7.3.5 Within the Scheduled Monument, a dip well installed by Atkins (Plaish SAM Dip Well) in July 2022 provides limited baseline hydrological data prior to the installation of the Scheme features in November 2022, particularly given the drought conditions of that summer and exceptionally high rainfall of November 2022 (see Atkins 2023). Atkins (2023) report that groundwater levels here were low (c. 25.1 m OD) from July 2022 to November 2022 (**Figure 7**) with brief peaks of higher levels from the end of August 2022 associated with rainfall events. Groundwater levels start to increase from November 2022, to around 25.60 m OD prior to implementation of the scheme and stayed at this level until May 2023.

7.3.6 On the basis of this data, groundwater level is consistently within the depth range of the organic deposits (i.e. below their surface, but above their base) in WA10 (25.34 to 24.90 m OD) prior to November 2022, with groundwater levels remaining consistently above the level of the organic deposits since November 2022.

7.3.7 Atkins (2023) stress that it is difficult to separate the impacts of the Scheme since November 2022 due to the limited baseline hydrological information within the SAM. However, data for June to September 2023 (not reported in Atkins 2023; see **Figure 7**) shows a gradual decline in groundwater levels during this period to between 25.4 and 25.3 m OD, punctuated by rainfall events where the groundwater rises to 25.6 m OD. The data indicates that groundwater levels remained consistently higher in the summer of 2023 than in 2022 (prior to installation of the Scheme features), and that groundwater levels are now generally above or at the top of the organic deposits in the Scheduled Monument.

7.4 Condition and preservation of biological remains

7.4.1 An assessment of the preservation and condition of the waterlogged plant remains and pollen in the peat deposits in WA10 was undertaken, following the guidelines and criteria set out in Historic England (2016), in order to compare the results with those of previous work on equivalent organic deposits examined by Scaife (2001) and in order to provide a baseline assessment of the current state of preservation of those remains.

7.4.2 The condition of the waterlogged plant remains, wood fragments, and invertebrates at the site can be classed as very poor to poor in all of the samples examined in WA10. This is indicated by several criteria:

- There are very few plant macroremains, although seeds of elder (*Sambucus nigra*) are well-represented amongst these. Assemblages dominated by elder seeds often indicate poor preservation conditions in waterlogged deposits since they are resistant to decay;
- High fragmentation rates and evidence for erosion/corrosion in the plant macroremains;
- Visual assessment of the wood fragments indicates that they are degraded. The comparatively large fragment of reaction wood at 0.78-0.80 m bgl is in poor condition. Reaction wood is particularly dense, making it resistant to decay;
- The near-absence of sapwood and bark on the wood fragments is an indicator of poor preservation conditions;
- Earthworm egg cases are present in most of the subsamples, suggesting that there have been cycles of drying/wetting which have contributed to the decay of environmental material.

7.4.3 On the basis of the assessment results, the deposits are likely to contain a restricted and biased assemblage of plant macroremains, wood, and invertebrates, probably due to degradation of the deposits.

7.4.4 When comparing the pollen assemblages encountered in WA10 to those of Scaife (2001), a very similar overall record is present in terms of the habitats indicated by the pollen assemblage. It is worth noting that the work of Scaife (2001) involved a full analysis and as such included larger pollen counts which typically record a wider range of plant taxa compared to smaller assessment counts.

7.4.5 However, considering the Scaife (2001) sedimentary sequence was located proximal to that being analysed herein – on the floodplain of Lukely Brook and in close vicinity to the Roman Villa – comparisons can be made. Scaife (2001) describes a buried palaeosol, overlain by peat which is in turn overlain by topsoil. It is possible that the same sequence is being assessed within this project, with the basal 'disturbed peat' described by Wessex Archaeology (2022) being the ‘buried palaeosol’ described by Scaife (2001). In both studies, the basal unit contains a slightly stronger arboreal signal, typified by alder and hazel, but herbs are more typical, with wild grasses, dandelions etc and sedges most common. With height through the stratigraphic sequence, both studies allude to a further reduction in trees and shrubs and an associated expansion of herbs.

7.4.6 In Scaife (2001), Lactuciodeae (dandelions etc) appear to be the most common towards the top of the sequence, whereas their contribution appears less (albeit still significant) in this study. Scaife (2001) explains that high levels of Lactuciodeae could be a taphonomic signal, whereby more robust pollen types are being preferentially preserved, but follows on to explain that within his results, a diverse pollen record, including less robust pollen types, are present, and as such the signal is likely to be a reliable one. Whilst this study broadly supports this, a distinct reduction in pollen abundance was encountered towards the top of the sequence (to be discussed further below). Scaife (2001) also discussed the presence of cereal pollen within the sequence, encountered in greatest numbers towards the base of the sequence. Whilst this study encountered some larger (>37µm) Poaceae grains, their presence was limited. In addition, it was not possible to definitively conclude that those

encountered were cereal rather than wild grasses with larger pollen grains, as these were often very crumpled. Overall however, the results of Scaife (2001) and this study are very similar, including the presence of potential anthropogenic indicators such as *Trichuris* eggs, and the presence of microcharcoal.

7.4.7 The pollen assessment included an assessment of pollen preservation according to the guidelines in Historic England (2016). The results are summarised in **Table 8**. The 'preservation index' of Tinsley (2013) attempts to quantify evidence of both biochemical (corrosion and degradation) and mechanical (crumpling and broken) breakdown of pollen grains.

7.4.8 As part of this study, in addition to counting pollen grains, the scores for biochemical deterioration (corrosion and degradation) for all grains were added and then divided by 100. The scores for mechanical (physical) deterioration were added, then weighted, before dividing by 100, so the two indices were directly comparable. As described by Tinsley (2013), if all pollen was well preserved, both the indices would be 0; the higher the indices, the poorer the preservation. As displayed in **Table 8**, the biochemical preservation index varied from between 0.46 to 0.99, whilst the mechanical preservation index varied between 0.72 to 1.42. **Figure 6** plots the Biochemical and Mechanical preservation indices against sample depth (1 being the uppermost sample, 8 being the basal sample). As a general rule, the level of biochemical and mechanical damage to pollen grains appears to increase with height through the sequence.

7.4.9 It is also noted that the two samples in which pollen was encountered in the lowest numbers (0.24m bgl and 0.64m bgl) show the highest biochemical and mechanical PI levels (samples 1 and 6). These relate to the lowermost sample of the main peat unit and the uppermost sample from the peat/topsoil interface. In an attempt to contextualise such results, comparisons are made to the results of the MARISP project (Brunning et al. 2013), during which the first attempts to quantify pollen preservation were made (Tinsley 2013). During the MARISP project, multiple pollen sequences across the Somerset Levels were analysed for pollen, with a focus on pollen preservation. The lowest indices recorded were 0.14 (biochemical preservation) and 0.08 (mechanical preservation), both from Meare Village East; the highest indices were 2.01 (biochemical preservation) and 0.68 (mechanical preservation) from Harter's Hill (Tinsley 2013).

Table 8 Pollen preservation index

Stratigraphy	**Topsoil/Peat**		**Peat**				**Disturbed Peat**	
Depth (m bgl)	**0.24**	**0.32**	**0.40**	**0.48**	**0.56**	**0.64**	**0.72**	**0.80**
Number of pollen taxa	16	16	11	19	19	15	17	16
Total identified extensively corroded grains (a)	4	2	5	4	4	2	7	5
Total identified extensively degraded grains (b)	22	10	7	6	6	20	12	8
Total identified extensively crumpled grains (c)	11	2	10	8	0	11	2	0
Total identified extensively broken grains (d)	6	5	7	6	2	7	1	7
Total identified grains with poor preservation (a+b+c+d)	43	19	29	24	12	40	22	20

Total well-preserved grains	6	18	28	35	19	8	29	26
Total ferns	14	8	14	13	7	8	55	22
Biochemical preservation index	0.91	0.7	0.49	0.46	0.78	0.99	0.68	0.51
Mechanical preservation index	1.42	1.11	1.21	0.99	1.04	1.5	0.72	0.78

7.4.10 When comparing the results of this study to that of the MARISP project, the level of mechanical degradation appears to therefore be much higher within this sequence than that encountered in the Somerset sequences. In contrast, the biochemical degradation falls within the variation encountered during the MARISP project. As the study of Scaife (2001) did not undertake a similar assessment of preservation, it is understandably difficult to compare. Scaife (2001) did however suggest pollen preservation was good overall. This study suggests that this is perhaps not entirely the case, particularly in light of the high level of mechanical damage. As no detailed comments on the physical damage of pollen grains were made within the Scaife (2001) study, it is not clear if the level of pollen preservation has changed over recent time.

7.4.11 It is also worth mentioning that the classification scheme is somewhat difficult to apply and may be biased towards specific pollen types. For example, one of the most abundant grains, Cyperaceae, almost always appears moderately to heavily crumpled, but this may not necessarily be a consequence of post depositional activity, instead merely reflecting the grain's typical morphology. Similarly, it is often very difficult to distinguish biochemical deterioration in grains with much thicker grain walls, such as the Lactuciodeae. Finally, it was often very difficult to be confident in reliably quantifying the level of grain corrosion or degradation on some grains (sufficiently to allocate a grading of 1-3), especially if the level of safranin staining was found to be low, which was found to be the case. However, the provision of baseline data here will certainly assist in understanding the impact of the Scheme on pollen preservation over time, should samples be obtained from the same deposits at a later date.

8 CONCLUSION AND RECOMMENDATIONS

8.1.1 A targeted geoarchaeological borehole survey has helped to refine understanding of the nature and distribution of the superficial geological deposits at the Site, and the extent and nature of archaeological and palaeoenvironmental remains which may be impacted by the Scheme. Along with the results of the borehole survey, the subsequent palaeoenvironmental assessment has provided baseline data on present ground conditions, and the preservation and condition of biological remains within organic deposits present within the Scheduled Monument.

8.1.2 The organic deposits at the Site were encountered only in Plaish Meadows, specifically within the Scheduled Monument in boreholes WA01 (25.43 to <25.34 m OD) and WA10 (25.34 to 24.90 m OD). A dip well installed by Atkins (Plaish SAM Dip Well) in July 2022 provides limited baseline hydrological data prior to the installation of the Scheme features in November 2022, particularly given the drought conditions of that summer and exceptionally high rainfall of November 2022 (see Atkins 2023). On the basis of this data, groundwater levels are consistently within the depth range of the organic deposits (i.e., below their surface, but above their base) in WA10 prior to November 2022, with groundwater levels remaining consistently above the level of the organic deposits since November 2022. Atkins (2023) stress that it is difficult to separate the impacts of the Scheme since November 2022 due to the limited baseline hydrological information within the SAM. However, data for June to September 2023 shows a gradual decline in

groundwater levels during this period to between 25.4 and 25.3 m OD, punctuated by rainfall events where the groundwater rises to 25.6 m OD. The data indicates that groundwater levels remained consistently higher in the summer of 2023 than in 2022 (prior to installation of the Scheme features), and that groundwater levels are now generally above or at the top of the organic deposits in the Scheduled Monument.

8.1.3 The results of the palaeoenvironmental assessment indicate that waterlogged plant macrofossil remains, wood fragments, and invertebrates at the site can be classed as very poor to poor in all of the samples examined in WA10. Pollen was encountered in varying abundance and diversity, with preservation poorest towards the top of the sequence. When compared to the full analyses undertaken by Scaife (2001), a very similar signal was encountered, typified by an open landscape with a further reduction in trees over time.

Considering the proximity to the study site of Scaife (2001), combined by the fact that these preliminary results are very similar to the full analyses undertaken by Scaife (2001), no further work is deemed necessary at this stage. Given the unique presence of peat deposits within a chalk catchment, the study of the levels of preservation of pollen, through the calculation of biochemical and mechanical preservation indices, will provide a valuable baseline data set if further works are undertaken at the Site as part of any future investigations.

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APPENDICES

Appendix 1 Borehole sediment logs

Site Code: 261461	Site Name: Lukey Brook Geoarchaeological Borehole Survey	Borehole ID: WA01
Coordinates (NGR) X: 448056.8565	Coordinates (NGR) Y: 87464.4280	Level (top): 25.4177 m OD
Length:	Width:	Depth:

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
101	Void	Void	0.0-0.075	25.42-25.345	
102	Friable silty loam. Rootlets. 10yr 3/2 Very dark greyish brown.	topsoil	0.075-0.23	25.345-25.19	
103	Plastic silty clay with frequent decayed chalk peagrit. 10yr 3/1 Very dark grey.	Subsoil	0.23-0.27	25.19-25.15	
104	More compact, plastic silt. Can roll into a sausage but breaks on bending. 10yr 3/1 very dark grey. Very occasional chalk flecks. Organic/humic.	Colluvium/sub soil	0.27-0.36	25.15-25.06	
105	No penetration	Bedrock	0.36+	25.06+	

Site Code: 261461	Site Name: Lukey Brook Geoarchaeological Borehole Survey	Borehole ID: WA02
Coordinates (NGR) X: 448014.9771	Coordinates (NGR) Y: 87454.4700	Level (top): 26.2954 m OD
Length:	Width:	Depth:

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
201	Dark brown dry sandy soil with angular and sub angular cobbles of flint. Clear sub horizontal contact with	Topsoil	0.00 – 0.30	26.30-26.00	
202	Light grey silty structured chalk. Soft at the surface and containing coarse flint clasts	Bedrock	0.30 – 0.40+	26.00-25.90	

Site Code: **261461**	**Site Name:** **Lukey Brook Geoarchaeological Borehole Survey**	**Borehole ID:** **WA03**
Coordinates (NGR) X: 448042.5101	**Coordinates (NGR) Y:** 87426.6871	**Level (top):** 25.7480 m OD
Length:	**Width:**	**Depth:**

Context Number	**Description**	**Interpretation**	**Depth m bgl**	**Depth m OD**	**Samples**
301	Friable, slightly silty, humic loam topsoil. 10yr 3/1 very dark grey. Rootlets within it. Drier at the top of the profile.	Topsoil	0.00 – 0.23	25.75-25.52	
302	No penetration	Bedrock	0.23+	25.52+	

Site Code: **261461**	**Site Name:** **Lukey Brook Geoarchaeological Borehole Survey**	**Borehole ID:** **WA04**
Coordinates (NGR) X: 447918.7331	**Coordinates (NGR) Y:** 87337.4212	**Level (top):** 26.9921 m OD
Length:	**Width:**	**Depth:** **0.50 m**

Context Number	**Description**	**Interpretation**	**Depth m bgl**	**Depth m OD**	**Samples**
401	Light brown soil with rootlets and modern plant material. Diffuse contact with	Topsoil	0.00 – 0.20	26.99-26.79	
402	Light brown dry sandy soil with angular and sub angular flint and mild bioturbation. Clear sub horizontal contact with	Subsoil	0.20 – 0.40	26.79-26.59	
403	Light grey silty structured chalk.	Bedrock	0.40 – 0.5+	26.59-26.49+	

Site Code: 261461	**Site Name:** Lukey Brook Geoarchaeological Borehole Survey	**Borehole ID:** WA05
Coordinates (NGR) X: 447848.3413	**Coordinates (NGR) Y:** 87305.3153	**Level (top):** 28.2138 m OD
Length:	**Width:**	**Depth:** 1 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
501	Loose brown slightly sandy soil and gravel with twigs and rootlets. Dry. Diffuse contact into:	Topsoil	0.00 to 0.37	28.21-27.84	
502	Brown, consolidated, very firm angular and sub angular flint gravel in a matrix of fine sandy silty chalk. Diffuse contact with	Colluvium	0.37 to 0.48	27.84-27.73	
503	Light grey with orange brown mottling. Soft silky white chalk throughout, homogenous texture. Flint clasts present throughout, mostly fine and angular to sub angular.	Bedrock	0.48 to 1.00+	27.73-27.21	

Site Code: 261461	**Site Name:** Lukey Brook Geoarchaeological Borehole Survey	**Borehole ID:** WA06
Coordinates (NGR) X: 447877.0786	**Coordinates (NGR) Y:** 87277.6640	**Level (top):** 27.2690 m OD
Length:	**Width:**	**Depth:**

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
601	Very dark brown organic soil with occasional peaty pockets and angular flint cobbles.	Topsoil	0.00 to 0.60	27.27-26.67	
602	Light grey soft structured chalk	Bedrock	0.60+	26.67+	

Site Code: 261461	**Site Name:** Lukey Brook Geoarchaeological Borehole Survey	**Borehole ID:** WA07
Coordinates (NGR) X: 447910.2472	**Coordinates (NGR) Y:** 87244.8707	**Level (top):** 29.1460 m OD
Length:	**Width:**	**Depth:**

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
701	Light brown dry sandy soil with angular and sub angular flint and mild bioturbation. Clear sub horizontal contact with	Topsoil	0.00 to 0.20	29.15-28.95	
702	Light grey structured chalk with flint cobbles throughout	Bedrock	0.20 to 0.70+	28.95-28.45	

Site Code: 261461	**Site Name:** Lukey Brook Geoarchaeological Borehole Survey	**Borehole ID:** WA08
Coordinates (NGR) X: 447792.5738	**Coordinates (NGR) Y:** 87250.1141	**Level (top):** 29.2594 m OD
Length:	**Width:**	**Depth:**

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
801	Light brown dry sandy soil with angular and sub angular flint and mild bioturbation. Clear sub horizontal contact with	Topsoil	0.00 to 0.40	29.26-28.86	
802	Light grey with orange brown mottling. Soft silky white chalk throughout, homogenous texture. Flint clasts present throughout, mostly fine and angular to sub angular.	Bedrock	0.4+	28.86+	

Site Code: 261461	Site Name: Lukey Brook Geoarchaeological Borehole Survey	Borehole ID: WA09
Coordinates (NGR) X: 447820.6694	Coordinates (NGR) Y: 87222.2926	Level (top): 28.0030 m OD
Length:	Width:	Depth: 0.50 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
901	Dark brown dry sandy soil with frequent angular and sub angular flint. Clear sub horizontal contact with	Topsoil	0.00 to 0.40	28.00-27.60	
902	Light grey soft silky white chalk throughout, homogenous texture. Flint clasts present throughout, mostly fine and angular to sub angular.	Bedrock	0.40	27.60+	

Site Code: 261461	Site Name: Lukey Brook Geoarchaeological Borehole Survey	Borehole ID: WA10
Coordinates (NGR) X: 448029.9394	Coordinates (NGR) Y: 87439.0166	Level (top): 25.7027 m OD
Length:	Width:	Depth: 1 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
1001	no retention	Void	0.00 to 0.23	25.70-25.47	
1002	Sh3 Th^{2}1 Ag+; humo. 3; very dark brown soft well humified decomposed organic matter with moderately humified reeds/hollow stems throughout. Diffuse contact into:	Peat/topsoil interface	0.23 to 0.36	25.47-25.34	Retained
1003	Sh4 Th+ Ag+; humo. 3; very dark brown well humified decomposed organic matter with trance of rootlets throughout. Homogenous texture. Diffuse into	Peat	0.36 to 0.69	25.34-25.01	Retained
1004	Sh2 Th^{2}1 Tl^{2}1; humo. 2; Dark brown well humified decomposed organic matter with fibrous wood fragments and a brick/CBM fragment. Diffuse contact with	Peat/archaeological layer	0.69 to 0.80	25.01-24.90	Retained
1005	Grey coarse angular flint cobbles in matrix of fine sand and silt. chalk, becoming structured chalk with depth.	Upper chalk surface, weathered	0.80 to 0.88	24.90-24.82	Retained

1006	Light grey fine sandy silt with white chalk and occasional angular gravel	Bedrock	0.88+	24.82+	Retained

Site Code: 261461	**Site Name:** Lukey Brook Geoarchaeological Borehole Survey	**Borehole ID:** WA11
Coordinates (NGR) X: 447735.9859	**Coordinates (NGR) Y:** 87168.8919	**Level (top):** 28.8119 m OD
Length:	**Width:**	**Depth:** 2 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
1101	Void	Void	0.00-0.13	28.81-28.68	
1102	Topsoil. Friable silty loam. 10yr 4/1 dark grey.	Topsoil	0.13-0.38	28.68-28.43	
1103	More compact silty loam. Can roll into sausage but breaks on bending. 10yr 3/2 very dark greyish brown. Frequent degraded chalk rubble/peagrit.	Subsoil/colluvium	0.38-0.47	28.43-28.34	
1104	No penetration	Bedrock	0.47+	28.34+	

Site Code: 261461	**Site Name:** Lukey Brook Geoarchaeological Borehole Survey	**Borehole ID:** WA12
Coordinates (NGR) X: 447434.0620	**Coordinates (NGR) Y:** 87013.7031	**Level (top):** 31.3826 m OD
Length:	**Width:**	**Depth:** 2 m

Context Number	Description	Interpretation	Depth m bgl	Depth m OD	Samples
1201	Light brown, dry gravelly top soil and subsoil, containing rootlets. Overall, granular and homogenous.	Top soil / subsoil	0.00 to 0.44	31.38-30.94	
1202	Void	void	0.44 to 1.00	30.94-30.38	
1203	Brown/grey coarse flint in a matrix of coarse sand. Unsorted and generally angular to sub angular. Sharp contact with	Colluvium	1.00 to 1.30	30.38-30.08	
1204	Light grey with yellow/brown mottling. Chalk, smooth and structured.	Bedrock	1.30+	30.08+	

Appendix 2 Spatial data for the boreholes

Name	Easting	Northing	Elevation (m OD)	Total depth (m)
WA01	448056.86	87464.43	25.42	0.36
WA02	448014.98	87454.47	26.30	0.40
WA03	448042.51	87426.69	25.75	0.23
WA04	447918.73	87337.42	26.99	0.50
WA05	447848.34	87305.32	28.21	1.00
WA06	447877.08	87277.66	27.27	0.60
WA07	447910.25	87244.87	29.15	0.70
WA08	447792.57	87250.11	29.26	0.40
WA09	447820.67	87222.29	28.00	0.50
WA10	448029.94	87439.02	25.70	1.00
WA11	447735.99	87168.89	28.81	0.47
WA12	447434.06	87013.70	31.38	2.00

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447000
447500
448000
87500
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CULVER CHALK FORMATION - CHALK

NEWHAVEN CHALK FORMATION - CHALK

SEAFORD CHALK FORMATION - CHALK

LEWES NODULAR CHALK FORMATION - CHALK

NEW PIT CHALK FORMATION - CHALK

ZIG ZAG CHALK FORMATION - CHALK

HOLYWELL NODULAR CHALK FORMATION - CHALK

WEST MELBURY MARLY CHALK FORMATION - CHALK

UPPER GREENSAND FORMATION - SANDSTONE AND CHERT

UPPER GREENSAND FORMATION - SANDSTONE, GLAUCONITIC

Bowcombe Road

Clatterford Shute

Millers Lane

Froglands Lane

Site boundary
Scheduled Monument

0 200 m

Coordinate system: OSGB 1936 British National Grid

Date: 02/11/2023	Created by: AW
Scale: 1:5,000 at A3	Revision: 0

Figure 1: Site location and BGS bedrock geology

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HEAD, 1 - CLAY, SILT, SAND AND GRAVEL

CLAY-WITH-FLINTS FORMATION - CLAY, SILTY, GRAVELLY

HEAD - GRAVEL, SAND, SILT AND CLAY

ALLUVIUM - CLAY, SILT, SAND AND GRAVEL

HEAD - GRAVEL, SAND, SILT AND CLAY

Bowcombe Road

Clatterford Shute

Millers Lane

Froglands Lane

Site boundary
Scheduled Monument

0 200 m

Coordinate system: OSGB 1936 British National Grid

Date: 02/11/2023	Created by: AW	
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Figure 2: Site location and BGS superficial geology

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447500
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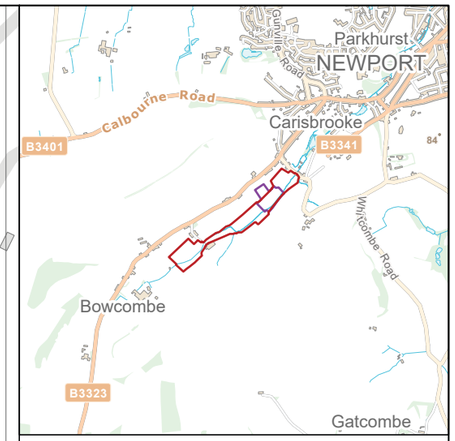
Bowcombe Road
Clatterford Shute
Millers Lane
Froglands Stream
Froglands Lane
Fishpond Stream
Lukely Brook

FS_SW
SD_SW
WA01
WA02
SAM_DW
WA10
WA03
WA04
WA05
PM_DW#1
WA06
WA08
WA07
WA09
PM_SW#1
PM_SW#2
WA11
PM_DW#2
HP_DW
WA12
HP_SW

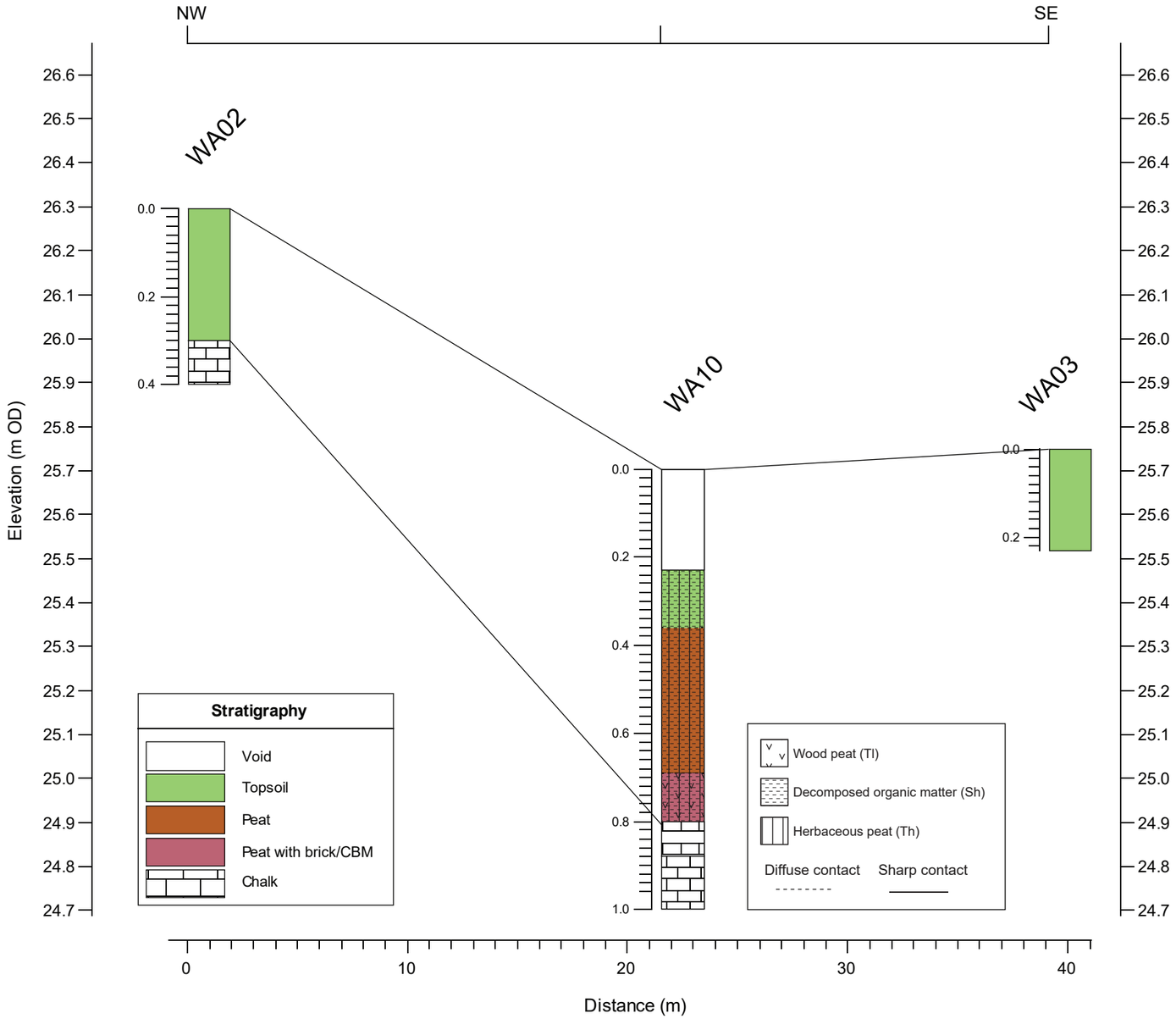


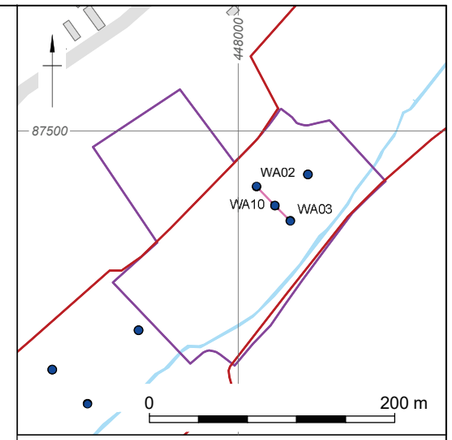
Site boundary
Scheduled Monument
Boreholes
Transect 1
Transect 2
Monitoring locations and features
Dip well
Stilling well
Ford
Wood feature
Drain

0 200 m

Date: 02/11/2023 | Created by: AW
Scale: 1:5,000 at A3 | Revision: 0

Figure 3: Borehole and transect locations





Site boundary
Scheduled Monument
Boreholes
Transect 1

Coordinate system: OSGB 1936 British National Grid

Date: 02/11/2023 | Created by: AW

Scale: Inset 1:5,000 at A3 | Revision: 0

Figure 4: Borehole transect within the Scheduled Monument

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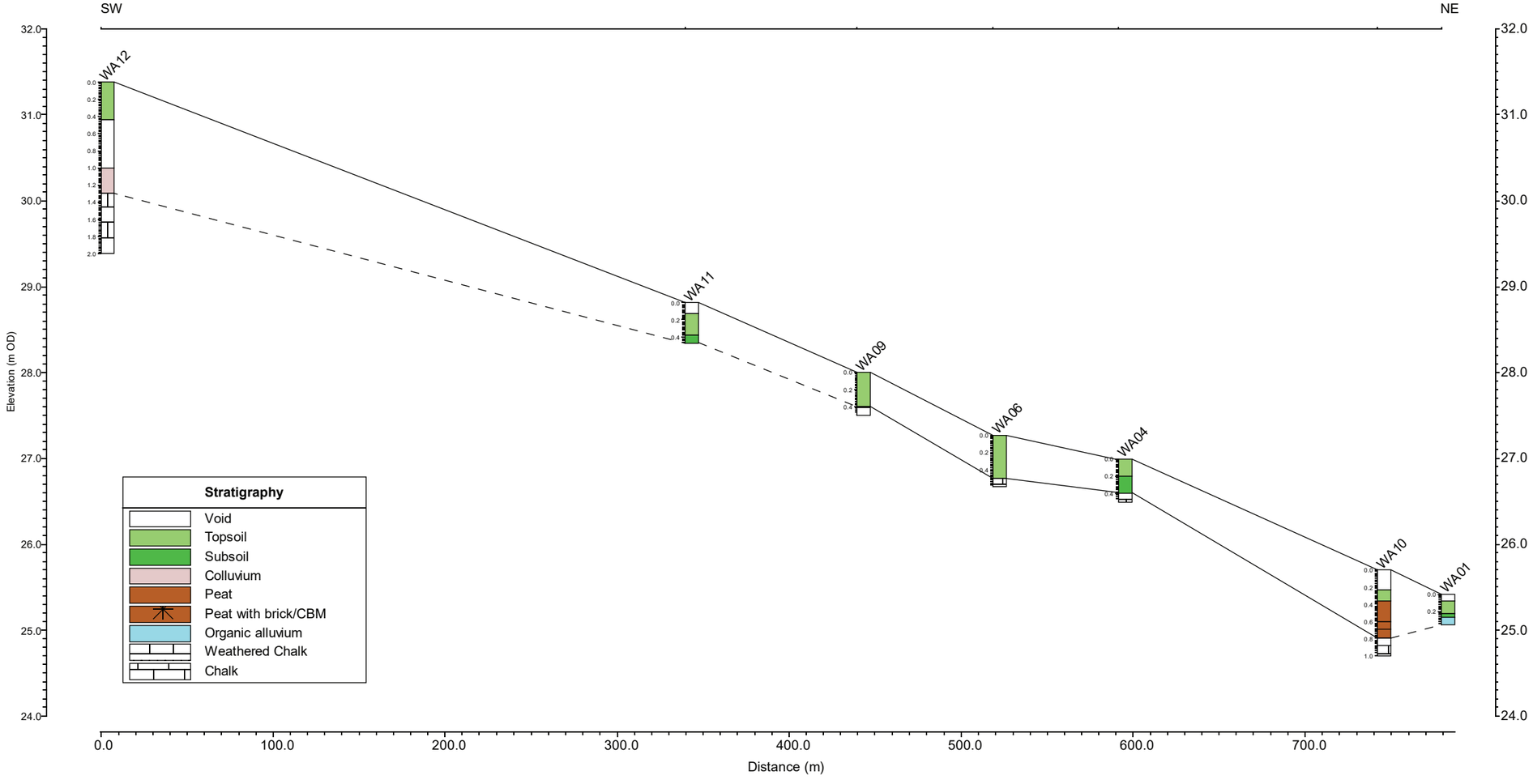
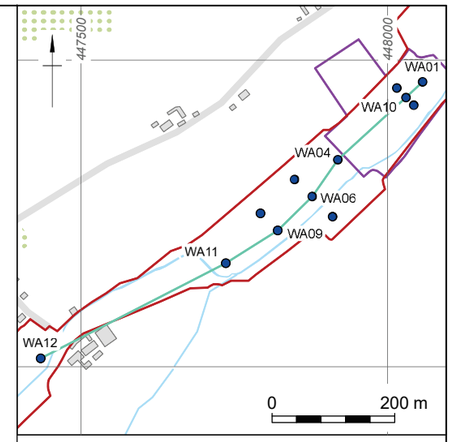
SW

NE





Site boundary
Scheduled Monument
Boreholes
Transect 2

Coordinate system: OSGB 1936 British National Grid

Date: 02/11/2023	Created by: AW
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Figure 5: Wider borehole transect

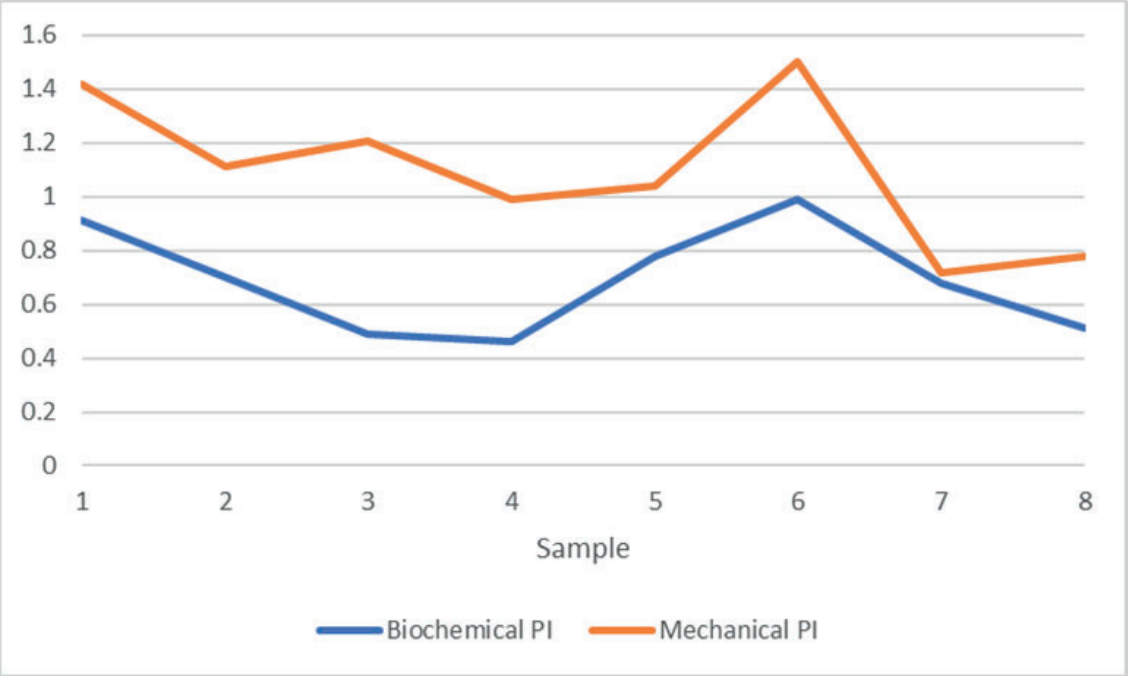

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Figure 6: Summary of biochemical and mechanical preservation index results from the Lukely Brook sequence, in accordance with the Historic England (2016)

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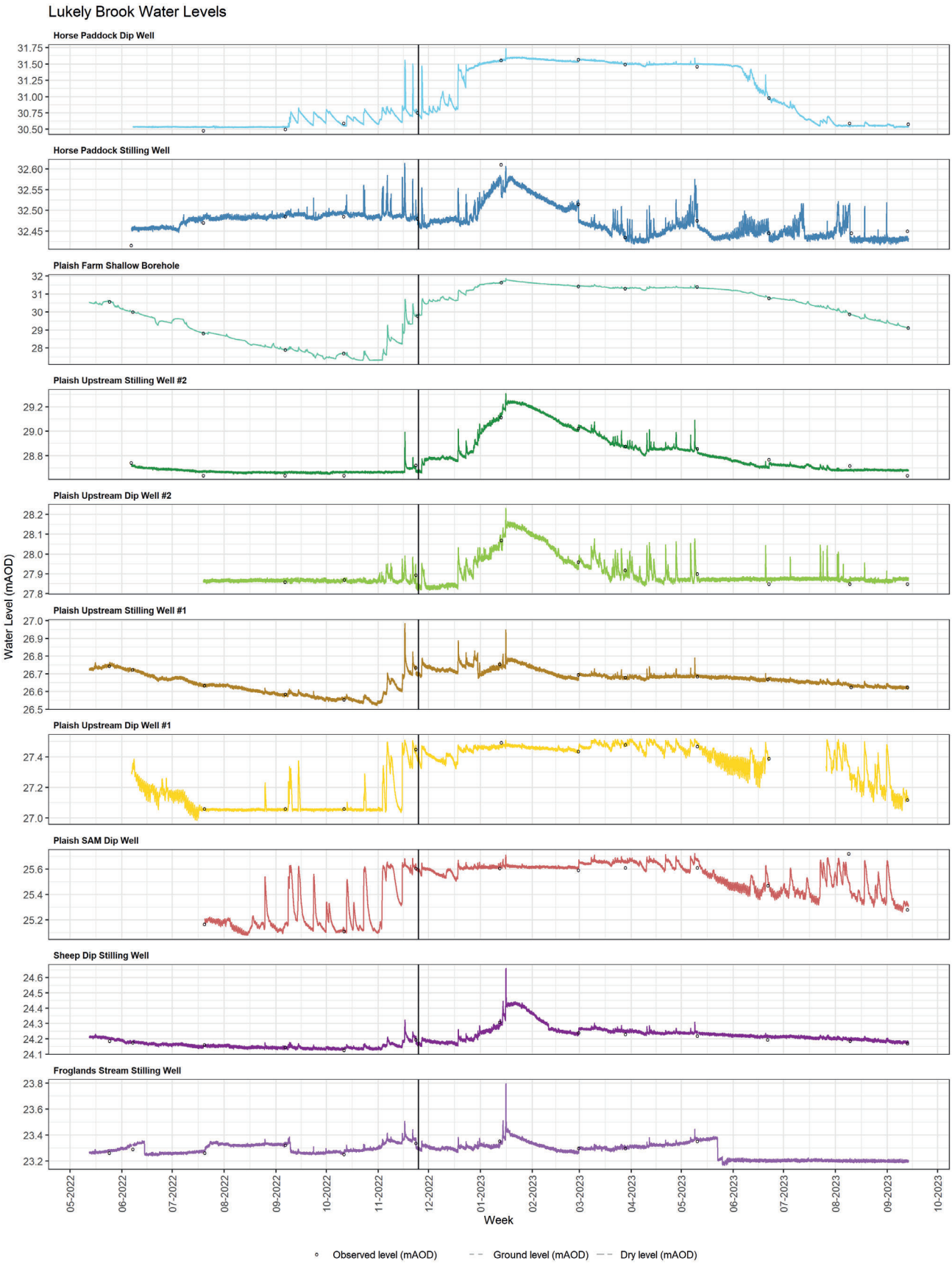

Graph provided by Atkins, originally produced for Plaish Meadows and Lukely Brook AMP7 WINEP Implementation Horse Paddock and Plaish Meadows Stage Zero Interim Monitoring Report. Unpublished Report, August 2023.

Date: 02/11/2023	Created by: AW	Revision: 0	Scale: NA

Figure 7: Lukely Brook water levels (provided by Atkins)

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